UNITED NATIONS ECONOMIC AND SOCIAL COMMISSION

FOR ASIA AND THE PACIFIC

AND

WORLD METEOROLOGICAL ORGANIZATION

REPORT OF THE TYPHOON COMMITTEE

ON ITS THIRTY-SIXTH SESSION

Petaling Jaya, Malaysia
15 - 20 December 2003

CONTENTS

I. ORGANIZATION OF THE SESSION

1. The thirty-sixth session of the ESCAP/WMO Typhoon Committee was held in Petaling Jaya, Malaysia from 15 to 20 December 2003.

Attendance

2. The session was attended by 75 participants from 11 out of 14 Members of the Typhoon Committee, namely: China; Hong Kong, China; Japan; Macao, China; Malaysia; the Philippines; Republic of Korea; Singapore; Thailand; the United States of America (USA); and Viet Nam.

3. The session was also attended by 3 observers, including two from the Russian Federation and one from Mauritius. Representatives from the Economic and Social Commission for Asia and the Pacific (ESCAP) and the World Meteorological Organization (WMO) also attended the session. The list of participants is given in Appendix I.

Opening of the Session (agenda item 1)

4. The opening ceremony was presided over by Honorable Dr. Hashim Hasan, Deputy Secretary-General, Ministry of Science, Technology and Environment, representative of H.E Dato' Seri Law Hieng Ding, Minister of Science, Technology and the Environment and commenced at 0900 hrs on Monday, 15 December 2003 in the Conference Hall of Armada Hotel.

5. Mr. Chow Kok Kee, Director-General, Malaysian Meteorological Service extended a cordial welcome to all the participants. He mentioned that Malaysia was one of the founding Members of the Committee and after which, the membership has been increased and many new activities have been carried out to enhance the capacity of the members in addressing the wide spectrum of issues related to tropical cyclones, disaster prevention and preparedness. Mr. Chow added that the Committee demonstrates the pragmatic cooperation among its members and there were many who joined the programmes and activities that have been organized by the Typhoon Committee Secretariat. He thanked WMO and ESCAP for their advices in organizing the session and wished the session all the success.

6. The representative of ESCAP, Mr. Ti Le-Huu, delivered the message of Mr.Kim Hak-Su, Executive Secretary of ESCAP. The Executive Secretary expressed sincere appreciation to the Government of Malaysia for hosting the session and for its active role since the inception of the Typhoon Committee in the common efforts to achieve the objectives of the Committee. He also expressed appreciation to the Government of the Philippines for hosting the Typhoon Committee Secretariat and for providing secretariat support, including the services of the Coordinator, a full-time meteorologist and a part-time hydrologist. He informed the Committee that the ESCAP Commission at its fifty-ninth session in September 2003 had noted with appreciation the progress and achievements made by the Committee and its Members in 2002. He pointed out that tropical cyclones and resulted water-related disasters continued to cause serious adverse socio-economic impacts during the past several years in many countries in Asia and the Pacific and called for greater efforts be made to improve disaster preparedness of the public for a better living with risk for a safer world in the twenty-first century, as stipulated in the Johannesburg Plan of Implementation (JPOI) of the World Summit on Sustainable Development (WSSD) in September 2002. He noted the continuing increase in support of the Ministry of Land, Infrastructure and Transport of Japan and the Infrastructure Development Institute-Japan in the implementation of the new RCPIP and welcomed the intention of the Ministry of Construction and Transportation of Republic of Korea to start a new programme to support in these common endeavors. He assured the Committee of ESCAP's continuing support to enhance sub-regional cooperation in cyclone-related disaster mitigation and water resources management within the framework of its own programme of work and available resources.

7. The representative of the WMO Secretariat, Mr. Eisa H. Al-Majed, addressed the session on behalf of Professor G.O.P. Obasi, Secretary-General of WMO. He expressed deep appreciation to

the Government of Malaysia for hosting the session. He also thanked the Government of the Philippines for hosting the Typhoon Committee Secretariat (TCS) and ESCAP for long-standing close cooperation with WMO. Mr. Al-Majed mentioned that the session would consider a number of very important issues that were expected to further strengthen and advance the work of the committee. He mentioned also that the World Meteorological Congress (May 2003) decided to establish a new WMO major programme on natural disaster prevention and mitigation aimed at enhancing international cooperation in the field of natural disaster activities. He encouraged Members to facilitate the transfer of the latest forecasting techniques, and to develop and organize training courses. He assured the participants that WMO would continue to assist NMHSs in their development plans through, among others, the resource mobilization for the implementation of regional projects and programmes.

8. Honorable Dr. Hashim Hassan, Deputy Secretary-General, Ministry of Science, Technology and the Environment, representative of H.E. Dato' Seri Law Hieng Ding, Minister of Science, Technology and the Environment, read the Minister's statement. He welcomed all the participants and said Malaysia was honored to host this regional meeting. Dr. Hashim mentioned that Malaysia experienced severe impacts of tropical storms that hit the state of Sabah in 1996, part of Malaysia, which brought severe flooding and damage to some areas. He highlighted the importance of timely and accurate warnings, and early preparation are critical in ensuring disaster relief carried out in time. He commended the support of ESCAP and WMO to the Typhoon Committee and noted that the Committee had made significant progress and provided an excellent platform for exchange of experience in disaster prevention and preparedness, including public awareness, improving of warning systems and preparation of hazard maps. He felt that the committee should continue to explore more capacity building opportunities, capitalizing on the expertise available among Members. In closing, Dr. Hashim wished the participants a pleasant stay in Malaysia and declared the thirty-sixth session officially open.

9. A ceremony was held in the presence of His Honorable Dato' Dr. Hashim Hassan, Deputy Secretary-General, Ministry of Science, Technology and the Environment, where the ESCAP/WMO Typhoon Committee Natural Disaster Prevention Award 2003 was presented to the RSMC Honolulu Hurricane Center USA in recognition of its valuable contribution and distinguished efforts in the improvements to weather services and systems in operation, particularly the system to improve tropical cyclone forecasts such as the EMWIN satellite communication system which is proving to be the most reliable method for receiving forecasts and warnings to small-island countries in the Pacific Ocean region; in providing training for forecasters such as the RSMC Pacific Training Desk which focuses on capacity building in the meteorological services of the small island states; and in providing tropical cyclone products and services for the public and governmental agencies informed of impending severe weather and other disturbances. Mr. James C. Weyman, Director of the RSMC Honolulu-Hurricane Center USA accepted the award on behalf of the Center.

II. ELECTION OF OFFICERS (agenda item 2)

10. Mr. Chow Kok Kee (Malaysia) and Mr. R. Jeffrey LaDouce (USA) were elected Chairman and Vice-Chairman of the Typhoon Committee, respectively. Mr. Lam Chiu-Ying (Hong Kong, China) was elected Chairman of the Drafting Committee.

III. ADOPTION OF THE AGENDA (agenda item 3)

11. The Committee adopted the agenda as shown in Appendix II.

IV. THE COMMITTEE'S ACTIVITIES DURING 2003 (agenda item 4)

12. The ESCAP representative informed the Committee that the Economic and Social Commission for Asia and the Pacific, at its fifty-ninth session held in Bangkok in September 2003, noted with appreciation the important achievements and progress of work by the Committee and its Members in 2002. It noted the increase in the subregional cooperation activities and enhanced visibility of the Committee in various international forums on disaster prevention and preparedness.

13. The Typhoon Committee Secretariat (TCS), on behalf of the Typhoon Committee, expressed its gratitude to Mr. Sampan Thaikruawan of the Thai Meteorological Department for representing the Committee at the 59th Session of ESCAP in Bangkok, Thailand, in September 2003. The TCS reported on the following activities undertaken in 2003:

- TCS Coordinator attended the Third World Water Forum in Kyoto, Japan in March 2003.
- TCS Hydrologist attended the Meeting of the Working Group on Hydrology Component in Beijing, China in September 2003.
- TCS published the 15th issue of Typhoon Committee Newsletter in July 2003.
- TCS published the 2002 Typhoon Committee Annual Review (TCAR) in October 2003.
- TCS *continued to manage the Typhoon Committee Foundation, Inc.* (TCFI) and awarded the foundation's 2003 Natural Disaster Prevention Award to the RSMC *Honolulu-Hurricane Center USA*.

(a) Meteorological Component (agenda item 4.1)

14. The session reviewed the activities of the Members during the past year, details of which are presented in Appendix III.

15. The delegate from China informed the Committee that the Chinese Meteorological Satellite FY-2B has been recovered from the technique problem. It can broadcast hourly northern hemisphere images except during eclipses periods from 28 August to 14 October and from 28 February to 14 April. China will launch a new satellite FY-2C in 2004. The Visible and Infrared Spin Scan Radiometer (VISSR) channels will be increased from 3 to 5.

16. The delegate from Japan informed the Committee that JMA started backup operation of GMS-5 by GOES-9 in May 2003 in collaboration with NOAA/NESDIS. NMHSs in Asia-Pacific region are able to retrieve satellite imagery either by accessing the JMA server through internet, by receiving WEFAX from GMS-5, or by direct reception of GOES GVAR data. JMA is now intensively making efforts toward the early launch of MTSAT-1R, the successor to GMS-5. However, it is premature to refer to the exact timing of the launch at this moment, because of the recent failure of launching H2-A Rocket. JMA will duly issue announcement, at the earliest possible date, of the timing of the launch as well as the schedule of transition from backup operation to full operation of MTSAT-1R and from WEFAX/HiRID to LRIT/HRIT for satellite imagery dissemination. Japan also stressed that JMA would give full consideration to the users' circumstances of their migration to MTSAT-1R.

17. The Committee agreed with the proposed amendments to the Typhoon Operation Manual (TOM) submitted by the Rapporteur, Mr. N. Mannoji (Japan), which is given in Appendix IV. The Committee expressed its gratitude to the services of the rapporteur and expressed its appreciation to JMA for the offer to continue to provide the services of a rapporteur on TOM for the coming year.

18. The Committee agreed to include the procedure for the annual update of the Extended Best Track in the TOM.

19. The Committee expressed its gratitude to JMA for the exemplary work of the Regional Specialized Meteorological Center (RSMC) Tokyo - Typhoon Center and its continued provision of numerical weather products to other Members. The Members noted that these forecasts continue to be of great help to their operations. Its activities in 2003 and implementation plan for the period 2003 to 2007 are contained in Appendix V.

(b) Hydrological Component (agenda item 4.2)

20. The Committee took note of the report of the pre-session of the TC hydrologists which met on Sunday, 14 December 2003 (Appendix VI) and progress of work as reported by the Members (Appendix VII).

21. The Committee was informed of the activities which had been carried out by the Working Group in 2003, which included the following:

- A preparatory meeting of the Working Group was sponsored by the Government of Japan and hosted by the Infrastructure Development Institute – Japan (IDI) in March 2003 to prepare for the Workshop on Implementation of the Hydrological Component of the New Regional Cooperation Programme Implementation Plan of the Typhoon Committee and to encourage all key TC-WGH members to speed up progress on pilot projects identified during the 2002 Workshop, particularly those related to the two projects on flood hazard mapping and sediment disaster forecasting and warnings;
- The Committee was represented at the Third World Water Forum held in Kyoto in March 2003 and took an active part in the conduct of the Flood Day of the Forum.
- With the assistance of ESCAP, the TC-WGH undertook a survey on the readiness of TC Members in the implementation of the hydrological and DPP components of the New RCPIP for presentation at the Beijing Workshop;
- The Workshop on Implementation of the Hydrological Component of the New Regional Cooperation Programme Implementation Plan of the Typhoon Committee was held in Beijing in September 2003; and
- The Committee was represented at the Second International Conference on Early Warning held in Bonn in October 2003, which was jointly organized by International Strategy for Disaster Reduction and Germany.

22. The Committee noted that important progress had been made during the past year over several joint projects as reported by the Chairman of the Pre-session, particularly the projects on flood hazard mapping and flashflood and sediment disaster forecasting and warning. It was pleased to note the enhanced visibility of the Committee at various international forums, including the Third World Water Forum held in Kyoto, Japan in March 2003 and the Second International Conference on Early Warning held in Bonn, Germany in October 2003. The Committee recorded that the allocation of US$17,500 from TCTF had enabled the TC-WGH to mobilize a total amount of over US$60,000 to expand its scope of work, including interaction with TC DPP experts. In this connection, the Committee encouraged the other two components: meteorology and DPP to initiate joint efforts towards achieving the goals and objectives proposed in the New RCPIP.

23. The Committee expressed its appreciation to the Working Group, those involved in the preparation and organization of the Workshop held in September 2003 in Beijing and expressed its gratitude to the Ministry of Water Resources of China, MLIT, IDI and JICA for all the financial support provided to the participants of the Workshop, including DPP experts of the Typhoon Committee, the services of various experts and part of the organization costs.

24. The Committee reviewed activities related to the hydrological component, including flood forecasting and warning, comprehensive flood loss prevention and management, improvement in communication with the public, and enhancement of public awareness of cyclone and water-related hazards. Activities on the hydrological component were reported by 11 TC Members, namely China; Hong Kong, China; Japan; Macao, China; Malaysia; Philippines; Republic of Korea; Singapore; Thailand; United States of America; and Viet Nam, and are summarized in Appendix VIII which includes also the summary of activities of ESCAP and WMO related to the hydrological component. The Committee was pleased to note that several Members had continued to exchange hydrological data for better flood forecasting and warnings in the past year.

(c) Disaster Prevention and Preparedness Component (agenda item 4.3)

25. The Committee reviewed the activities on disaster prevention and preparedness (DPP) as summarized in Appendix VIII which also includes a brief summary of activities presented by the representatives of ESCAP, WMO and the Asian Disaster Reduction Centre (ADRC) related to disaster prevention and preparedness. The Committee noted the willingness of all the delegations to enhance their interaction on DPP activities among the Members and the DPP, meteorological and hydrological components.

26. ADRC circulated an updated list of Internet web sites that Members can access for meteorology, hydrology and disaster prevention and preparedness information and invited the Committee Members to provide additional information or corrections to enable it to update the list soon.

(d) Training Component (agenda item 4.4)

27. The Committee reviewed the efforts made by the Members with respect to the training component and was pleased to note that various education and training activities were supported by Members themselves and WMO. The details are given in Appendix IX.

28. The Committee expressed its gratitude to those Members which had their national facilities available for the training of meteorological and hydrological personnel of other interested Members.

29. The Committee took note of the important contribution of the Micronesian Meteorologist Intern Program and the Pacific Desk Program conducted by RSMC Honolulu-Hurricane Center.

30. The Committee reiterated that CD-ROMs be produced for all workshops or seminars sponsored by TC Trust Funds for distribution to all Members, including those who could not participate in such training opportunities, in order to maximize the use of its resources.

(e) Research Component (agenda item 4.5)

31. The Committee noted many research activities undertaken by Members on various aspects of tropical cyclones, including those related to meteorological, hydrological and DPP components. The summary reports of individual Members on their respective activities in the research component are given in Appendix X.

32. The Committee took note of the important contribution of the National Research Institute for Earth Science and Disaster Prevention (NIED) of Japan for the development of the prediction method of flood runoff and inundation combined by the scaling and probability theory, as this method will be very effective for ungauged basins.

V. REVIEW OF THE 2003 TYPHOON SEASON/PUBLICATIONS (agenda item 5)

33. The Members noted that 21 typhoons developed in 2003. A review of the tropical cyclones affecting the Members is given in Appendix XI.

34. As in the previous years, RSMC Tokyo-Typhoon Center provided the session with a review of the 2003 typhoon season contained in Appendix XII.

Publications

35. The TCS reported to the Committee that it had published the 15th issue of the Typhoon Committee Newsletter in July 2003 and the publication of the 2002 Typhoon Committee Annual Review (TCAR) in October 2003 and had disseminated to all the Members, ESCAP and WMO in electronic (CD-ROM) format.

36. The Members noted with satisfaction the above publications through the commendable efforts of the Chief Editor provided by the TCS and the National Editors provided by the Members.

The Committee proposed that the current Chief Editor continue with the editorial task.

37. The RSMC Tokyo – Typhoon Center published the "Annual Report on Activities of the RSMC Tokyo – Typhoon Center in 2002" in the form of CD-ROM with printed matters in November 2003. The RSMC Tokyo also published Technical Review No. 6 that contains a paper on the development of guidance for forecast of maximum precipitation amount in March 2003.

VI. COORDINATION WITH OTHER ACTIVITIES OF THE WMO TROPICAL CYCLONE PROGRAMME (agenda item 6)

38. The consideration under this agenda item was based upon the information contained in the twenty-ninth session status report on the implementation of the WMO Tropical cyclone Programme (TCP) and supplementary detailed information presented verbally at the session by the representative of the WMO Secretariat. The Committee noted with appreciation the comprehensive information provided on the implementation of the TCP.

39. The Committee was pleased that the third issue of the publication *"Annual Summary of Global Tropical Cyclone Season 2002"* was posted on the TCP home page (http://www.wmo.int/web/www/TCP/trop-cyc.html) and the brochure *"Specialized centers provide up-to-date tropical cyclone, hurricane, typhoon advisories"* (WMO/TD-No. 1045, TCP-44) was updated.

40. The Committee was informed that the TCP had arranged for reviews and assessments that would lead to suitable conversion factors between the WMO 10-minute average wind and one-, two- and three-minute "sustained" winds. The outcomes would be included in the relevant publications of the five tropical cyclone regional bodies.

41. The Committee noted with satisfaction that the TCP, in cooperation with the Joint Commission for Marine Meteorology, organized the Second Workshop on South China Sea Storm Surge, Wave and Ocean Circulation Forecasting – *A Hands-on Ocean Forecast Training Laboratory for the South China Sea Region* (Kuantan, Malaysia, 15 – 19 September 2003).

42. The Committee noted with satisfaction that two woman forecasters from China and Thailand had undertaken very successfully the third on-the-job training in typhoon operations at the RSMC Tokyo – Typhoon Center from 23 July to 1 August 2003. It also noted with appreciation that JMA would organize the attachment of two woman forecasters to the RSMC Tokyo for 10 days in July/August 2004. A CD-ROM prepared by the RSMC for the 2003 on-the-job training material was distributed to TC Members at this session.

43. The Committee requested the TCP to continue to facilitate and enhance the coordination, harmonization, and collaboration of tropical cyclone activities between the ESCAP/WMO Typhoon Committee and other tropical cyclone regional bodies, in particular the WMO/ESCAP Panel on Tropical cyclones for the Bay of Bengal and the Arabian Sea and the RA V Tropical Cyclone Committee for the South Pacific and South-East Indian Ocean.

44. The Committee supported the implementation for 2004, the TCP sub-project No. 25: Study on the economic and societal impacts of tropical cyclones, as a case study for the Philippines.

45. The Committee was informed that the WMO pilot Web site "Severe Weather Information Centre" (SWIC), aiming at facilitating access by the international media to official NMS warnings, had been operating smoothly since it was launched for an operational trial in September 2001. Over the past two years, the number of participants increased gradually. By mid-2003, all Regional Specialized Meteorological Centres (RSMCs) and Tropical Cyclone Warning Centres (TCWCs) under the TCP were contributing to the pilot project. Furthermore, 12 Members of the Typhoon Committee also make their warnings available to the Web site. The SWIC Web site is gaining increasing popularity. More than 1.3 million page views were recorded in September 2003 when tropical cyclones were active in the Northern Hemisphere. Looking ahead, more facilities will be developed to assist NMSs to provide their warnings and advisories dynamically onto the Web site. It is also planned that the Web site will be extended to cover other severe weather types. Heavy rain will be the first to be added in the coming year.

VII. PROGRAMME FOR 2004 AND BEYOND (agenda item 7)

Regional Cooperation Programme Implementation Plan (RCPIP)

46. The Chairman of the Interim Working Group (IWG) on RCPIP presented the IWG's findings and recommendations as contained in his report (Appendix XIII). He pointed out that the proposals and options contained in the report were the results of the common efforts of 7 core members and 6 experts from China and Japan. The proposals and options have also incorporated advice from other TC experts. The IWG report covers (1) Options and Proposals on Changes to the Methodology and Implementation of New Technologies which May Lead to Efficiencies of the Typhoon Committee (TC), TC Coordinator and the TC Secretariat (TCS); (2) Options for the Framework of Priorities for Activities of the Typhoon Committee; (3) Options for Reporting Formats for the Five Components of the RCPIP for the Typhoon Committee Together with the Mechanisms Aimed at Improving the Implementation of the RCPIP; (4) Options for Collaborative Activities Among the Five Components of the RCPIP; (5) Options for Mobilizing Resources to Achieve the Goals and Objectives, as Determined by the Typhoon Committee at its Thirty-Fifth Session; and (6) Proposed Updates to the Statute of the Typhoon Committee and Rules and Procedures of the Typhoon Committee. The Committee commented on the work of the IWG and felt that further study was required.

47. With respect to the options for mobilizing resources to achieve the goals and objectives of the Committee, three special lectures were presented by Mr. Ti Le-Huu, ESCAP; Mr. E. Al-Majed of WMO and Mr. K. Kuroiwa of JMA, as recommended by the IWG. On the basis of the background lectures, the Committee discussed various options for resource mobilization and agreed on the following:

(a) Resource mobilization should aim to benefit all TC Members and ultimately typhoon-prone communities.
(b) A questionnaire would be prepared and distributed to the Members in January 2004 to collect information on achievements, successes and problems in mobilizing resources. The responses from the Members are expected to be returned to TCS before March 2004. The Committee requested interested participants to the Session to assist TCS in the preparation of the questionnaire to enable it to send it out as scheduled.
(c) A database on resources mobilization, based on the responses to the questionnaire mentioned above, would be created at the TCS for easy reference by all Members. The Committee also agreed to appoint a Rapporteur to prepare a synthesis report compiling and analyzing the responses to the questionnaire.
(d) Mr. Koji Kuroiwa of Japan accepted the invitation of the Committee to be the Rapporteur. The Rapporteur's report will be provided to the Working Group (refer para. 52) by April 2004 to develop strategies and one or two project proposals for implementation of resource mobilization.
(e) Coordination and links with other activities of WMO and ESCAP to facilitate resource mobilization should be further strengthened.
(f) TC annual sessions should include presentations on mobilization of resources and Members should include information on resource mobilization in their country reports.
(g) Other options and mechanisms of resource mobilization would be reviewed after TC decided on its future structure and operations.

48. Regarding the format for the framework for priorities of the Committee proposed by the IWG, the Committee endorsed the table form of the RCPIP Goals, Objectives, Actions and Priorities given in Annex II of Appendix XIII. In this connection, the Committee asked that "completion date" be changed to "target dates" and "success criteria" be further refined to facilitate future monitoring. The Committee took note of the new research themes proposed by Japan and requested TCS in cooperation with all the TC Working Groups and Members to update the RCPIP. Recognizing the

importance of sharing the information contained in the RCPIP with a wider audience, it requested that the updated RCPIP be presented in a more attractive manner, if possible in colour and posted on the TCS Website.

49. The Committee endorsed the proposed new format of the country report containing three main components, viz. meteorology, hydrology and DPP as outlined in Annex III of Appendix XIII. The Committee also agreed that :

(a) the format be standardized to facilitate integration of information provided by the Members to the TC Report.
(b) these reports be submitted in electronic form.
(c) the new format be applied to the next session (37th Session).

The Committee requested the TCS to provide the Members with all of the details required for the standardized country report format. In addition, the Committee expressed its appreciation to the Hong Kong Observatory for its kind assistance in hosting all the 36th TC documents. The Secretariats were requested to remind relevant contact persons of the TC Members of the Website before the next session to enable participants to download the documents.

50. Regarding options for collaborative activities, the Committee agreed that efforts should be made to explore options contained in Annex IV of Appendix XIII. It agreed that the three components should hold their corresponding pre-sessions the day prior to the start of the 37th Session of the TC followed by a plenary pre-session for the three components to interact. The Committee also requested that efforts be made to involve DPP experts and meteorologists in the 2004 Seoul Workshop of the TC Working Group on Hydrology. It noted the various mechanisms proposed by the IWG and requested that specific result- and action-oriented themes be submitted to the Committee by the Chairman of a new Working Group (refer para.52) for consideration at the next session.

51. In deliberating the future structure and mode of operation of the TC, the Committee expressed its appreciation to Dr R. L. Kintanar for his long involvement in the work of the TC since its establishment in 1968 and his dedicated services over the past three decades as TCS Coordinator. The Committee also put on record its gratitude to the Government of the Philippines for kindly hosting the TCS during the past three decades. The Committee expressed its sincere appreciation to the IWG for its various proposals which would have important impacts on the modus operandi of the TC.

52. The Committee agreed:

(a) that Members would deliver their country reports covering all three components with training and research activities in one presentation. Starting with the 36th session, Members were requested to limit their presentations to 20 minutes each to allow more time for interaction.
(b) to establish the Working Group on the Review of Operations and Structure of the Typhoon Committee (ROSTY). The Committee appointed Mr. Jim Weyman of USA as the Chairman of the Working Group. The Working Group would consist of core members to be nominated by China; Hong Kong, China; Japan; Malaysia; Philippines; Republic of Korea and Thailand. The nominations should be submitted to the TCS with a copy to the Working Group Chairman by 21 January 2004. Failure to meet the above deadline implies that the respective members do not wish to take part in the Working Group. Other Members are welcome to participate in the work of the Working Group at their own expense. The Committee requested the Working Group to collect more information and develop more refined proposals for discussion and adoption, if appropriate, by the TC at its 37th session. The Working Group should also deliberate on the budgetary process with a view to proposing options to ensure smooth operations and proactive development of the Committee. The Committee approved the Terms of Reference of the Working Group as shown in Appendix XIV.

Working Group on a Unified North-West Pacific Tropical Cyclone Best Track Data Set

53. The Chairman of the Working Group on a Unified North-West Pacific Tropical Cyclone Best Track Data Set (Mr. N. Mannoji, RSMC Tokyo, Japan) gave a concise summary of the report (Appendix XV) in which the plan to produce a dataset named an "Expanded Best Track Data Set for the Western North Pacific and the South China Sea" (hereafter EBT) is described. The working group consists of Dr. Lei Xiaotu (Shanghai Typhoon Institute, China), Ms. Queenie Lam (HKO, Hong Kong, China), Mr. Prisco D. Nilo (PAGASA, Philippines), and Mr. Frank Wells (WFO Guam, USA).

54. Some comments were made on the implementation: i) It is confirmed that EBT is regarded to be "essential data" under the WMO Resolution 40, and the EBT can be accessed on the web site of RSMC Tokyo - Typhoon Center without restriction. ii) The meteorological, storm surge and loss and damage data to be added for regular update might be different from those for the passage report, on which full quality check is not necessarily conducted. iii) RSMC - Tokyo should submit a progress report of EBT to the Committee every year.

55. The Committee decided to approve the plan to produce the EBT. The Committee requested Members to cooperate with RSMC Tokyo - Typhoon Center in producing the EBT, and to nominate a contact person on this subject. Each Member is to provide the name of the contact person to the Typhoon Committee Secretariat by 15th January, 2004. The Committee decided to dissolve the Working Group on a Unified North West Pacific Best Track Data Set and expressed its sincere appreciation for the work they performed.

Typhoon Research Coordination Group (TRCG)

56. The Committee took note of the report made by the Chairman of TRCG including the status and plan for the visiting lecturer programme and for the Typhoon Committee Research fellowship scheme. A TRCG meeting was held during the 36th Session to discuss its activities in 2004 and 2005. The summary of the meeting is attached in Annex I of Appendix XVI, including the action plan in 2004.

57. The TRCG recommended the following topics to promote research activities in conjunction with the refined priorities of RCPIP.

(1) To implement the roving seminars in 2004 under the visiting lecturer programme (Annex III of Appendix XIX of final report 34th session) to promote research and development, and to strengthen capacity building on the tropical cyclone forecasting and other two components hydrology and DPP. The roving seminars in 2003 are summarized in Annex II.
(2) To continue TRCG fellowship scheme. The Committee invited TCS to issue a letter to all Members to invite applications for fellowships and identification of hosting organizations. The current status of the scheme is summarized in Annex III.
(3) To plan a regional workshop in 2005 to stimulate joint collaboration among the three components: meteorology, hydrology, and disaster prevention and preparedness.
(4) To update the list of resource persons or contact points (Annex IV) in the region for better interaction, encouraging members to take part in the development work, to share research results, and to assist other members in adopting the use of information through internet.

58. The Committee urged its Members to implement the above recommendations as far as possible and requested TCS to provide necessary support to the Working Group.

59. The Committee expressed its appreciation to the Chairman and members of the Typhoon Research Coordination Group (TRCG) for its report and their work. The Committee decided to re-establish TRCG to be chaired by Dr. Woo-Jin Lee (Republic of Korea) because of his excellent guidance and contributions to the TRCG and invited all Members to nominate representatives to take an active part in the work of the Group.

Meteorological component

60. The Committee expressed its appreciation for the practicability of the Second Workshop on South China Sea Storm Surges, Wave and Ocean Circulation Forecasting: "A hands – on ocean forecast training laboratory for the South China Sea region" which was jointly organized by TCP and JCOMM in Kuantan, Malaysia from 15 to 19 September 2003 and encouraged that this type of workshop be held in the future for TC Members.

61. The Committee expressed its appreciation to Republic of Korea for the organization of the training workshop on weather forecasting for operational meteorologists, which was held in Seoul from 6 April to 3 May 2003 for 25 participants from WMO Members in the region, including 9 meteorologists from TC Members (Cambodia, Malaysia, Lao PDR, Philippines, Thailand and Viet Nam) under the sponsorship of KOICA. It encouraged that similar training workshop be continued in the future. The Committee was informed that the next training course would be held in April-May 2004.

62. The Committee was informed that the Second Regional Technical Conference on Tropical Cyclones, Storm Surges and Floods would be conducted in Brisbane, Australia from 1 to 3 July 2004, in conjunction with the International Conference on Storms, in Brisbane from 5 to 9 July 2004.

63. The Committee agreed on the support for the attendance of eight (8) typhoon experts, at the above Regional Technical Conference and International Conference, with financial assistance from TCTF (see paragraph 81 (6)).

64. The Committee endorsed the implementation of the fourth Typhoon Operational Forecasting Training at the RSMC Tokyo – Typhoon Center:

- Attachment of two woman forecasters one each from Hong Kong, China and Malaysia;
- Period of Training – 10 days: Wednesday, 28 July – Friday, 6 August 2004;
- Financial Assistance: Similar arrangements for the training will be made; i.e. WMO would provide travel costs and TCTF would provide reduced DSA (see paragraph 81 (7)).

65. The Committee approved the replacement of the three typhoon names: CHATAAN, RUSA and VAMEI, which were retired at the last Session as follows: Chataan by MATMO, Rusa by NURI, and Vamei by PEIPAH. It also agreed to replace the name of the typhoon IMBUDO, which devastated the Philippines in 2003, with a new name: MOLAVE. The Committee agreed that the new list of names would become effective on 1 January 2004. It further request TCS Coordinator to report at the next session a list of retired names for future reference.

Hydrological Component

66. The Committee took note of the report of the pre-session of the TC Hydrologists (Appendix VII) as presented by the Pre-Session Chairman, which included the results and recommendations of the pre-session and the Workshop on Implementation of the Hydrological Component of the New RCPIP held in Beijing from 22 to 26 September 2003. The Beijing Workshop was jointly organized by the Ministry of Water Resources of China, the Ministry of Land, Infrastructure and Transport (MLIT) of Japan, Infrastructure Development Institute (IDI) of Japan, the Japan International Cooperation Agency (JICA), ESCAP, WMO and TCS. The Committee expressed its appreciation to the Typhoon Committee Working Group on Hydrology (TC-WGH) for the important progress in connection with the implementation of the Hydrological Component of the New RCPIP and particularly for the interaction with the DPP components. The Committee encouraged the TC-WGH to involve also TC meteorologists in the interaction.

67. The Committee expressed its gratitude to all the donors, Members and cooperating agencies, especially MLIT and IDI for their contribution to the work of the TC-WGH and the

sponsorship of the participation of TC-DPP experts in the last two annual workshops. It also expressed its sincere appreciation to the Ministry of Construction and Transportation (MOCT) of Republic of Korea for its commitment to enhance financial support in leading the two priority projects of the Hydrology on "Evaluation and Improvement of Operational of Flood Forecasting System – Focusing on Model Performance" and "Development of Guidelines for Dam Operation in Relation to Flood Forecasting". It also noted that the strategies proposed by the TC-WGH aiming at enhancing the effectiveness of these two projects would require systematic cooperation among the Members during the next four years, 2004-2007, and invited MOCT of Republic of Korea to continue its assistance to the successful completion of these projects in 2007.

68. The Committee decided to re-establish the Working Group on Hydrology to be responsible for the planning and promotion of cooperation among the TC Members in the implementation of the Hydrological Component of the RCPIP. The Committee requested the Working Group to submit a report through the TCS to the 37th session. The Working Group membership included.

- Mr. Kenzo Hiroki (Japan), Chairperson
- Mr. Liu Jinping (China), Vice Chairperson
- Mr. Low Koon Sing (Malaysia)
- Dr. Hong Ilpyo (Republic of Korea)
- Mr. Ryosuke Kikuchi, (Japan)

The Committee also requested other interested Members to take part in the Working Group and invited ESCAP and WMO to involve in this Working Group.

69. The Committee requested TCS in cooperation with the MOCT of Republic of Korea to organize a 4-day workshop for TC hydrologists on "Living with Risk: Dealing with Typhoon-related Disasters as part of Integrated Water Resource Management" in Seoul in 2004. The representatives of MOCT recommended that the Workshop be held from 11 to 15 October 2004. However, in view of the requirement of report submission to the Committee six weeks before the next session, the Committee urged that efforts be made to hold the Workshop between the period from July to September 2004. In noting the importance of interaction among the three components, the Committee also agreed to provide resource to support the participation of two TC meteorologists as resource persons at the Workshop. The Committee requested KMA to provide the service of a meteorologist as a resource person and asked that the workshop be organized in such a way to ensure effective interaction among the components. In order to enhance the effectiveness of the workshop, the Committee also agreed on the following:

(a) To request Japan and Republic of Korea to provide the services of experts to prepare for the organization of the Workshop, including holding a preparatory task force meeting in Republic of Korea at an early stage, to facilitate the exchange of experiences and to prepare programme for follow-up action taking into account the priority accorded in the RCPIP.
(b) To request TCS, with assistance from ESCAP and Japan, to encourage all focal points for the hydrological component and DPP and meteorological resource persons to prepare for the Workshop.
(c) To request ESCAP to assist TCS and Republic of Korea in preparing the technical programme of the Workshop.
(d) To allocate one day of the four-day Workshop to discuss detailed proposal on follow-up actions as submitted to the Workshop.
(e) To extend, if possible, the Workshop by one day, without financial requirements from TCTF, to enable the participants to undertake field work for the preparation exercise on the flood hazard.
(f) To authorize the TCS to join the International Flood Network (IFNET), encourage TC Members to take part in IFNET and request IFNET Secretariat to provide TC Members with information and related developments of its project on the Global Flood Alert System (GFAS).

(g) To encourage the TC-WGH to interact with other international organizations and forums working on water-related disasters, including ADPC and ADRC.

Other matters

70. As practiced in the previous years, the Committee requested all the Working Groups to submit their reports to the TCS six weeks prior to the next session.

VIII. SUPPORT REQUIRED FOR THE COMMITTEE'S PROGRAMME (agenda item 8)

(a). Arrangements for the Typhoon Committee Secretariat (TCS)

71. The Committee expressed its gratitude to the Government of the Philippines for hosting the TCS and for providing a full-time meteorologist, a part time hydrologist as from January 2002 and support staff.

72. The Committee expressed its gratefulness for the dedication and continuous services extended by Dr. R. L. Kintanar in his capacity as the TCS Coordinator.

73. TCS office and staffing structure enabled the Secretariat to function very effectively and efficiently. It noted with appreciation that TCS had established its own website (www.tcsphilippines.org) which the Members can view and download the TC Newsletter and the TCAR. The Committee encouraged TCS and Members to improve their websites and provide voluntary support

74. The Committee appreciated the offer from the Philippines to provide a part-time staff to assist on Information and Communication Technology (ICT).

75. The Committee noted with appreciation that the TCS office was relocated at the PAGASA main office building with adequate office facilities including office supplies and 1 vehicle to service the transportation needs of the office.

(b) Technical Cooperation

76. The Committee expressed its appreciation for the presentation on resource mobilization made by representative of ESCAP, WMO and Japan (see para. 47).

77. The Committee reviewed the resources available to support its work programmes, including the contribution from Members themselves and external support from WMO/VCP, ESCAP, TCDC, bilateral assistance and other potential donors. The Committee made use of this review for the consideration of 2004 work programmes.

(c) Typhoon Committee Trust Fund (TCTF)

78. The WMO representative presented to the session financial statement of the TCTF. The Committee reviewed the financial statement submitted by WMO which covered the period from 01 January 2002 to 31 October 2003. The Committee reviewed the financial report on the TCTF and the balance of the fund as of 31 October 2003 as shown in Appendix XIX.

79. The delegation of the Philippines informed the Committee that apart from hosting the TCS, the Government will provide the services of an ICT expert to support TCS and contribute US$6,000 to TCTF with the possibility of increasing it to the full level of US$12,000 depending on the continuing improvement of the national economy. The Committee welcomed the offer of the Government of the Philippines for hosting the TCS.

80. The Committee urged its Members to continue to enhance their contributions to the Trust Fund.

81. The Committee, after careful consideration, agreed to the use of the TCTF for the following specific purposes from I January to 31 December 2004:

(1)	*Operating costs of TCS, including the support for the TCS Coordinator*	US$	26,220
(2)	Publishing the Typhoon Committee Newsletter No. 16	US$	500
(3)	Printing and distribution costs of the publication of the 2003 Typhoon Committee Annual Review (TCAR) (CDs)	US$	500
(4)	*Travel cost for TCS staff participation at the thirty-seventh session of* the Typhoon Committee	US$	4,500
(5)	Printing and distribution costs of documents for the thirty-seventh session of the Committee	US$	1,000
(6)	Support for the attendance of eight (8) typhoon experts, at the Second Regional Technical Conference on Tropical Cyclones, Storm Surges and Floods (Brisbane, Australia, 1 to 3 July 2004) and the International Conference on Storms (Brisbane, 5 to 9 July 2004)	US$	22,400
(7)	Support for attachment of two (2) women typhoon forecasters to RSMC Tokyo Typhoon Centre	US$	4,000
(8)	Support for visiting lecturer services and the roving seminars	US$	10,000
(9)	Support for a Workshop on Implementation on Hydrological Component of RCPIP, including 2 meteorologist	US$	20,500
(10)	Support for the Working Group on the Review of the Operations and Structure of the Typhoon Committee	US$	9,000
	TOTAL	**US$**	**98,620**

(11) Any other emergency expenditure that can be justified for the use of the TCTF requires the concurrence of the TCS Coordinator and the Typhoon Committee Chairman. In this regard, emergency expenditure can only be executed if savings are realized elsewhere.

82. The Committee decided that total actual expenditure for the year 2004 is not to exceed US$ 100,000, noting that the support cost to be charged by WMO has not been included in the above budget. The Committee agreed to limit the total planned budget, including the support cost, within the limit of US$100,000 as had been agreed in the previous years.

IX. DATE AND PLACE OF THE THIRTY-SEVENTH SESSION (agenda item 9)

83. The Committee welcomed the offer of the delegation of China to host the thirty-seventh session in mid-November 2004, subject to the approval of its Government. The pre-session meeting of TC meteorologists, hydrologists and DPP experts will be arranged by the Secretariats in consultation with the Chairman and the host country.

X. SCIENTIFIC LECTURES (agenda item 10)

84. The following scientific lectures were presented:

(1) Merging nowcasting and NWP in weather warning operations, with special reference to landslides by Ms. C.C. Lam, Hong Kong, China

(2) Autonomous moving-nest typhoon model based on the community model MM5 by Prof. Hyeok-Joe Kwon, Republic of Korea
(3) Sediment Disaster Forecasting and Warning System by Dr. Nobutomo Osanai, Japan
(4) Recent Progress in Meso-Scale Numerical Weather Prediction at JMA by Mr. Nobuo Sato, Japan
(5) Some Recent Research Results on Tropical Cyclone Formation by Dr. R. L. Elsberry, U.S.A.
(6) Community Based Hazard Mapping by ARDC by Mr. Satoru Nishikawa, Japan
(7) International Flood Network (IFNet) and Global Flood Alert System by Mr. Ryosuke Kikuchi, Japan
(8) TC Numerical Prediction System in China, The Current Status and the Future by Dr. Duan Yihomg, China
(9) Relationship Between South China Sea SST and ENSO by Mr. Subramaniam Moten, Malaysia
(10) World Conference on Disaster Reduction in 2005 by Mr. Akihide Enoki, Japan
(11) Landslide studies in Mauritius by Mr. Beenay Pathack, Mauritius

85. The Committee expressed its appreciation to all the lecturers and requested the TCS to disseminate all the lecture papers and to include them in the Typhoon Committee Annual Review for 2003.

XI. ADOPTION OF THE REPORT (agenda item 11)

86. The Committee adopted the report of the session at 1240 hours, 20 December 2003.

XII. CLOSURE OF THE SESSION

87. The delegates from the Members of the Typhoon Committee, observers, and representatives of ESCAP, WMO and TCS expressed their thanks and appreciation to the Government of Malaysia and the Malaysian Meteorological Service for the successful hosting of the 36th session of the Typhoon Committee. They also expressed gratitude to Mr. Chow Kok Kee, Director-General of the Malaysian Meteorological Service, and his staff for the warm hospitality and excellent arrangements made and to the Department of Irrigation and Drainage Malaysia for organizing the technical visit to its project in Malacca.

88. The Session was closed by the Chairman at 1312 hours, 20 December 2003.

LIST OF APPENDICES

APPENDIX I

LIST OF PARTICIPANTS

36th SESSION ESCAP/WMO TYPHOON COMMITTEE
15 – 20 December 2003
Petaling Jaya, Malaysia

MEMBERS OF THE TYPHOON COMMITTEE

CHINA

Mr. Huang Li

Deputy Administrator
China Meteorological Administration (CMA)
46 Zhongguancun Nandajie, Haidian
Beijing 100081, China
Tel: (86-10) 68-406-642 (Office)
Fax: (86-10) 62-174-239
Email: HL@cma.gov.cn

Mr. Zheng Yunjie

Deputy Director-General
Department of International Cooperation
China Meteorological Administration (CMA)
46 Zhongguancun Nandajie, Haidian
Beijing 100081, China
Tel: (86-10) 68-406-146 (Office)
Fax: (86-10) 62-174-797
Email: yzheng@cma.gov.cn

Ms. Jiao Meiyan

National Meteorological Centre
China Meteorological Administration (CMA)
46 Zhongguancun Nandajie, Haidian
Beijing 100081, China
Tel: (86-10) 68-406-169 (Office)
Fax: (86-10) 0621-75928
Email: jiaomy@cma.gov.cn

Ms. Tian Cuiying

Department of Forecasting Services and
Disaster Mitigation
China Meteorological Administration (CMA)
46 Zhongguancun Nandajie, Haidian
Beijing 100081, China
Tel: (86-10) 68-406-682 (Office)
Fax: (86-10) 62-174-797
Email: tiancy@cma.gov.cn

Mr. Jia Tianqing

Guangdong Meteorological Bureau
6, Fujin Road, Guangzhou 510080
China
Tel: (86-20) 87-667-965 (Office)
Fax: (86-20) 87-773-952
Email: tqjia@grmc.gov.cn

Mr. Duan Yihong

Shanghai Typhoon Institute
166 Puxi Road, Shanghai 200030, China
Tel: (86-21) 64-391-966(Office)
Fax: (86-21) 64-391-966
Email: duanyh@mail.typhoon.gov.cn

Mr. Liu Jinping

Bureau of Hydrology
Ministry of Water Resources (MWR)
2 Lane 2, Baiguang Road
Beijing 100053, China
Tel: (86-10) 63-202-515(Office)
Fax: (86-10) 63-202-471
Email: jpliu@mwr.gov.cn

Mr. Tang Shengwen

Red Cross Society of China
53 Garmian Hutong, Eastern District
Beijing 100010, China
Tel: (86-10) 65-139-926(Office)
Fax: (86-10) 65-124-144
Email: rcsc@Chinese red cross.rog.cn

HONG KONG, CHINA

Mr. Lam Chiu-ying

Director
Hong Kong Observatory
134A Nathan Road, Kowloon
Hong Kong, China
Tel: (852) 2926 8221 (Office)
Fax: (852) 2721 6557
E-mail: dhko@hko.gov.hk

Miss Lam Ching-chi

Scientific Officer
Hong Kong Observatory
134A Nathan Road, Kowloon
Hong Kong, China
Tel: (852) 2926 8452 (Office)
Fax: (852) 2375 2645
E-mail: cclam@hko.gov.hk

JAPAN

Mr. Nobuo Sato

Director, Administration Division
Forecast Department
Japan Meteorological Agency
1-3-4 Otemachi, Chiyoda-ku
Tokyo 100-8122, Japan
Tel: (813) 3212-8341 Ext. 3103 (Office)
Fax: (813) 3284-0180
E-mail: nsato@met.kishou.go.jp

Mr. Koji Kuroiwa

Deputy Head
Office of International Affaires
Planning Division, Administration Department

Japan Meteorological Agency
1-3-4 Otemachi, Chiyoda-ku
Tokyo 100-8122, Japan
Tel: (813) 3211-4966
Fax: (813) 3211-2032
E-mail: kuroiwa@met.kishou.go.jp

Mr. Akihide Enoki

Deputy Director for Disaster Preparedness
Cabinet Office, Government of Japan
1-2-2 Kasumigaseki, Chiyoda-ku
Tokyo 100-8969, Japan
Tel: (813) 6501-6996
Fax: (813) 3597-9091
E-mail: aenoki@op.cao.go.jp

Mr. Ryosuke Kikuchi

Director
The 2nd Research Department
Infrastructure Development Institue-Japan
5-3-23 Kojimachi, Chiyoda-ku
Tokyo 102 0083, Japan
Tel: (813) 3263-7920
Fax: (813) 3230-4030
E-mail: 2bu1@idi.or.jp

Mr. Toshihiro Kikui

Chief of Sabo Department
Sabo Technical Center (STC)
4-8-21 Kudan-minami, Chiyoda-ku
Tokyo 102 0074, Japan
Tel: (813) 5276-3272
Fax: (813) 5276-3392
E-mail: kikui@stc.or.jp

Mr. Masayuki Miyase

Acting Chief of Planning Department
Sabo Technical Center (STC)
4-8-21 Kudan-minami, Chiyoda-ku
Tokyo 102 0074, Japan
Tel: (813) 5276-3271
Fax: (813) 5276-3391
E-mail: miyase@stc.or.jp

Mr. Nobuaki Sakai

Engineer of Sabo Department
Sabo Technical Center (STC)
4-8-21 Kudan-minami, Chiyoda-ku
Tokyo 102 0074, Japan
Tel: (813) 5276-3272
Fax: (813) 5276-3392
E-mail: sakai@stc.or.jp

Dr. Tokuo Kishii

Principal Senior Researcher
National Research Institute for Earth Science
And Disaster Prevention (NIED)
Prof. Tsukuba University
3-1 Tennodai, Tsukuba, Ibaraki
305 0006 Japan

Tel: (81) 2986-37512
Fax: (81) 2986-37510
E-mail: kishii@bosai.go.jp

Dr. Nobutomo Osanai

Team Leader
Erosion and Sediment Control Research Group
PWRI
1-6, Minamihara, Tsukuba City, Ibaraki
Pref. 305 8516, Japan
Tel: (81298) 79-6784
Fax: (81298) 79-6729
E-mail: osanai@pwri.go.jp

Mr. Kenzo Hiroki

Head, Flood Disaster Prevention Division
Research Center for Disaster Risk Management
National Institute for Land and Infrastructure
Management, Ministry of Land, Infrastructure
And Transport
1- Asahi, Tsukuba City, Ibaraki Prof,
305 0804, Japan
Tel: (8129) 864-2932
Fax: (8129) 864-0598
E-mail: hiroki-k92rw@nilim.go.jp

Mr. Nobutaka Mannoji

Head, National Typhoon Center
Forecast Division, Forecast Department
Japan Meteorological Agency
1-3-4 Otemachi, Chiyoda-ku
Tokyo 100 8122
Tel: (813) 3212-8341 ext.3148
Fax: (813) 3211-4923
E-mail: nmannoji@npd.kishou.go.jp

MACAO, CHINA

Mr. Antonio Viseu

Sub-director
Rampa do Observatorio
Taipa Grande, PO Box 93
Macao, China
Tel: (853) 8-986-213 (Office)
Fax: (853) 850-557
E-mail: aviseu@smg.gov.mo

Ms. Leong Ka Cheng, Florence

Chief of Weather Monitoring Centre
Rampa do Observatorio
Taipa Grande, PO Box 93
Macao, China
Tel: (853) 8-989-270 (Office)
Fax: (853) 850-557
E-mail: kcleong@smg.gov.mo

Mr. Iao Ion Tong

Chefe de Primeira
2-6 Estrada Coelho Amaral
Corpo de Bombeiros

Macao, China
Tel: (853) 3966373 (Office)
Fax: (853) 361128
E-mail: tong-iao@hotmail.com

MALAYSIA

Mr. Chow Kok Kee

Director-General
Malaysian Meteorological Service
Jalan Sultan, 46667 Petaling Jaya
Selangor, Malaysia
Tel: (603) 79678001 (Office)
Fax: (603) 79549372
E-mail: chow@kjc.gov.my

Dr. Yap Kok Seng

Deputy Director-General II
Malaysian Meteorological Service
Jalan Sultan, 46667 Petaling Jaya
Selangor, Malaysia
Tel: (603) 79678003 (Office)
Fax: (603) 79550964
E-mail: yks@kjc.gov.my

Mr. Ooi See Hai

Director
KLIA Meteorological Office
Malaysian Meteorological Service
Jalan Sultan, 46667 Petaling Jaya
Selangor, Malaysia
Tel: (603) 79678004 (Office)
Fax: (603) 79549372
E-mail: osh@kjc.gov.my

Mr. Subramaniam Moten

Director
Research Division
Malaysian Meteorological Service
Jalan Sultan, 46667 Petaling Jaya
Selangor, Malaysia
Tel: (603) 79678225 (Office)
Fax: (603) 7955094
E-mail: subra@kjc.gov.my

Ms Che Gayah Ismail

Director
Subang Meteorological Office
L/T Sultan Abdul Aziz Shah
47200 Subang,
Selangor, Malaysia
Tel: (603) 7846-1441(Office)
Fax: (603) 7846-3485
E-mail: pghsubang@kjc.gov.my

Mr. Phang Kun Liong

Meteorologist
Climate Division
Malaysian Meteorological Service
Jalan Sultan, 46667 Petaling Jaya

	Selangor, Malaysia Tel: (603)7967-8227 (Office) Fax: (603)7956-3621 E-mail: phangkl@kjc.gov.my
Mr. Azmi bin Md. Jafri	Senior Assistant Director Hydrology and Water Resources Division Department of Irrigation and Drainage DID Complex, Km-7, Jalan Ampang 68000 Kuala Lumpur, Malaysia Tel: (603) 4255-2672 (Direct Line) (603) 4256-2657 (Gen.Line) Fax: (603) 4256-3735 Email: azmijafri@did.moa.my
Mr. Low Koon Sing	Senior Assistant Director Hydrology and Water Resources Division Department of Irrigation and Drainage DID Complex, Km-7, Jalan Ampang 68000 Kuala Lumpur, Malaysia Tel: (603) 4255-2684(Office) Fax: (603) 4260-1289 Email: lowks@did.moa.my
Ir. Chong Sun Fatt	Senior Assistant Director Hydrology and Water Resources Division Department of Irrigation and Drainage DID Complex, Km-7, Jalan Ampang 68000 Kuala Lumpur, Malaysia Tel: (603) 42-552-635 (Office) Fax: (603) 42-563-735 Email: chongsf@did.moa.my
Ms Norlida bte Mohd. Dom	Engineer Hydrology and Water Resources Division Department of Irrigation and Drainage DID Complex, Km-7, Jalan Ampang 68000 Kuala Lumpur, Malaysia Tel: (603) 4255-2650 (Direct Line) (603) 4256-2657 (General Line) Fax: (603) 42-563-735 Email: norlidamd@did.moa.my
Mr. Abdul Khadir Othman	Principal Assistant Director Crisis & Disaster Management Unit National Security Divisiom Prime Minister's Department Putrajaya 62502, Malaysia Tel: (603) 8888-3052 (Office) Fax: (603) 8888-3051 Email: upkb@bkn.jpm.my
Mr. Mohamed b. Hj. Daud	Assist Director Crisis & Disaster Management Unit

	National Security Divisiom Prime Minister's Department Putrajaya 62502, Malaysia Tel: (603) 8888-2063 (Office) Fax: (603) 8888-051 Email: upk@bkn.3jpm.my
Mr. Rahimi bin Razali	Assistant Director Crisis & Disaster Management Unit National Security Divisiom Prime Minister's Department Putrajaya 62502, Malaysia Tel: (603) 88-882-062 (Office) Fax: (603) 88-883-051 Email: upkb@bkn.jpm.my
Mejar Rosli bin Che Mee	Assistant Director Crisis & Disaster Management Unit National Security Divisiom Prime Minister's Department Putrajaya 62502, Malaysia Tel: (603) 8888-2061 (Office) Fax: (603) 8888-3051 Email: upkb@bkn.jpm.my
Hajah Rahamah Mohd. Baki	Assistant Director of Rehabilitation Division Social Welfare Department 6-16 Floor, Wisma Shen Jalan Masjid India, 60564 Kuala Lumpur Tel: (603) 2692-4010 (Office) Fax: (603) 2693-4270 E-mail: -
Ms. Saptuyah Haji Sazali	Assistant Director Social Welfare Department 11th Floor, Wisma Seberkas Kuching, Sarawak Tel: (082) 412577 (Office) Fax: (082) 256710 E-mail: saptuya2@sarawaknet.gov.my

PHILIPPINES

Dr. Florentino O. Tesoro	Undersecretary for Regional Operation Department of Science and Technology & Officer-in-charge Philippines Atmospheric Geophysical and Astronomical Services Administration (PAGASA) Agham Rd, Diliman., Quezon City, Philippines Tel: (632) 9-294-865 (Office) Fax: (632) 9-294-865 Email: ftesoro@laguna.net

REPUBLIC OF KOREA

Dr. Kyung-Sup Shin

Director-General of Forecast Bureau
Korea Meteorological Administration (KMA)
460-18, Shindaebang-dong
Donjak-ku, Seoul 156-720
Republic of Korea
Tel: (822) 836-3155
Fax: (822) 836-3157
E-mail: ksshin@kma.go.kr

Dr. Ae-Sook Suh

Director of International Cooperation Division
Korea Meteorological Administration (KMA)
460-18, Shindaebang-dong
Donjak-ku, Seoul 156-720
Republic of Korea
Tel: (822) 836-2385 (Office)
Fax: (822) 836-2386
E-mail: assuh@kma.go.kr

Dr. Woo-Jin Lee

Director
Numerical Weather Prediction Division
Korea Meteorological Administration (KMA)
460-18, Shindaebang-dong
Donjak-ku, Seoul 156-720
Republic of Korea
Tel: (822) 836-5473 (Office)
Fax: (822) 836-5474
E-mail: wjlee@kma.go.kr

Mr. Yun-Ang Chung

Chief Weather Forecaster
Korea Meteorological Administration (KMA)
460-18, Shindaebang-dong
Donjak-ku, Seoul 156-720
Republic of Korea
Tel: (822) 831-0365 (Office)
Fax: (822) 836-6755
E-mail: chungya@kma.go.kr

Professor H. Joe Kwon

Professor
Dept. Atmospheric Science
Kongju National University
Kongju, Chungnam 314-701
Korea
Tel: (82) 41-850-8527
Fax: (82) 41-856-8527
E-mail hjkwon@kongju.ac.kr

Mr. Hwang Ha-Yong

Ministry of Government Administration & Home Affairs
1417 Central Government Complex
55 Seiong-Ro, Jongro-Gu
Seoul 110-034, South Korea
Tel: (82) 2-3703-5222 (Office)

Fax: (82) 2-3703-5566
E-mail: H9281@mogaha.go.kr

Mr. Ki-Sik Kim

Director/Disaster Prevention & Planning Division
Ministry of Government Administration & Home Affairs
1417 Central Government Complex
55 Seiong-Ro, Jongro-Gu
Seoul 110-034, South Korea
Tel: (82)-2-3703-5211 (Office)
Fax: (82)-2-3703-5566
E-mail: kimks@mogaha.go.kr

Mr. Cheol Heo

Deputy-Director
River Management Division
Ministry of Construction & Transportation
1 Joongang-Dong, Gwacheon City
Republic of Korea
Tel: (82)-2-504-9043 (Office)
Fax: (82)-2-504-9112
E-mail: heocheol@moct.go.kr

Mr. Jae-Gyu Park

Assistant Director
Gyeong IN Canal Division
Ministry of Construction & Transportation
1 Joongang-Dong, Gwacheon City
Republic of Korea
Tel: (82)-2-2110-8241(Office)
Fax: (82)-2-504-7372
E-mail: jaepak@moct.go.kr

Dr. Il-Pyo Hong

Senior Researcher
Water Resources Research Department
Korea Institute of Construction Technology
2311 Daehwa, Ilsan, Koyang, Keyonggi
Republic of Korea
Tel: (82)-31-910-0264 (Office)
Fax: (82)-31-910-0251
E-mail: iphong@kict.re.kr

Mr. Kim Sang Ug

Researcher
Water Resources Research Department
Korea Institute of Construction Technology
2311 Daehwa, Ilsan, Koyang, Keyonggi
Republic of Korea
Tel: (82)-31-910-0310 (Office)
Fax: (82)-31-910-0251
E-mail: sukim@kjct.re.kr

Mr. Ki-Suk Kim

Director-General of Center for Hydroinformatics Research
462-1, Jeonmin-dong, Yusung-gu, Daejeon
Korea, 305-730
Tel: (82)-42-860-0350 (Office)

Fax: (82)-42-860-3599
E-mail: kimks@kowaco.or.kr

Dr. Dugkeun Park

Senior Analyst/National Disaster Management
System Task Force
Ministry of Government Administration & Home Affairs
253-42, Gongdeok-Dong
Mapo-Gu, Seoul 121-719, South Korea
Tel: (82)-2-3703-2730 (Office)
Fax: (82)-2-3703-2792
E-mail: dr_park@mogaha.go.kr

SINGAPORE

Mr. Lam Keng Gaik

Head, Main Met Office (Changi Airport)
P..O.Box 8
Singapore Changi Airport 918741
Tel: (65) 65422863
Fax: (65) 65457192
E-mail: lam_keng_gaik@nea.gov.sg

THAILAND

Mr. Dusadee Sarigabutr

Deputy Director-General
Thai Meteorological Department
4353 Sukhumvit Road, Bang-Na
Bangkok 10260, Thailand
Tel: (662)-02-3669444 (Office)
Fax: (662)-3994016
E-mail: tmd_inter@tmd.go.th

Mrs. Chutamart Prateepavanich

Deputy Director-General
Department of Disaster Prevention and Mitigation
3/12 U-Thong Nok Road
Dusit District
Bangkok 10300, Thailand
Tel: (662)-243-2231 (Office)
Fax: (662)-243-2231
E-mail: chuta@loxinfo.co.th

Dr. (Ms) Somsri Huntrakul

Director
Telecommunication and Information Division
Thai Meteorological Department
4353 Sukhumvit, Bang-Na
Bangkok 10260, Thailand
Tel: (662)-3994555 (Office)
Fax: (662)-3989861
E-mail: somsri@metnet.tmd.go.th

Mr. Sampan Thaikruawan

Acting Director
Research and Development Division
Thai Meteorological Department
4353 Sukhumvit Road

Bangkok 10260, Thailand
Tel: (662)-3992354 (Office)
Fax: (662)-3994020
E-mail: tmd_inter@tmd.go.th

Mr. Suporn Ratananakin

Chief of Foreign Relations
Department of Disaster Prevention and Mitigation
3/12 U-Thong Nok Road
Dusit District
Bangkok 10300, Thailand
Tel: (662)-243-0020-6 ext. 3362 (Office)
Fax: (662)-243-2204
E-mail: foreign_dpm@yahoo.com

Mr. Montree Chanachaiviboonwat

Senior Civil Engineer
Bureau of Disaster Prevention Measures
Department of Disaster Prevention and Mitigation
3/12 U-Thong Nok Road
Dusit District
Bangkok 10300, Thailand
Tel: (662)-243-2209 (Office)
Fax: (662)-243-2212
E-mail: montrichat@hotmail.com

UNITED STATES OF AMERICA

Mr. R. Jeffrey LaDouce

Regional Director.
National Weather Service, Pacific Region
U.S. National Weather Service
737 Bishop Street
Suite 2200 Honolulu
HI 96813-3213, USA
Tel: (808) 532-6416 (Office)
Fax: (808) 532-5569
E-mail: Jeff.ladouce@noaa.gov

Mr. James C. Weyman

Director, RSMC Honolulu HI USA
Meteorologist in Charge, WFO Honolulu HI USA
NOAA/NWS WFO Honolulu
2525 Correa Road Suite 250
Honolulu HI 96822-2219 USA
Tel: (808) 973-5272 (Office)
Fax: (808) 973-5271
E-mail: james.weyman@noaa.gov

Mr. Frank Wells

Science and Operations Officer
NOAA/NWS WFO Guam
2525 Hueneme Road, Barrigada
Guam 96913, U.S.A.
Tel: (671) 472-0948 (Office)
Fax: (671) 472-7405
E-mail: frank.h.wells@noaa.gov

VIET NAM

Mr. Bui Van Duc

Acting Director-General
National Hydrometeorological Service
Ministry of Natural Resources & Environment
4 Dang Thai Than Str., Hanoi, Vietnam
Tel: (84)-4-8244189 (Office)
Fax: (84)-4-9432628
E-mail: ducbv@fpt.vn

Ms. Duong Lien Chau

Deputy-Director
National Center for Hydrometeorological Forecasting
National Hydrometeorological Service
4 Dang Thai Than Str., Hanoi, Vietnam
Tel: (84)-4-8244918 (Office)
Fax: (84)-4-8254278
E-mail: met_srf@fpt.vn
dlchau@yahoo.com

Mr. Nguyen Xuan Dieu

Deputy-Director
Department of Dike Management
Central Committee for Flood & Storm Control
Ministry of Agriculture & Rural Development
A4 Building, No 4 Ngoc Ha Str.,
Ba Dinh, Hanoi, Vietnam
Tel: (84)-4-7335686 (Office)
Fax: (84)-4-7336647
E-mail: pclbtw@fpt.vn

OBSERVERS

Dr. Russell L. Elsberry

CAS Tropical Cyclone Rapporteur
Department of Meteorology
Naval Postgraduate School
585 Dyer Road
Monterey California 93943, U.S.A
Tel: (01) 831-696-2373 (Office)
(01) 831-659-2795 (Home)
Fax: (01) 831-696-3061
E-mail: elsberry@nps.navy.mil

Mr. Satoru Nishikawa

Executive Director
Asian Disaster Reduction Center
1-5-2 Wakinohamakaigan-dori, Chuo-ku
Kobe 651-0073, Japan
Tel: (81-78) 262-5540
Fax: (81-78) 262-5546
E-mail: nishikawa@adrc.or.jp

Mr. Beenay Pathack

Deputy-Director
Mauritius Meteorological Services
St. Paul Road, Vacoas, Maritius
Tel: (230) 6861031/2 (Office)

Fax: (230) 6861033
Email: bpathack@mail.gov.mu
meteo@intnet.mu

Mr. Yuri A. Platonov

Head of International Organizations and Conventions
Division of Science & International Cooperation
Department of Roshydromet
Novovagarikovsky Str. 12, Moscow 123242
Russia
Tel: (07095) 255-2488 (Office)
Fax: (07095) 255-5226
E-mail: unmc@mcc.mecom.ru

Mr. Boris V. Koubai

Chief of Meteorological Administration
Of Primorsky region
Russian Federation
Mordovtoceva str. 3
Vladivostok, 690990, Russia
Tel: (4232)-221-750 (Office)
Fax: (4232)-221-750
E-mail: master@primpogoda.ru

Ms. Imelda Abarquez

Project Manager
Asian Disaster Preparedness Center (ADPC)
P.O.Box 4 Klong Luang
Pathumthani 12120, Thailand
Tel: (662) 516-5900 (Office)
Fax: (662) 524-5350
E-mail: iabarquez@adpc.net

UNITED NATIONS ECONOMIC AND SOCIAL COMMISSION FOR ASIA AND THE PACIFIC (UNESCAP)

Mr. Ti Le-Huu

Economic Affairs Officer
UNESCAP Water Resources Section
Environment & Sustainable Development Division
UN Building, Room 506, Rajadamnern Nok Avenue
Bangkok 10200, Thailand
Tel: (662)-288-1450 (Office)
Fax: (662)-288-1059
E-mail: ti.unescap@un.org

WORLD METEOROLOGICAL ORGANIZATION (WMO)

Mr. Eisa Hussain Al-Majed

Regional Director for Asia and the South-west Pacific
7 bis avenue de la Paix, Case postale No. 2300
CH-1211 Geneve 2, Switzerland
Tel: (41-22) 730-8510 (Office)
Fax: (41-22) 730-8118
E-mail: al-majed_e@gateway.wmo.ch

Mr. Katsuhiro Abe

Chief
Tropical Cyclone Programme Division
World Weather Watch-Applications Department
World Meteorological Organization (WMO)
7 bis avenue de la Paix, Case postale No. 2300
CH-1211 Geneve 2, Switzerland
Tel: (41-22) 730-8453 (Office)
Fax: (41-22) 730-8021
E-mail: kabe@wmo.int

TYPHOON COMMITTEE SECRETARIAT (TCS)

Dr. Roman L. Kintanar

TCS Coordinator
PAGASA Main Office Building
Science Garden Complex
Agham Road, Diliman
Quezon City, Philippines
Tel: (632) 434 9026 (office)
Fax: (632) 434 9026
Email: tcs@philonline.com

Mr. Martin F. Rellin Jr.

Seconded Meteorologist
TCS; Chief of Staff, Office of Director
PAGASA Main Office Bldg
Science Garden Complex
Agham Rd, Diliman
Quezon City, Philippines
Tel: (632) 434 2436 (office)
Fax: (632) 929 4865
Email: jun_r@eudoramail.com
tcs@philonline.com

APPENDIX II

AGENDA

1. Opening of the session.
2. Election of officers.
3. Adoption of the agenda.
4. The Committee's activities during 2003:
   (a) Meteorological component;
   (b) Hydrological component;
   (c) Disaster prevention and preparedness component;
   (d) Training component;
   (e) Research component.
5. Review of the 2003 typhoon season/annual publications.
6. Coordination with other activities of the WMO Tropical Cyclone Programme.
7. Programme for 2004 and beyond.
8. Support required for the Committee's programme.
9. Date and place of the thirty-seventh session.
10. Scientific lectures.
11. Adoption of the report.

APPENDIX III

SUMMARY OF THE REPORTS OF THE TYPHOON COMMITTEE MEMBERS ON THEIR ACTIVITIES RELATED TO THE METEOROLOGICAL COMPONENT

The delegate from **China** reported that the China Meteorological Administration (CMA) was making effort to establish its New Generation Doppler Radar Network which consists of 126 new Doppler radars (CINRAD). So far 52 CINRAD radars have been put in place. These radars have played an important role in monitoring typhoons and observing rainstorm and hail, making great contribution to the reduction and mitigation of meteorological disasters over many provinces in China. By the end of this year, 62 CINRAD radars will be established in China and 30 more are expected next year.

Under the Automatic Atmospheric Monitoring System Project, 582 Automatic Weather Stations (AWS) were put into operation by to Jan. 1, 2003. Thus, the total number of AWS in operation under CMA was about 746. In addition, CMA signed purchase order with manufacturers in 2002 for additional 850 AWSs. It is expected that they will be put in place next year and by then the total AWS in operation will be 1606.

In 2003, the capability of upper air sounding network in China has been further enhanced. 13 sets of L-band secondary wind-finding radar together with its digital radiosonde system were put into operation by 1 August 2003. As a result, the quality of upper air data at these sites has been significantly improved.

The Satellite based domestic telecommunication network has been running smoothly. Additional 24 PCVSAT receiving-only stations have been installed, including one installed in Vietnam in July 2003. Currently, the PCVSAT system consists of 2440 remote stations, and the average volume of data transmitted daily is over 1Gbytes.

The GTS circuit, Beijing–Offenbach, was updated in April 2003. The new link is connected to RMDCN of RA VI by Frame Relay service provided by EQUANT. The data exchange rate is 48Kbps. FTP is adopted to exchange data on the new link. In addition, the backup link via Internet was established in 2002.

A high performance computer, IBM Regatta P670, equipped with eight 1.1GHz Power4 processors and 8GB Memory card was installed in NMC in December 2002. The Peak Speed of the computer is 35.2GFLOPS.

A nationwide video-conference system was built within CMA system in January 2002. It is a satellite-based system and connects NMC and meteorological offices at provincial and municipal levels. At present, the system has started its operation in NMC and meteorological offices in some provinces. Such a system can support point-to-point, point-to-multipoint, and multipoint-to-multipoint video-conferences. In addition to satisfactory performance on synchronous transmission of audio and video signals, the system can also transmit the weather charts and images on the screen of the local workstations or PC terminals. The system contributes to the efficient exchanges and consultation of the forecasters between NMC and provincial meteorological offices, hence improves the weather forecast services provided by CMA.

The MTTP (Model for Typhoon Track Prediction) running on the supercomputer, Shen Wei , is quasi-operational this year. The research work on the application of new generation

medium range forecast model T213L31 has been carried out since last year. The real time experimental forecast system has been put into running since 13 June 2003, which is run once a day and produces 4-day track forecast.

In order to improve on early warning to give the public extended time preparation against the oncoming tropical cyclone, under the basis of 24-hour and 48-hour forecast in past time, additional forecast was issued to public by the National Meteorological Center in 2003: (1) As to numbered tropical cyclones, 72-hour forecast for the location and movement was issued every 6hour at 00UTC, 06UTC, 12UTC, 18UTC. (2) 24-hour forecast for the location and movement was added at 09 UTC.

The delegate from **Hong Kong, China** reported that tropical cyclone position forecasts up to 72 hours were made available to the public in 2003. The mean position error for 72-hour forecast was about 320 km which was comparable to 48-hour forecast error a decade ago. The notable improvement was mostly contributed by multi-model ensemble forecast.

On top of the GTS, the Hong Kong Observatory (HKO) has been acquiring additional data including QuikSCAT, SSM/I and JMA global model data from its the Internet Meteorological Data Acquisition System. A rapidly updated analysis system was put into trial operation at 10-km, 5-km and 1-km resolutions in 2003. The hourly wind field analyses was particularly useful for analyzing the wind structure of tropical cyclones in the vicinity of Hong Kong.

The Tropical Cyclone Information Processing System (TIPS), which facilitates forecasters' visualization of various TC forecast tracks from different models or meteorological centres, was also put into operation in 2003.

During the passage of Typhoon Dujuan, a record daily high of 9.7 million page views was recorded by HKO's website. The WMO pilot project on Severe Weather Information Centre (SWIC) undertaken by HKO continued to gain much popularity. The SWIC web site also received the Asia Pacific Information and Communications Technology Award (Best of E-government and Services) in December 2003.

The delegate from **Japan** reported that the Geostationary Meteorological Satellite (GMS)- 5, stationed at 140E has been in operation for more than 8 years (far beyond its design lifetime of five years) due to the failure of the launch of MTSAT-1 to take over GMS-5 in 1999. In order to avoid interruption of the geostationary satellite observations over the western Pacific, the Japan Meteorological Agency (JMA) and NOAA/NESDIS of the United States jointly implemented the back-up operation of GMS-5 with GOES-9. Since 22 May 2003, GOES-9 at 155E over the equator has been successfully carrying out the back-up operation. The collaboration between the two satellites is now providing the region with three functions which were originally performed by GMS-5, as follows:

(1) Earth image observations (GOES-9 GVAR);
(2) Broadcast of WEFAX picture derived from GOES-9 GVAR data via GMS-5 and dissemination of S-VISSR type data (only IR-1 channel) derived from GOES-9 GVAR data via Internet (from JMA Regional Specialized Meteorological Center (RSMC) data server to the registered National Meteorological Centers); and
(3) Collection of meteorological observational data via GMS-5.

JMA is now intensively making efforts toward the early launch of MTSAT-1R, the successor to GMS-5, which will perform enhanced observations using JAMI (Japanese Advanced Meteorological Imager) with five channels (one visible and four infrared channels)

as compared with S-VISSR of GMS-5 (one visible and three infrared channels). Improvement of the dissemination of observations will be made by introducing HiRID/HRID (High Resolution Image Data/High Rate Information Transmission) and WEFAX/LRIT (Low Rate Transmission).

Despite the recent failure of the launch of Japan's H2-A Rocket, by which MTSAT-1R is scheduled to be launched, JMA will continue to make efforts for the launch of MTSAT-1R at the earliest possible time. However, it is premature to indicate the timing of the launch of MTSAT-1R at this moment. As regards the announcement issued earlier by JMA about the transition schedule of the data dissemination for MDUS and SDUS users, JMA will duly reissue the announcement, in consideration of the delay and uncertainty of the launching schedule, that will include the timing of the start of operation of MTSAT-1R, termination of the back-up operation of GMS-5 with GOES-9 as well as transition to new broadcasting service after MTSAT-1 has become operational. JMA is fully aware that all of the GMS-5 users require enough transition time for the new service and, accordingly, the announcement will be made well in advance and cover all the relevant information for the users.

The delegate from **Macao, China,** reported a new AWS station with wind, temperature/humidity and precipitation sensors was installed at the northeast of Macao thus to enhance the Macao AWS network within nearly 1-2km grid. 5-level ultra-sonic AWS each level with 2 wind sensors to the East and West sides as well as 3-level temperature/humidity sensors were installed in the 338 meters Macao Tower thus enhance the capability of monitoring low level meteorological parameters.

The MM5 model has been running successfully and operationally in SUN E5500 server with 10 CPUs for a few years. As alternative economic consideration, we are trying to develop a low cost Linux Cluster System (LCS). The LCS configuration has 1 server node and 4 nodes and connected by the 100M fast Ethernet network. Each node has dual P-III 700Mhz CPUs, totally 10 CPUs were served to running the MM5 with the MPI (Message Passing Interface) for the parallel computation. The diskless boot up system technology is also applied in LCS which will reduce a lot of system administration when the number of clients increase. With comparison of the performance of SUN E5500 and the LCS, the processing time for 60-hour forecast on both system are nearly the same, while LCS is even faster than the SUN E5500 a little bit. But the CPU usage of LCS is only 75%, which means the bottom neck is exist on the network communication speed. This can be improved by upgrade the 100M to Gigabit network which we will test in the next stage.

In upgrading of internal computer network core, a latest version of gigabit switch have been installed, the network can therefore support layer 3 switching, increase connection speed between internal network segments. Broadband internet connection has replaced the previous 64K thus enhance both download and upload of data.

Upgrade of network communication speed between SMG headquarter and meteorological center in Macao airport from 512kps to 1Mkps was made to enhance quality of real-time video-conference of weather briefing and data transmission. Two new air-monitoring systems as well as one AWS station in collaboration with local electric company were installed in the southern island.

Upgrade of software of tape library backup system was also made which schedulely backup meteorological data include AWS, GTS, radar, satellite, wind profiler, climate data... etc as well as system backup for all servers and users data.

A new alert server system was installed for multi–purpose such as automatic checking of GTS warnings, tell the time, checking computer systems, detecting predefined severe

weather condition through meteorological equipments such as lighting detector, automatic weather stations (AWS) ... etc. The alarm will trigger relevant actions to be taken by our colleagues.

A special format of Satellite and FAX chart data received through PCVSAT system from CMA were decoded and displayed to SMG Intranet. A new site services in Macao-Hong Kong Ferry Terminal was set up to provide professional information to related operators of private companies and government departments. A communication/web server has been installed. A PC with web browser and printer is running 24 hours for users. Data is updated real-time through telephone line from SMG's headquarter.

In cooperation with HKO, composite radar images as well as 2D wind field of several severe weather cases such as tropical cyclones and heavy rainstorm were successfully generated. Latest version of WAVEWATCH III, 2.22, has started operation to provide wave forecast over the Northern region of the South China Sea (Area:10N-30N and 105E-130E). The third-generation ocean wind-wave model runs twice daily. By ingesting 10-metre wind field from NWP, the model generates 96-hour wave forecast with 6-hour interval.

Reconstruction of the site for wind profiler/RASS system as well as new configuration for the system sampling thus enhanced data quality. The real-time data of wind profiler/RASS system were displayed graphically with user-friendly web-based technique in SMG Intranet.

In cooperation with all local mobile telecommunication company, weather information such as hourly weather report, weather forecast, severe weather warnings, UV index and air quality index forecast are now available to mobile phone users. At the same time, we are using the system to disseminate faster the weather warnings to officials under structure of the civil protection, thus to enhance relevant actions.

Due to the launched of web site World Weather Information Service (WWIS), at <www.worldweather.org>, developed by HKO under the auspices of WMO which offer new service access by all to the latest weather forecasts of the world's cities issued by the National Meteorological and Hydrological Services (NMHSs). We thus build system to retrieve the forecast information and provide to mass media e.g. TV, Radio, Newspaper as well as through our web site.

A brand-new SMG website <http://www.smg.gov.mo> provides new arrangement of the main page and plentiful new added information such as knowledge on meteorology and meteorological instrument, technical papers, numerical model output, weather information for cities around the world, aviation weather information etc.

Automatic computerize system to handle routine tasks in Climate and Atmospheric Environment Center were developed and implemented thus to enhance efficiency and reduce manual jobs. Continuous development and improvement of Intranet with new technique and products. Thus provides easy, convenient and efficient way for all forecasters and managerial staffs to access different meteorological data and products through web browser.

The Airport Meteorological Office continuing the development and enhancement of the web server application software to provide aviation related weather information to operators. The server enables the operators to access the information more efficiently through web browsers.

The delegate from **Malaysia** reported that a buoy was set up in the South China Sea within the Malaysian territorial water and is expected to be operational by early 2004. The

acquired meteorological and oceanographic parameters are aimed at enhancing the understanding of ENSO, monsoon and tropical cyclones. The Malaysian Meteorological Service (MMS) and the Drainage and Irrigation Department (DID) have access to internal webs of both parties in terms of denser real-time rainfall data to improve weather and flood forecastings. Studies in the relationship of the sea-surface temperatures in the South China Sea and ENSO evolution are conducted. Several meteorologists attended a few international seminars/workshop/symposium for capacity building.

The delegate from the **Republic of Korea** reported that since the last session, much efforts have been made to further strengthen meteorological observation system in Korea, by establishing new observation stations and sites in the area of upper-air observation, AWS, marine and weather radar observing network.

A new upper-air station at Heuksando (an island on the southwest sea of the peninsular) was set up early 2003 and, like other existing four upper-air stations, has being operated fully, following the guidance of the TC Operational Manual relating to the observing frequency and reporting, such as four-time observations and reports through GTS a day when typhoon or severe weather systems are expected to approach the Korean peninsular. In 2003, two weather radars were also newly installed, thus resulting in an effective weather radar observing network consisting of 8 Doppler radars to cover the whole country.

In addition, two projects to intensify the meteorological observation network in Korea are being carried out: one is the setting up of 10 wind profiler stations and the other is the construction of a marine observation base on the West sea of the Korean peninsular, whose purpose is to monitor sea surface condition and severe weather phenomena such as typhoon approaching the Korean peninsular from its west sea. These projects, started in 2003, are expected to be completed by 2005 and to be in full operation by 2006.

As for the technical advances, the Weather Analysis and Information System (so called FAS), which is a weather forecaster's workstation for forecast preparation and interactive display of all kinds of weather information in a single screen, was linked to all the meteorological stations under KMA in 2003. By 2005, an integrated nowcasting application which can detect, analyze, and monitor convection and generate short-term probabilities forecast and warning guidance for severe weather will be integrated into the current system.

An effort was also made to improve KMA's NWP models to produce typhoon forecasts; Global Data Assimilation and Prediction System (GDAPS), Regional Data Assimilation System (RDAPS), Ensemble Prediction System (EPS), and Barotropic Adaptive-grid Typhoon Simulation Model (BATS).

The moisture information extracted from the GOES-9 SATOB data by using bogus technique has been assimilated in the GDAPS assimilation system since June 2003, resulting in the improvement of the typhoon forecast. The typhoon bogus algorithm for the 3D VAR is being developed and will be installed when operational 3DOI scheme is replaced with the 3 DVAR system.

A new typhoon model, Double Fourier Series BARotropic Typhoon Model(DBAR) is being tested for the routine operation to issue 72-hour track prediction at four times a day.

Currently, a research is also under progress to implement moving nested grid system in RDAPS to resolve the fine structure in the typhoon vortex and surrounding motion field. Data assimilation of the asynoptic observations, such as radar rainfall intensity, AWS

observations and satellite radiances will be done continuously for the improvement of both global and regional models.

A web-based Typhoon Analysis and Prediction System (TAPS) developed in 2001 to provide comprehensive typhoon information in a single display was continuously upgraded with user's interaction. The current version can easily search all historical typhoons which had similar tracks as current one, with the forecast tracks of a typhoon generated by various KMA's typhoon models including those of RSMC, CMA and ECMWF.

The delegate from **Singapore** reported that modification of GMS receiving system to receive from GOES 9 satellite was completed in August 2003. Currently, the full set of GOES 9 data together with Terra, NOAA and Feng Yun, enable Singapore to adequately meet the required temporal and spatial coverage for monitoring forest fire and smoke haze. In addition, techniques of rainfall estimation and experimental pollutant trajectories model are also used during regional dry season to achieve the monitoring objectives.

The delegate from **Thailand** reported that a new Geographic Information System (GIS) has been installed that could enable TMD to support the requisition on meteor-hydrological data map for multipurpose applications in the GIS contexts.

The **3-Net** project comprising *Intranet, Internet, and Extranet* has been introduced and implemented : to share information and hydro-meteorological as well as other services with in TMD bodies; to serve international activities in hydro-meteorology; and to be an information access for other national agencies responsible in comprehensive natural disaster monitoring and preparedness plan of the kingdom, respectively.

Facilities both in equipment and format have been prepared for The MT SAT data receiving. The new web site, http://www.weather.go.th with severe weather warning contents, was constructed apart from the existing one (http://www.tmd.go.th).

The new set of aviation meteorological observation is being installed at the New Bangkok International Airport (NBIA) which is scheduled to be officially open in the year 2005. Wave Forecast Model (WAM) has been used continually to forecast wave height..

The monsoon-weather connection over Thailand is being investigated. A number of case studies in monsoonal regard were produced.

Ten participants participated in 11 overseas training courses, and a number of local trainings had been done focusing on ICT.

The delegate from the **United States of America** reported that the USA provided a brief review of the USA country report highlighting facility upgrades in the Micronesian islands, implementation of the Integrated Forecast Preparation System, and implementation of the 96 and 120-hour tropical cyclone forecasts.

The delegate from **Viet Nam** reported that 6 automatic air environment observational stations have been installed and put inoperation. The upper-air sounding observation at Da Nang (48855) has also been increased.

Installed and put into operation were a PCVSAT system (for data collecting and processing), and a HRM (High Resolution Regional Model, DWD) which run in parallel computers (4 PC with 2 CPU each). The model is run twice a day for 72-hour forecasts. The initial and boundary data are taken from GME (Global Model Europe, DWD).

APPENDIX IV

Proposed Amendments to the Typhoon Committee Operational Manual Meteorological Component (TOM)

Introduction

1. The typhoon Committee Operational Manual - Meteorological Component (TOM) has been reviewed and updated every year since the first issue in 1987. The 2003 edition of TOM was published in February 2003 in accordance with the approval of amendments to the previous issue of TOM at the thirty-fifth session of the Typhoon Committee (19 to 25 November 2002, Chaing Mai, Thailand) as proposed by the rapporteur.

2. At the thirty-fifth session, the Committee decided that a rapporteur of the Japan Meteorological Agency (JMA) would continue the services for updating TOM. On 23 June 2003, the rapporteur, Mr. Nobutaka Mannoji, Head of the RSMC Tokyo - Typhoon Center, invited the individual focal points of the meteorological component of the Members to provide him with proposals on the further update of TOM.

3. As of the end of October 2003, proposals were submitted by the eight focal points of China, Hong Kong/China, Japan, Macao/China, Republic of Korea, Singapore, Thailand and U.S.A. WMO also submitted a proposal as well as the above eight focal points.

4. Major points of the proposed amendments are as follows:

- Revision of the description about the Tropical Cyclone Programme (TCP) of WMO and its international cooperation and coordination in Chapter 1.

- Amendment to some terminologies used in the region and meanings of terms used for regional exchange in Chapter 1.

- Addition of the 1.25×1.25 degrees GPV output products and the Global Wave model products of numerical weather prediction by RSMC Tokyo-Typhoon Center for regional purposes in Chapter 3.

- Amendment to Table 5.1 in Chapter 5 to include the improvement of meteorological telecommunication circuits: Beijing – Tokyo, Washington – Tokyo, Tokyo – Bangkok, and RTH radio broadcast for Beijing.

- Amendment to Appendix 2-A to update the list of surface observing stations in China.

- Amendment to Appendix 2-B to update the list of upper-air observing stations in China and Republic of Korea.

- Amendment to Appendix 2-D to amend the technical specifications of radars of Japan and to add a new radar station of Republic of Korea.

- Replacement of Appendix 2-E "SCHEDULE OF GMS VISSR OBSERVATION AND WEFAX/DATA DISSEMINATION" with "SCHEDULE OF MTSAT OBSERVATION AND DISSEMINATION".

- Replacement of Appendix 2-E, Annex "INFORMATION ON TRANSMISSION OF THE STRETCHED VISSR DATA OF THE GMS" with "THE BACKUP OF GMS-5 WITH GOES-9".

- Amendment to Appendix 2-F to update satellite imagery receiving facilities of Hong Kong/China, Republic of Korea, Singapore and Thailand.

- Amendment to Appendix 3-A to describe improvements in operational Global Spectral Model and Typhoon Model of RSMC Tokyo.

- Amendment to Appendix 3-B to describe a newly introduced operational tropical cyclone track forecast method of Hong Kong, China and insertion of its outline (Appendix 3-E).

- Amendment to Appendix 3-B and Appendix 3-D to describe improvements of numerical models of Republic of Korea.

- Amendment to Appendix 4-A to revise an example of RSMC tropical cyclone advisory due to the commencement of 72-hour intensity forecast.

- Amendment to Appendix 4-C to insert an USA station broadcasting cyclone warnings for ships on the high seas.

- Amendment to Appendix 5-C to describe changes of receiving stations for collection and distribution of information related to tropical cyclones.

- Revision of Appendix 7-A "LIST OF DATA ARCHIVED BY RSMC TOKYO-TYPHOON CENTER".

- Replacement of Appendix 7-A, Annex "SPECIFICATION OF MONTHLY REPORT CD-ROM FOR GMS DATA" with "SPECIFICATION OF MTSAT IMAGER DATA ON DVD-RAM (DRAFT)".

Proposed Amendments to the Typhoon Committee Operational Manual - Meteorological Component (TOM)

Page	Line	Present Description	Proposed Amendment
CHAPTER 1			
1	23-35	Whole of 5th paragraph	<< *to be replaced* >> " new text (see **Attachment C1**)
2 3	34-8	(v) minimum pressure (vi) direction of movement (vii) speed of movement (viii) average wind speed (ix) maximum wind speed (x) gusts (xi) storm radius (xii) gale radius (xiii) storm surge potential for a particular coastal location (xiv) storm tide potential for a particular coastal location	<< *to be replaced* >> " (v) direction of movement (vi) speed of movement (vii) maximum sustained wind (viii) gusts (ix) storm radius (x) gale radius (xi) storm surge potential for a particular coastal location (xii) storm tide potential for a particular coastal location
	23	..... anemometer or estimated	<< *to be inserted* >> " ..... anemometer or wind averaged over the previous 1 minute (mean surface wind) at 10 meter height or estimated .....
4	20	Storm: Mean surface wind speed of 48 to 63 knots.	" << *to be deleted* >>
5	1		<< *to be added before "Tropical cyclone"* >> Sustained wind speed: Average wind speed. Average period of one, three or ten minutes is depending upon the regional practices.
5	31-32	* Maximum sustained wind speed: Average period of one, three or ten minutes depending upon the regional practices	" << *to be deleted* >>
6	23	by the RSMC	<< *to be replaced* >> " by the RSMC
CHAPTER 2			
8	5	surface observations	<< *to be replaced* >> " marine meteorological observations
	5	meteorological observing ships	" research vessels
	9	ships	" JMA research vessels
	11	Surface observations	" Marine meteorological observations
	14	Sea surface observations	" Marine meteorological observations
	17	Surface observations	" Marine meteorological observations
8 9	37-26	2.4 Meteorological satellite observations	" new text (see **Attachment C2**)
CHAPTER 3			
11 3-	14	in Tables 3.1 to 3.5 Table 3.2	<< *to be replaced* >> in Tables 3.1 to 3.3 " new Table 3.2 (see **Attachment C3-1**)

Page	Line	Present Description	Proposed Amendment
14 16		Table 3.3	□¨ new Table 3.3 (see **Attachment C3-2**)
CHAPTER 5			
			<< to be replaced >>
23	5	Cable (FR), 32 Kbit/s (CIR) TCP/IP	□¨ Cable (FR), 32 Kbps (CIR) TCP/IP
	6	Cable, 64 Kbit/s TCP/IP	□¨ Cable (FR), 32 Kbps from Tokyo / 768 Kbps from Washington (CIR) TCP/IP
	8	Cable, 16 Kbps, Frame Relay	□¨ Cable (FR), 16Kbps (CIR) TCP/IP
24	3	Beijing 1 RTT, 1FAX	□¨ Beijing 1FAX (Shanghai)
CHAPTER 7			
27	12	The data set should be kept in storage for three years.	□¨ *<< to be deleted >>*
Appendix 1-A			
			<< to be replaced >>
		Macau	□¨ Macao, China
Appendix 2-A			
			<< to be replaced >>
1		China (54): ….. 857, 683, 927, 945 (58): ….. 345, 362, 445, 457, 472, … 477, 556, 569, 646, 653, 659, 666	□¨ (54): ….. 857, 863, 929, 945 □¨ (58): ….. 345, 362, 457, 472, … 477, 543, 556, 569, 646, 659, 660, 666 □¨
Appendix 2-B			
			<< to be replaced >>
1		China (57): 084, 494, 972 Republic of Korea (47): 090, 102, 122, 138, 158, 185	□¨ (57): 083, 494, 972 □¨ (47): 090, 102, 122, 138, 158, 185, 169
Appendix 2-C			
			<< to be replaced >>
1		DISTRIBUTION OF THE RADAR STATIONS OF TYPHOON COMMITTEE MEMBERS	□¨ new Figure (see **Attachment A2C**)
Appendix 2-D			
			<< to be replaced >>
4		Akita (47582) Antenna elevation 56.8 Beam width 1.4 (H) 1.4 (V)	□¨ 55.3 □¨ 1.1 (H) 1.1 (V)
6		Matsue/Mikasayama (47791) Murotomisaki (47899) Antenna elevation 200.3 Pulse length 2.7 Sensitivity minimum of receiver -110 Beam width 1.4 (H) 1.5 (V)	□¨ Matsue/Misakayama (47791) □¨ 198.8 □¨ 2.6 □¨ -112 □¨ 1.1 (H) 1.1 (V)
7		Tanegashima/Nakatane (47869) Sensitivity minimum of receiver -111 Naza/Funchatoge (47909) Sensitivity minimum of receiver -112	□¨ -113 □¨ Naze/Funchatoge (47909) □¨ -113
13		(Name of Member Republic of Korea)	new Table (see **Attachment A2D**)

Page	Line	Present Description	Proposed Amendment
Appendix 2-E			
			<< to be replaced >>
1-5		SCHEDULE OF GMS VISSR OBSERVATION AND WEFAX/DATA DISSEMINATION	□¨ SCHEDULE OF MTSAT OBSERVATION AND DISSEMINATION new text (see **Attachment A2E**)
Appendix 2-E, Annex			
			<< to be replaced >>
1-3		INFORMATION ON TRANSMISSION OF THE STRETCHED VISSR DATA OF THE GMS	□¨ THE BACKUP OF GMS-5 WITH GOES-9 new text (see **Attachment A2EA**)
Appendix 2-E, Annex, Attachment			
1-2		CONCEPT OF THE STRETCHED VISSR DATA TRANSMISSION	□¨ *<< to be deleted >>*
Appendix 2-F			
			<< to be replaced >>
1-2		SATELLITE IMAGERY RECEIVING FACILITIES AT TYPHOON COMMITTEE MEMBERS	new Table (see **Attachment A2F**)
Appendix 3-A			
			<< to be replaced >>
1	2	(GSM-0103)	□¨ (GSM-0305)
	34	- grid-scale condensation with threshold at 100% r.h. with evaporation of falling rain	□¨ - prognostic cloud water scheme by Smith (1990)
	35	- prognostic cloud water content	□¨ - bulk formulae for surface fluxes with similarity functions by Louis (1982)
2	1	(TYM 0103)	(TYM 0306)
	8	(321 x 217)	(640 x 320)
	14-17	- asymmetric structure whenever apropriate, derived from the previous prediction by TYM and tuned so that initial translation velocity better fits the latest analyzed track, otherwise, derived from the latest 6-hr prediction by GSM	□¨ - asymmetric structure derived from first guess field (prediction by GSM)
	20	the Fujita formula	□¨ the Fujita's (1952) formula
	25		*<< to be inserted after "- modification of r.h. near TC center" >>* - asymmetric structure whenever apropriate, derived from the previous prediction by TYM and tuned so that initial translation velocity better fits the latest analyzed track, otherwise, derived from the latest 6-hr prediction by GSM
3	16	- grid scale condensation with threshold at 100% r.h. with evaporation of falling rain	*<< to be replaced >>* □¨ - prognostic cloud water scheme by Smith (1990)
Appendix 3-B			
5		The Multi-Model Ensemble Technique ….. (JMA), and European Centre …..	*<< to be inserted >>* □¨ ….. (JMA), National Centers for Environmental Prediction (NCEP) and European Centre …..

Page	Line	Present Description	Proposed Amendment
			<< to be inserted between page 5 and page 6 >>
5-6		(Name of the Member Hong Kong, China)	Operational Regional Spectral Model (ORSM) new text (see **Attachment A3B-1**)
			<< to be replaced >>
15		(Name of the Member Republic of Korea) (Description of the method of Barotropic Adaptive Typhoon System (BATS)) Lateral boundary: Prediction by GDAPS at T-6h initial	Lateral boundary: □¨ Prediction by GDAPS at t-0h initial at 00 and 12UTC Prediction by GDAPS at t-6h initial at 06 and 18UTC
		(Type of output of Global Data Assimilation Prediction System (GDAPS)) every 6 hours up to 60 hours at 00/12UTC	□¨ every 6 hours up to 84 hours at 00/12UTC
			<< to be added after Regional Data Assimilation Prediction System (RDAPS) >> new text (see **Attachment A3B-2**)
Appendix 3-D			
			<< to be replaced >>
1	25	- prediction by GDAPS at T-6h initial	□¨ - prediction by GDAPS at T-0h initial at 00 and 12UTC - prediction by GDAPS at T-6h initial at 06 and 18UTC
2	21	320 longitudes	□¨ 640 longitudes
3	28	with GMS data	□¨ with GOES data
			<< to be added after page.3 >> (4) <Double Fourier-series BARotropic typhoon model(DBAR)> new text (see **Attachment A3D**)
			<< to be added after Appendix 3-D >> Appendix 3-E Outline of HKO - Operational Regional Spectral Model new text (see **Attachment A3E**)
Appendix 4-A			
			<< to be replaced >>
1		Example of RSMC tropical cyclone advisory	□¨ new text (see **Attachment A4A**)
Appendix 4-B			
			<< to be replaced >>
8		Cheju	□¨ Jeju
Appendix 4-C			
			<< to be replaced >>
1		Republic of Korea Cheju	□¨ Jeju
			<< to be inserted between Thailand and Viet Nam >> U.S.A. Honolulu Hawaii KMV-99 Pacific Ocean

Page	Line	Present Description	Proposed Amendment
Appendix 5-A			
			<< to be replaced>>
1		China	
	10-14	Central Meteorological Office National Meteorological Centre China Meteorological Adm. (Director: Qiu Guoqing) 46 Baihiquiaolu Western Suburb Telex: 22094 FDSMA CN Tel.: (+86) (10) 6840 6615 Cable: 2894 Fax: (+86) (10) 6217 4797 or 6217 5928	□¨ National Meteorological Center China Meteorological Administration (Director: Zhang Guocai) No. 46 Zhongguancun Nandajie Beijing 100081 Tel.: (+86) (10) 6840 6625 Cable: 2894 Fax: (+86) (10) 6217 5928 E-mail: zhanggc@cma.gov.cn
		Japan	
	33	(Director: T. Aoki)	□¨ (Director: J. Ichizawa)
	37	E-mail: tksh.aoki@met.kishou.go.jp	□¨ *<< to be deleted>>*
			<< to be replaced>>
2		Republic of Korea	
	24-26	460-18, Shindaebang 2-dong Thongjak-gu Seoul 156-720	□¨ 460-18, Sindaebang -dong Dongjak-gu Seoul 156-720
		Thailand	
	30-32	Weather Forecast Division Meteorological Department (Deputy Director-General: Dusadee Sarigabutr) Tel.: (+66) (2) 3989 816, 3989 836	□¨ Thai Meteorological Department (Director-General: Dr. Prapansak Buranaprapa) Tel: (+66) (2) 399 1425 366 9333
	33-36	Observation Division Meteorological Department (Director: Songkran Agsorn) Tel.: (+66) (2) 393 5521 398 9861 Fax: (+66) (2) 398 4972	□¨ Meteorological Observation and Warning Bureau Thai Meteorological Department (Director: Kriengkrai Khovadhana) Tel.: (+66) (2) 399 1420 Fax: (+66) (2) 399 1420
	37-39	Telecommunication Division Meteorological Department (Director: Kamnueng Muangkote)	□¨ Meteorological Telecommunication and Information Division Thai Meteorological Department (Director: Pairat Sangsnit)
3	3	John F. Miller	□¨ Genevieve Miller
	4		*<< to be added after section USA >>* RSMC Honolulu (Jim Weyman, Director) 2525 Correa Road Suite 250 Honolulu, HI 96822 Tel (+1-808) 973-5272 Fax (+1-808) 973-5271
Appendix 5-C			
			<< to be replaced >>
1-3		COLLECTION AND DISTRIBUTION OF INFORMATION RELATED TO TROPICAL CYCLONES	□¨ (see **Attachment A5C-1**, **A5C-2** and **A5C-3**)

Page Line	Present Description	Proposed Amendment
Appendix 6-B		
		<< to be replaced >>
2 Fig. 6-B.2	JBOA	□¨JPBN
3 Fig. 6-B.3	JBOA	□¨JPBN
Appendix 7-A		
		<< to be replaced >>
1	LIST OF DATA ARCHIVED BY RSMC TOKYO-TYPHOON CENTER	□¨new text (see **Attachment A7A**)
2	SPECIFICATIONS OF GMS IMAGE MICROFILM	□¨ *<< to be deleted >>*
Appendix 7-A, Annex		
1-2	DATA SET MAGNETIC TAPE CHARACTERISTICS	□¨ *<< to be deleted >>*
		<< to be replaced >>
3	SPECIFICATION OF MONTHLY REPORT CD-ROM FOR GMS DATA	□¨SPECIFICATION OF MTSAT IMAGER DATA ON DVD-RAM (DRAFT) new text (see **Attachment A7AA**)
4	SPECIFICATION OF GMS VISSR DATA ON DVD-RAM	□¨ *<< to be deleted >>*

Activities of the Meteorological Component of the Typhoon Committee - including execution of the meteorological component of TOPEX for three years - had been planned and organized under the Tropical Cyclone Programme (TCP) of the World Meteorological Organization (WMO). The main long-term objective of the TCP is to assist Members in upgrading the capabilities of NMHSs to provide better tropical cyclone, related flood and storm surge forecasts and more effective warnings through regionally coordinated systems, and to encourage Members to establish national disaster prevention and preparedness measures.

As a result of international cooperation and coordination, and with the aid of meteorology and modern technology, such as satellites, weather radars and computers, all tropical cyclones around the globe are now being monitored from their early stages of formation and throughout their lifetime. Six centres designated by WMO as Regional Specialized Meteorological Centres (RSMCs) located in Honolulu, La Reunion, Miami, Nadi (Fiji), New Delhi and Tokyo, as well as other centres of national Meteorological Services carry out these activities. These centres also provide forecasts on the behaviour of tropical cyclones, their movement and changes in intensity and on associated phenomena - principally storm surges and flash floods.

2.4 Meteorological satellite observations

The meteorological satellite information obtained by MTSAT and related products is operated as follows:

(i) the full disk data are obtained hourly;
(ii) the half disk data in northern hemisphere are obtained hourly in addition to the full disk data;
(iii) three successive half disk data in northern/southern hemisphere are also observed six-hourly in order to derive Atmospheric Motion Vector(AMV).

Detailed information is given in Appendix 2-E.

A list of satellite imagery receiving facilities at meteorological centres of the Typhoon Committee Members is given in Appendix 2-F.

SAREP reports (Part A) will be disseminated eight times a day in case (i) mentioned below, or four times a day in case (ii) or (iii) from the RSMC Tokyo - Typhoon Center to Typhoon Committee Members through the GTS under the heading TCNA20 RJTD:

(i) when a tropical cyclone of TS intensity or higher is located in the responsible area of the RSMC Tokyo - Typhoon Center;
(ii) when a tropical depression existing in the responsible area is forecasted to have an intensity of TS or higher within 24 hours; or
(iii) when a tropical cyclone existing out of the responsible area is forecasted to move into the responsible area and to have an intensity of TS or higher within 24 hours.

Information on the intensity of the tropical cyclone at 0000, 0600, 1200 and 1800 UTC will be reported under the heading TCNA21 RJTD.

Details of the SAREP code are to be found in the Manual on Codes, Volume 1, FM 85-IX (WMO Publication No. 306).

Table 3.2 Grid point value output products of Numerical Weather Prediction by RSMC Tokyo - Typhoon Center for regional purposes

Area	20S-60N, 80E-160W	20S-60N, 60E-160W
Resolution	2.5×2.5 degrees	1.25×1.25 degrees
Levels and elements	Surface (P,U,V,T,TTd,R) 850hPa (Z,U,V,T,TTd,ω) 700hPa (Z,U,V,T,TTd,ω) 500hPa (Z,U,V,T,TTd,ζ) 300hPa (Z,U,V,T) 250hPa (Z,U,V,T) 200hPa (Z,U,V,T) 150hPa (Z,U,V,T) 100hPa (Z,U,V,T)	Surface (P,U,V,T,TTd,R)** 1000hPa (Z,U,V,T,TTd) 925hPa (Z,U,V,T,TTd,ω) 850hPa (Z*,U*,V*,T*,TTd*,ω,ψ,χ) 700hPa (Z*,U*,V*,T*,TTd*,ω) 500hPa (Z*,U*,V*,T*,TTd*,ζ) 400hPa (Z,U,V,T,TTd) 300hPa (Z,U,V,T,TTd) 250hPa (Z,U,V,T) 200hPa (Z*,U*,V*,T*,ψ,χ) 150hPa (Z,U,V,T) 100hPa (Z,U,V,T) 70hPa (Z,U,V,T) 50hPa (Z,U,V,T) 30hPa (Z,U,V,T) 20hPa (Z,U,V,T) 10hPa (Z,U,V,T)
Forecast hours	(00 and 12 UTC) 0, 6, 12, 18, 24, 30, 36, 48, 60 and 72 hours	(00 and 12 UTC) 0 – 84 every 6 hours In addition (12 UTC), * 96, 120, 144, 168 and 192 hours ** 90 – 192 every 6 hours
Frequency (initial times)	Twice a day (00 and 12 UTC)	Twice a day (00 and 12 UTC)

Area	Whole globe		Whole globe
Resolution	2.5×2.5 degrees		1.25×1.25 degrees
Levels and elements	Surface(P,R,U,V,T) 1000hPa(Z) 850hPa(Z,U,V,T,TTd) 700hPa(Z,U,V,T,TTd) 500hPa(Z,U,V,T) 300hPa(Z,U,V,T) 250hPa(Z,U,V,T)* 200hPa(Z,U,V,T) 100hPa(Z,U,V,T)* 70hPa(Z,U,V,T)* 50hPa(Z,U,V,T)* 30hPa(Z,U,V,T)*	Surface (P,U,V,T,TTd*) 1000hPa (Z,U,V,T,TTd*) 850hPa (Z,U,V,T,TTd) 700hPa (Z,U,V,T,TTd) 500hPa (Z,U,V,T,TTd*) 400hPa (Z,U,V,T,TTd*) 300hPa (Z,U,V,T,TTd*) 250hPa (Z,U,V,T) 200hPa (Z,U,V,T) 150hPa (Z,U,V,T) 100hPa (Z,U,V,T) 70hPa (Z,U,V,T) 50hPa (Z,U,V,T) 30hPa (Z,U,V,T) 20hPa (Z,U,V,T) 10hPa (Z,U,V,T)	Surface (P,U,V,T,RH,R,CI) 1000hPa (Z,U,V,T,RH, ω) 925hPa (Z,U,V,T,RH, ω) 850hPa (Z,U,V,T,RH, ω,ψ,χ) 700hPa (Z,U,V,T, RH, ω) 600hPa (Z,U,V,T, RH, ω) 500hPa (Z,U,V,T, RH, ω, ζ) 400hPa (Z,U,V,T, RH, ω) 300hPa (Z,U,V,T, RH, ω) 250hPa (Z,U,V,T) 200hPa (Z,U,V,T, ψ,χ) 150hPa (Z,U,V,T) 100hPa (Z,U,V,T) 70hPa (Z,U,V,T) 50hPa (Z,U,V,T) 30hPa (Z,U,V,T) 20hPa (Z,U,V,T) 10hPa (Z,U,V,T)
Forecast hours	(00 and 12 UTC) 24, 48 and 72 hours In addition (12 UTC), 96 – 192 every 24 hours * 96 and 120 only	(00 and 12 UTC) 0 hours * 00UTC only	(00 and 12 UTC) 0 – 84 every 6 hours In addition (12 UTC), 96 – 192 every 12 hours
Frequency (initial times)	twice a day (00 and 12 UTC)		twice a day (00 and 12 UTC)

Area	Whole globe
Resolution	2.5×2.5 degrees
Levels and elements	Surface (P) 1000hPa(Z) 850hPa (T,U,V) 500hPa (Z) 250hPa (U,V) *Above GPVs are ensemble mean and standard deviation of ensemble forecast memers.
Forecast hours	Every 12 hours from 0 192 hours
Frequency (initial times)	Once a day (12 UTC)

Notes:
Cl : cloud cover (total)
RH :relative humidity
U : u-component of wind
ζ : relative vorticity
ω : vertical velocity
P : pressure reduced to MSL
T : temperature
V : v-component of wind
χ : velocity potential
R : total precipitation
TTd : dew point depression
Z : geopotential height
ψ : stream function

(Naming rules of WMO headings)

$HT_{11}A_1A_{21}$ii RJTD $YT_{12}A_1A_{22}$ii RJTD

T_{11}	Meaning
P	Pressure
E	Precipitation
H	Geopotential height
U	U-component of wind
V	V-component of wind
T	Temperature
R	Dew point depression or Relative humidity
O	Vertical velocity
Z	Relative vorticity
X	Stream function
Y	Velocity Potential

T_{12}	Meaning
In addition to T_{11}	
S	Precipitation
W	Vertical velocity
P	Ensemble mean of Pressure
H	Ensemble mean of Geopotential height
T	Ensemble mean of Temperature
U	Ensemble mean of U-component of wind
V	Ensemble mean of V-component of wind

E	Standard deviation of Pressure
J	Standard deviation of Geopotential Height
G	Standard deviation of Temperature
M	Standard deviation of U-component of wind
L	Standard deviation of V-component of wind

A_1	Meaning
C	60E - 160W, 20S - 60N1.25 X 1.25deg
D	80E - 160W, 20S - 60N2.5 X 2.5deg
X	Northern Hemisphere 2.5 X 2.5deg
Y	Southern Hemisphere 2.5 X 2.5deg
I	30W - 60E 0 - 90N Tinned Grid
J	60E - 150E 0 - 90N Tinned Grid
K	150E - 120W 0 - 90N Tinned Grid
L	120W - 30W 0 - 90N Tinned Grid
M	30W - 60E 90S - 0 Tinned Grid
N	60E - 150E 90S - 0 Tinned Grid
O	150E - 120W 90S - 0 Tinned Grid
P	120W - 30W 90S - 0 Tinned Grid

A_{21}	Meaning
A	Analysis (initial time)
B	6 hours forecast
C	12 hours forecast
D	18 hours forecast
E	24 hours forecast
F	30 hours forecast
G	36 hours forecast
H	42 hours forecast
I	48 hours forecast
Y	54 hours forecast
J	60 hours forecast
Z	66 hours forecast
K	72 hours forecast
L	84 hours forecast
M	96 hours forecast
N	108 hours forecast
O	120 hours forecast
P	132 hours forecast
Q	144 hours forecast
R	156 hours forecast
S	168 hours forecast
X	192 hours forecast

A_{22}	**Meaning**
In addition to A_{11}	
P	78 hours forecast
Q	90 hours forecast
R	102 hours forecast
S	114 hours forecast
T	126 hours forecast
U	138 hours forecast
V	150 hours forecast
W	162 hours forecast
X	174 hours forecast
Y	180 hours forecast
Z	186 hours forecast

ii	**Meanings**
98	Air properties for the Earth's surface
89	Reduced to sea level
88	Ground or water properties for the Earth's surface
99	1000 hPa
92	925 hPa
85	850 hPa
70	700 hPa
60	600 hPa
50	500 hPa
40	400 hPa
30	300 hPa
25	250 hPa
20	200 hPa
15	150 hPa
10	100 hPa
07	70 hPa
05	50 hPa
03	30 hPa
02	20 hPa
01	10 hPa

Table 3.3: List of other products and data by RSMC Tokyo - Typhoon Center for regional purposes

Products/ Data	GOES data	Typhoon Information	Global Wave Model (GRIB)	Observational data
Contents	(a) Digital data (GRIB) • Cloud amount • Convective cloud amount • Equivalent blackbody temperature (b) Satellite-derived high density cloud motion vectors (BUFR)	Tropical cyclone related information (BUFR) •Position, etc.	• Significant wave height • Prevailing wave period • Prevailing wave direction Forecast hours: 0, 6, 12, 18, 24, 30, 36, 42, 48, 54, 60, 72 78, 84 (00 and 12 UTC); 96, 108, 120, 132, 144, 156, 168 ,180 and 192 hours (12 UTC)	(a) Surface data (SYNOP, SHIP) (b) Upper-air data (TEMP, parts A-D) (PILOT, parts A-D)
Frequency (initial times)	(a)4 times a day (00, 06, 12 and 18 UTC) (b)Once a day (04 UTC)	4 times a day (00, 06, 12 and 18 UTC)	Twice a day (00 and 12 UTC)	(a) Mainly 4 times a day (b) Mainly 2 times a day

(Naming rules of headings for global wave model products)

$T_1T_2A_1A_2$ii RJTD

T_1	**Meaning**
H	(Except for 78 hours forecast)
Y	(Only 78 hours forecast)

T_2	**Meaning**
J	Significant wave height
M	Prevailing wave period
Z	Prevailing wave direction

A_1	**Meaning**
N	Northern hemisphere 1.25 X 1.25degs
S	Southern hemisphere 1.25 X 1.25degs

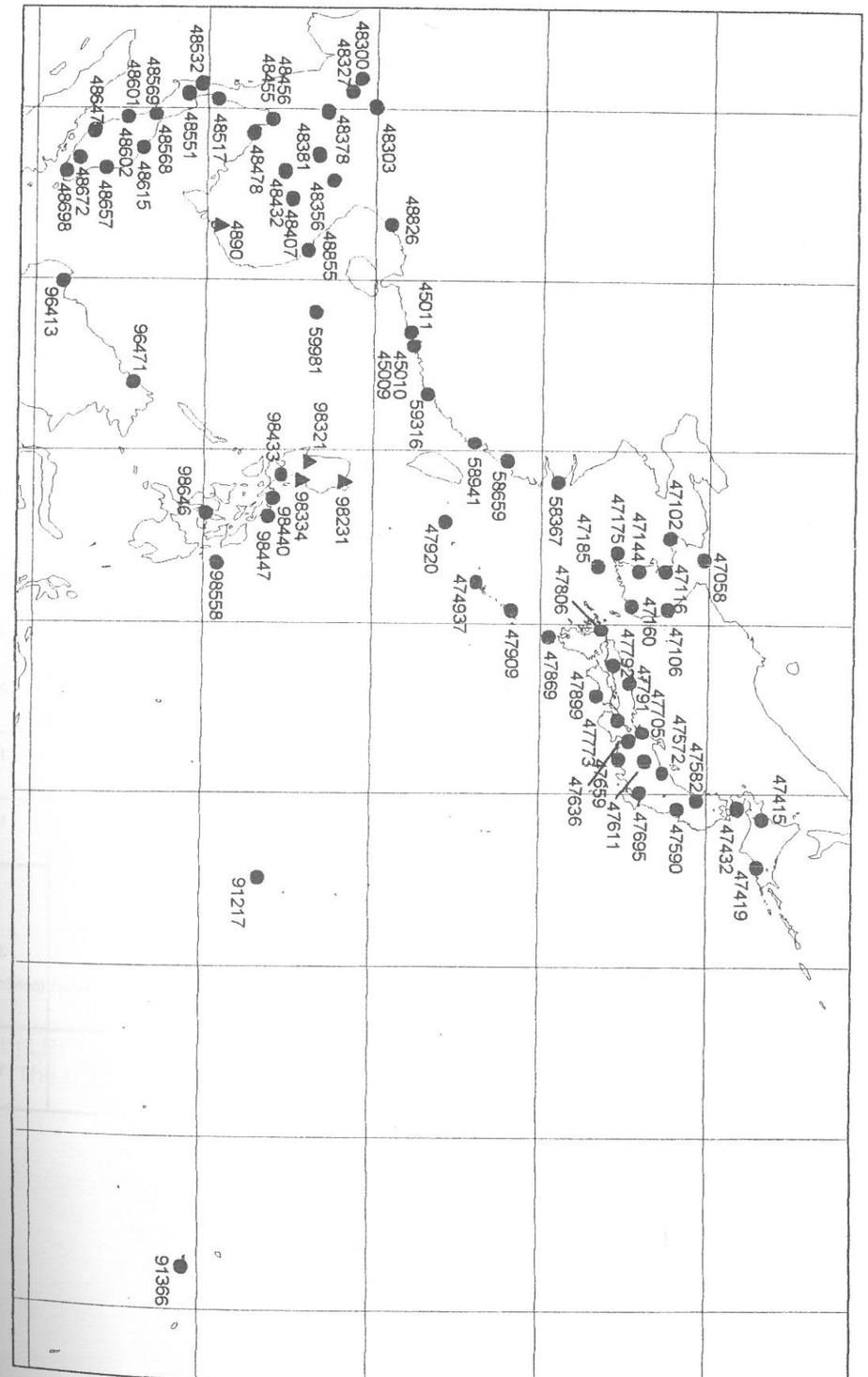
A_2	**Meaning** (When T_1=H except for 78 hours forecast)
A	initial time (00UTC)
B	6 hours forecast
C	12 hours forecast
D	18 hours forecast
E	24 hours forecast
F	30 hours forecast
G	36 hours forecast
H	42 hours forecast

I	48 hours forecast
Y	54 hours forecast
J	60 hours forecast
Z	66 hours forecast
K	72 hours forecast
P	78 hours forecast (Only when T_1=Y)
L	84 hours forecast
M	96 hours forecast
N	108 hours forecast
O	120 hours forecast
P	132 hours forecast
Q	144 hours forecast
R	156 hours forecast
S	168 hours forecast
W	180 hours forecast
X	192 hours forecast

ii	**Meanings**
88	Ground or water properties for the Earth's surface (Fixed)

APPENDIX 2-C

DISTRIBUTION OF THE RADAR STATIONS OF TYPHOON COMMITTEE MEMBERS



Name of the Member Republic of Korea

NAME OF STATION		Gwanaksan	Jeju	Busan	Donghae	Gunsan	Baengnyeong-do	Jindo
SPECIFICATIONS	Unit							
Index number		47116	47185	47160	47106	47144	47102	47175
Location of station		37° 26′ N 126° 58′ E	33° 17′ N 126° 10′ E	35° 07′ N 129° 00′ E	37° 30′ N 129° 08′ E	36° 01′ N 126° 47′ E	37° 56′ N 124° 40′ E	34° 28′ N 126° 19′ E
Antenna elevation	m	637	81	532	53	227	185	494
Wave length	cm	5.6	5.6	5.6	5.6	5.6	5.3	10.4
Peak power of transmitter	kW	250	250	250	250	250	250	750
Pulse length	μ s	2/ 0.5	2/ 0.8	2/ 0.8	2/ 0.8	2/ 0.8	2 - 10/ 1.0	2.5/ 0.85
Sensitivity minimum of receiver	dBm	-108	-108	-108	-108	-108	-108	-110
Beam width (Width of over -3dB antenna gain of maximum)	deg	1.2	1.2	1.2	1.2	1.2	0.95	1
Detection range	km	480	480	480	480	480	512	480
Scan mode in observation 1.Fixed elevation 2.CAPPI 3.Manually controlled		2, 3	2, 3	2, 3	2, 3	2, 3	2,3	2,3
DATA PROCESSING								
MTI processing 1.Yes, 2.No		2	2	2	2	2	2	2
Doppler processing 1.Yes, 2.No		1	1	1	1	1	1	1
Display 1.Digital, 2.Analog		1	1	1	1	1	1	1
OPERATION MODE (When tropical cyclone is within range of detection) 1.Hourly 2.3-hourly 3.Others		3 (continuous)	3 (continuous)	3 (continuous)	3 (continuous)	3 (continuous)	3 (continuous)	3 (continuous)
PRESENT STATUS 1.Operational 2.Not operational(for research etc.)		1	1	1	1	1	1	1

SCHEDULE OF MTSAT OBSERVATION AND DISSEMINATION

1. IMAGER observation

The IMAGER observation time is as follows:

(a) the full disk data are obtained hourly;

(b) the half disk data in northern hemisphere are obtained hourly in addition to the full disk data;

(c) three successive half disk data in northern/southern hemisphere are also observed six-hourly in order to derive Atmospheric Motion Vector(AMV).

(NOTE : users are informed of the latest satellite observation schedule by MANAM)
(SCHEDULE (DRAFT) : Figure 2-E.1)

2. Data Dissemination Services for MDUS Users

The High Resolution Imager Data (HiRID) is new data dissemination service for MDUS.
HiRID for all observations are disseminated in semi-real time.
(SCHEDULE (DRAFT) : Figure 2-E.1)

3. Picture and Data Dissemination Services for SDUS Users

(a) WEFAX
The Weather Facsimile (WEFAX) is picture dissemination service for SDUS.
The current services of WEFAX disseminations will be continued until Spring 2005.

- Four-sectorized full disk
  Images A, B, C and D (IR1) : 00, 03, ... and 21 UTC
  Images K, L., M and N (IR3) : 00 and 12 UTC
  (SCHEDULE (DRAFT) : Figure 2-E.1 , IMAGES : Figure 2-E.2)

- Polar stereographic projection
  Image H (IR1) : hourly
  Image I (VIS) or J (enhanced IR1) : hourly
  (SCHEDULE (DRAFT) : Figure 2-E.1 , IMAGES : Figure 2-E.3)

(b) LRIT
The Low Rate Information Transmission (LRIT) is new data dissemination service for SDUS.

- Full disk
  Images FT (IR1) : hourly
  Images FW(IR3) : 00, 06, 12 and 18 UTC
  (SCHEDULE (DRAFT) : Figure 2-E.1 , IMAGES : Figure 2-E.4)

*The first character of image types means that it was made for full disk observation data. "F" stands for Full disk observation.
*The second character of image types means the kind of sensor. "T" stands for Thermal channel (infrared ch1). "W" stands for Water vapor (infrared ch3).

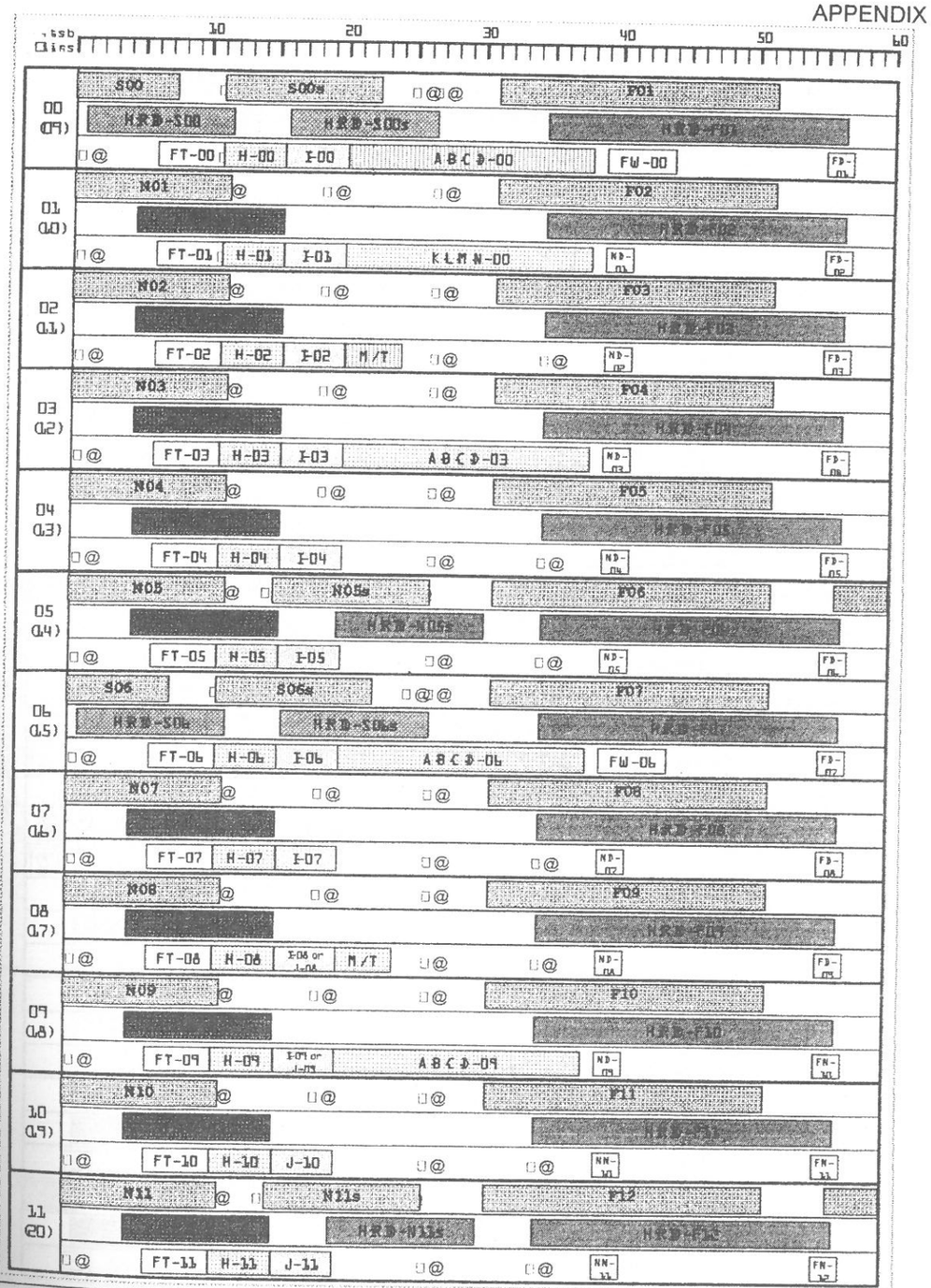
- Polar stereographic projection
  Images FD or FN : hourly
  Images ND or NN : hourly expect for 00,06,12 and 18 UTC

*The first character of image types is the distinction of the observation. "F" stands for Full disk observation. "N" stands for Northern hemisphere observation.
*The second character of image types means the distinction of day and night. "D" stands for Daytime. "N" stands for Nighttime.

Polar stereographic projection Image types
Images FD : AT(East Asia IR1) + AW(East Asia IR3)+ AV(East Asia VIS)
+ NV(north-east of Japan VIS) + SV(south-west of Japan VIS).
Images FN : AT(East Asia IR1) + AL(East Asia IR4) +AW(East Asia IR3).
Images ND : AT(East Asia IR1) + AV(East Asia VIS)
+ NV(north-east of Japan VIS) + SV(south-west of Japan VIS).
Images NN : AT(East Asia IR1) + AL(East Asia IR4).

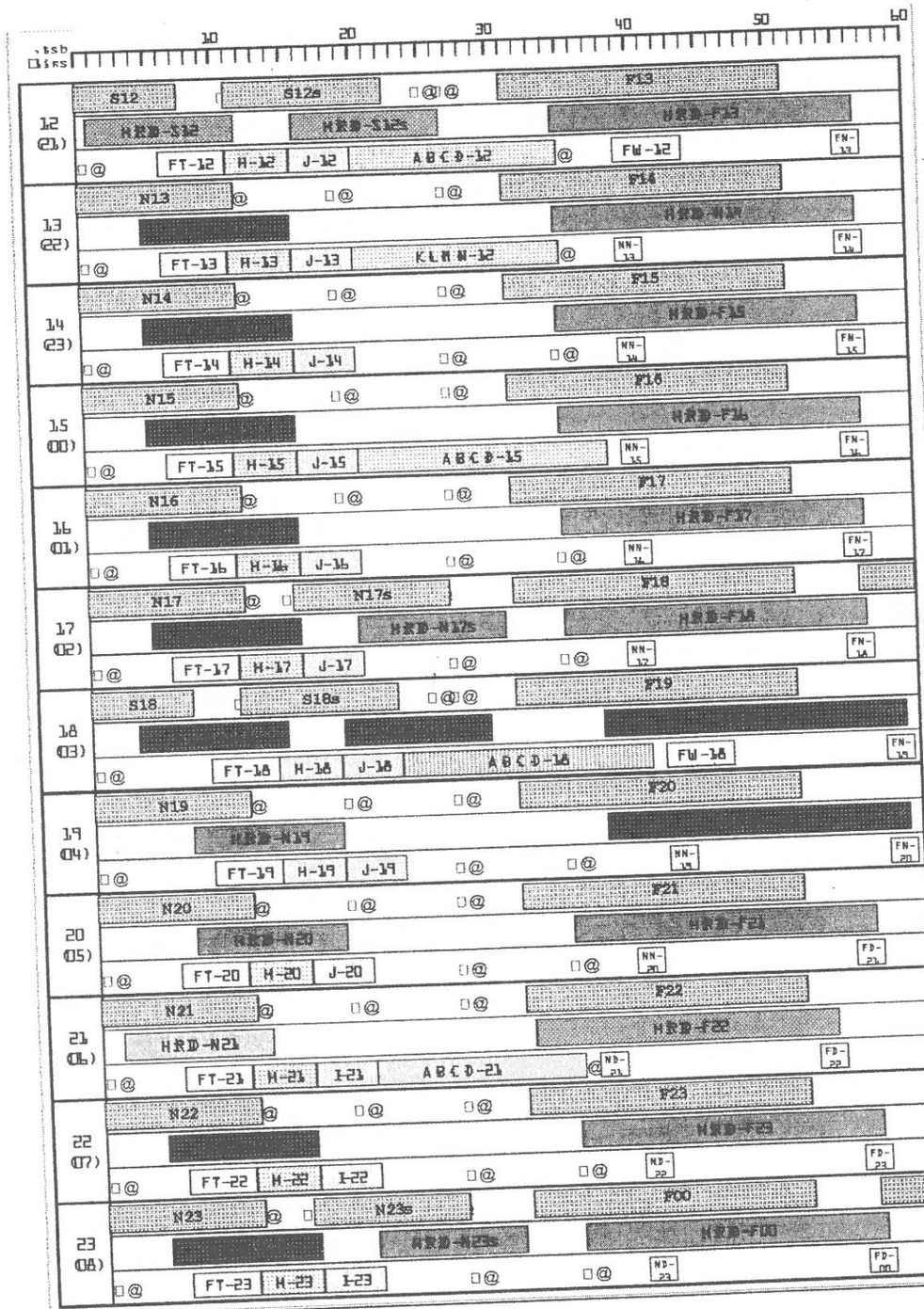
*The first character of image types means the map area.
"A" stands for East Asia area. "N" stands for north-east of Japan area. "S" stands for south-west of Japan area.
*The second character of image types means the kind of sensor. "T" stands for Thermal channel (infrared ch1). "W" stands for "Water vapor (infrared ch3)". "L" stands for Low cloud channel (infrared ch4).

(SCHEDULE (DRAFT) : Figure 2-E.1 , IMAGES : Figure 2-E.4)



*IMAGER OBSERVATION
F : full disk observation, **N** : Northern hemisphere observation, **S** : Southern hemisphere Observation.
*WEFAX DISSEMINATION
A-D : IR four-sectorized picture of full-disk image,
H-J : IR, VIS and enhanced IR polar-stereographic picture covering the far east area including Japan,
K-N : WV four-sectorzed picture of full-disk image, **M** : Manual amendment (MANAM), **T** : Test pattern.
*LRIT DISSEMINATION
FT : IR1 full-disk image, **FW** : IR3 full-disk image
FD : AT+AW+AV+NV+SV , **FN** : AT+AL+AW , **ND** : AT+AV+NV+SV , **NN** : AT+AL
AT, AW, AL, AV,NV,SV : polar-stereographic image
AT(East Asia IR1), AW(East Asia IR3), AL(East Asia IR4), AV(East Asia VIS),
NV(north-east of Japan VIS), SV(south-west of JAPAN VIS)

Fig. 2–E.1 SCHEDULE OF MTSAT OBSERVATION AND DISSEMINATION (DRAFT) (1/2)



*IMAGER OBSERVATION
F : full disk observation, **N** : Northern hemisphere observation, **S** : Southern hemisphere Observation.
*WEFAX DISSEMINATION
A-D : IR four-sectorized picture of full-disk image,
H-J : IR, VIS and enhanced IR polar-stereographic picture covering the far east area including Japan,
K-N : WV four-sectorzed picture of full-disk image, **M** : Manual amendment (MANAM), **T** : Test pattern.
*LRIT DISSEMINATION
FT : IR1 full-disk image, **FW** : IR3 full-disk image
FD : AT+AW+AV+NV+SV , **FN** : AT+AL+AW , **ND** : AT+AV+NV+SV , **NN** : AT+AL
AT, AW, AL, AV,NV,SV : polar-stereographic image
AT(East Asia IR1), AW(East Asia IR3), AL(East Asia IR4), AV(East Asia VIS),
NV(north-east of Japan VIS), SV(south-west of JAPAN VIS)

Fig. 2-E. 1 SCHEDULE OF MTSAT OBSERVATION AND DISSEMINATION (DRAFT) (2/2)

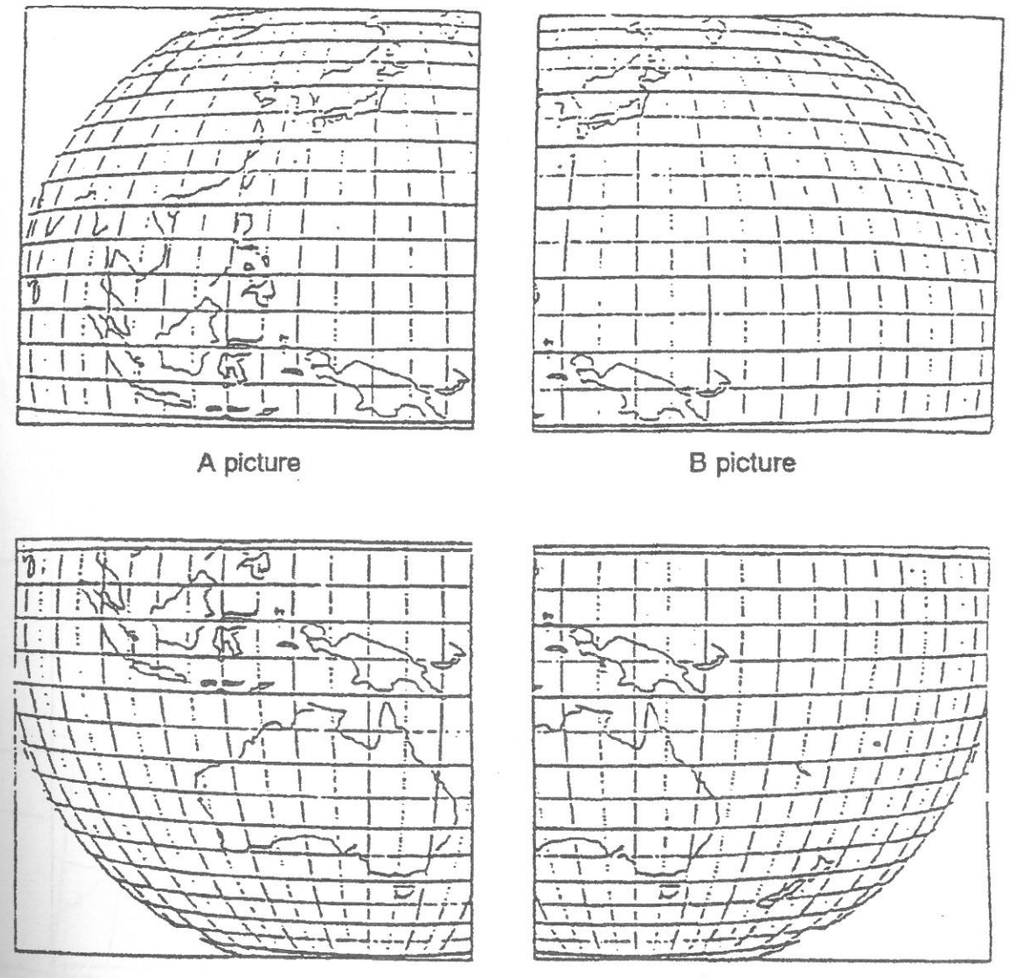


Fig. 2-E. 2 WEFAX IR four-sectorized image “A”, “B”, “C” and “D”

NOTE: “K”, “L”, “M” and “N” images are of the same size as IR four-sectorized image

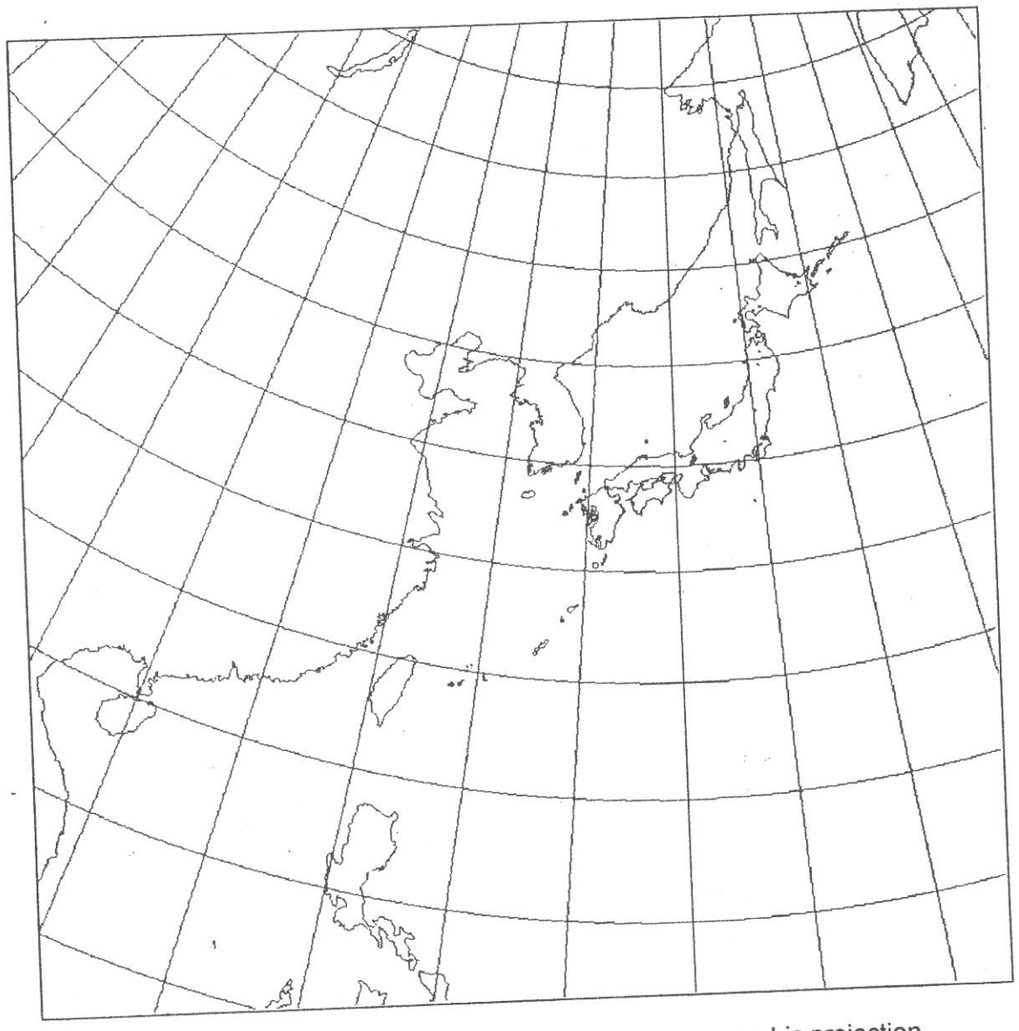
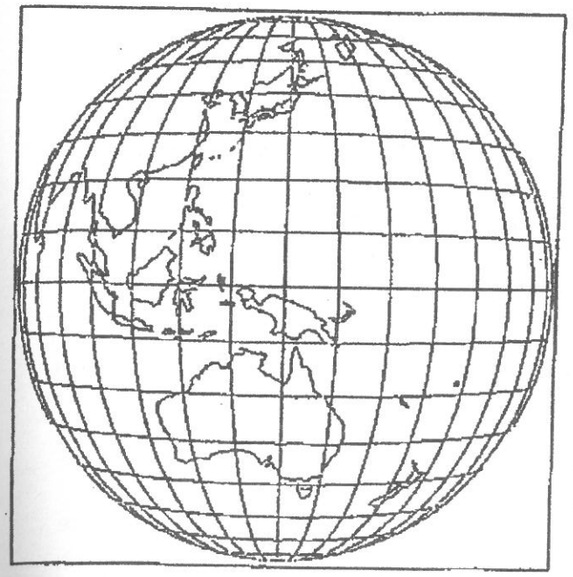
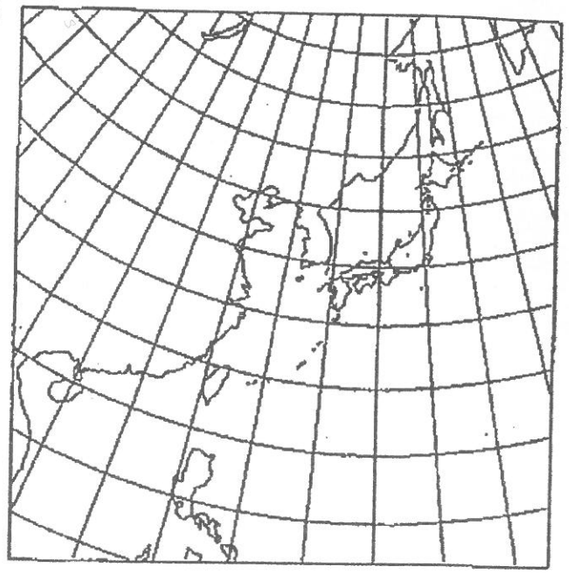


Fig. 2-E. 3 WEFAX "H" image of the polar stereographic projection

NOTE: "I" and "J" images are of the same size and projection as "H"



Full disk(FT,FW)



East Asia (AT,AW,AL,AV)

north- east of Japan (NV)

south-west of Japan (SV)

Fig. 2-E. 4 LRIT Images

"FT" and "FW" image of full disk
"AT", "AW", "AL", "AV", "NV" and "SV" image of the polar stereographic projection

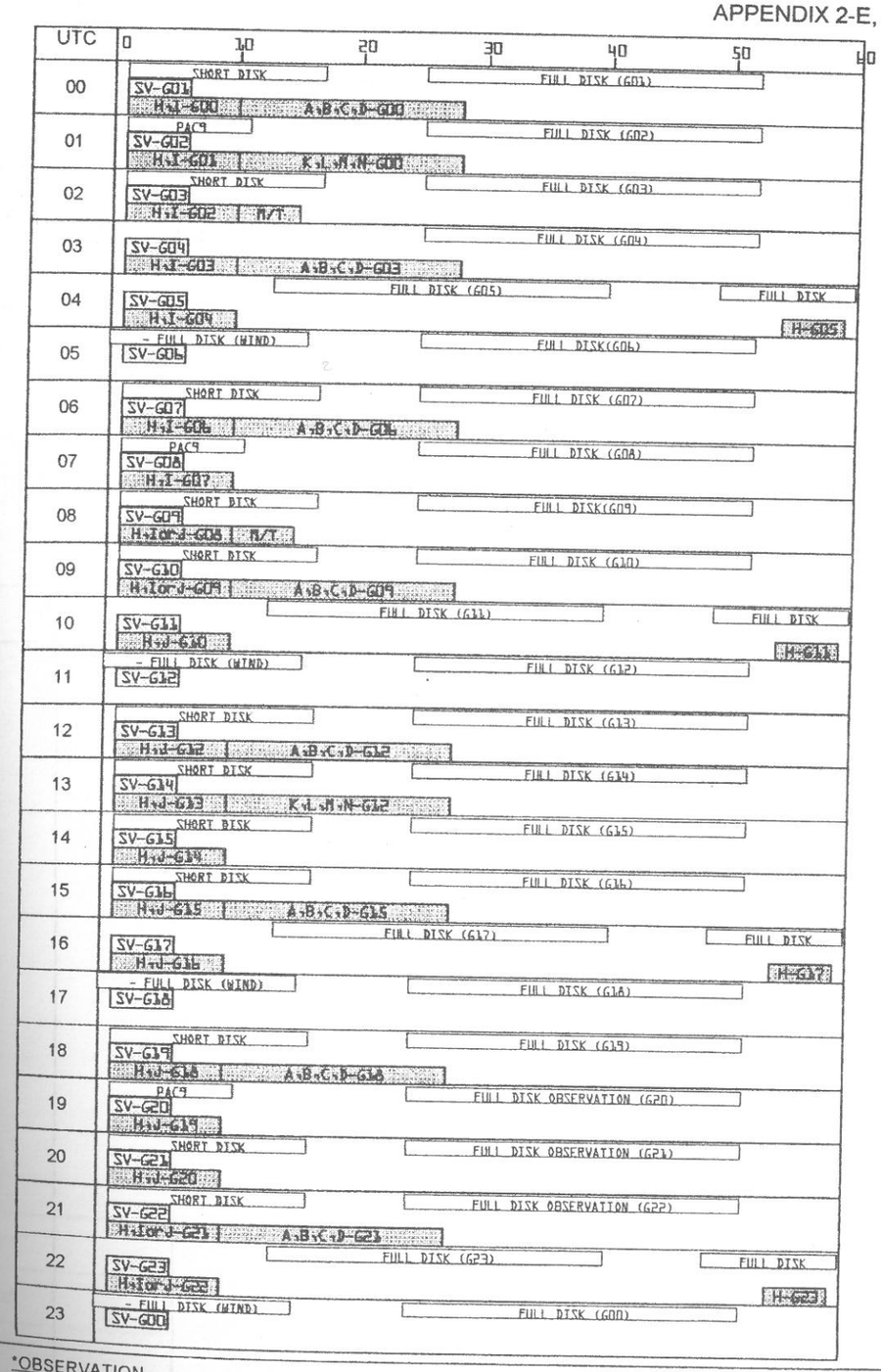
THE BACKUP OF GMS-5 WITH GOES-9

The Japan Meteorological Agency (JMA) started the backup of GMS-5 with GOES-9 on 22 May 2003 in cooperation with US NOAA/NESDIS. GOES-9 has been operated at 155E degrees of the geostationary orbit by US NOAA/NESDIS. The backup will be terminated when MTSAT-1R, the successor to GMS-5, starts its normal operation. The schedule of GOES-9 IMAGER observation is shown Fig 2-E.6.

The WEFAX converted from GVAR data are disseminated via GMS-5 stationed 140E degrees of the geostationary orbit. The schedule of GMS-5 WEFAX dissemination is shown Fig 2-E.7.

The S-VISSR type data (IR1 channel) converted from GVAR data are put on the RSMC Data Server of JMA for the National Meteorological and Hydrological Services, which have been registered to JMA to access the data through the Internet. S-VISSR type data are made about 10-15 minutes after observation end.

The observations of SHORT FULL DISK, PAC9 and WIND OBSERVATION are neither broadcasted via GMS-5 (WEFAX) nor distributed via the Data Server (S-VISSR typed data).



*OBSERVATION
FULL DISK, SHORT DISK, PAC9 : GOES-9 Observation.
*S-VISSR TYPE DATA
SV : S-VISSR type data (IR1) is posted on the RSMC Data Server.
*WEFAX DISSEMINATION
WEFAX is disseminated via GMS-5.
A-D : IR 4-sectorized picture of full-disk image,
H-J : IR, VIS and enhanced IR polar-stereographic picture covering the far east area including Japan,
K-N : WV 4-sectorzed picture of full-disk image, **M** : Manual amendment (MANAM), **T** : Test pattern.

THE BACK-UP OPERATION SCHEDULE OF GMS-5 WITH GOES-9

SATELLITE IMAGERY RECEIVING FACILITIES AT TYPHOON COMMITTEE MEMBERS

Member	Station		GOES 1. M-DUS 2. S-DUS 3. Movie	NOAA 1. HRPT 2. APT	Meteosat 1. P-DUS
Cambodia					
China	Beijing	(39.9°N, 116.4°E)	1, 2	1, 2	
	Shanghai	(31.1°N, 121.4°E)	1	2	
	Shenyan	(41.8°N, 123.6°E)	1		
	Guangzhou	(23.1°N, 113.3°E)	1		
Democratic People's Republic of Korea	Pyongyang	(39.0°N, 125.8°E)	1,2	1	
Hong Kong, China	Kowloon	(22.3°N, 114.2°E)	1, 2, 3	1	
Japan	Chichijima	(27.1°N, 142.2°E)	2, 3		
	Chitose	(42.8°N, 141.7°E)	2, 3		
	Fukue	(32.7°N, 128.8°E)	2, 3		
	Fukuoka	(33.6°N, 130.4°E)	2, 3		
	Fukuoka	(33.6°N, 130.5°E)	2, 3		
	Hakodate	(41.8°N, 140.8°E)	2, 3		
	Haneda	(35.6°N, 139.8°E)	1, 2, 3		
	Hirara	(24.8°N, 125.3°E)	2, 3		
	Hiroshima	(34.4°N, 132.5°E)	2, 3		
	Ishigaki	(24.3°N, 124.2°E)	2, 3		
	Itami	(34.8°N, 135.5°E)	2, 3		
	Kagoshima	(31.6°N, 130.6°E)	2, 3		
	Kansai	(34.4°N, 135.2°E)	2, 3		
	Kashiwa	(35.9°N, 140.0°E)	2, 3		
	Kiyose	(35.8°N, 139.5°E)	2		
	Kobe	(34.7°N, 135.2°E)	2, 3		
	Maizuru	(35.5°N, 135.3°E)	2, 3		
	Minamidaito	(25.8°N, 131.2°E)	2, 3		
	Minamitorishima	(24.3°N, 154.0°E)	2, 3		
	Nagasaki	(32.7°N, 129.9°E)	2, 3		
	Nagoya	(35.2°N, 137.0°E)	2, 3		
	Naha	(26.2°N, 127.7°E)	2, 3		
	Narita	(35.8°N, 140.4°E)	1, 2, 3		
	Naze	(28.4°N, 129.5°E)	2, 3		
	Nemuro	(43.3°N, 145.6°E)	2, 3		
	Niigata	(37.9°N, 139.1°E)	2, 3		
	Okinawa	(26.2°N, 127.7°E)	2, 3		
	Osaka	(34.7°N, 135.5°E)	2, 3		
	Sapporo	(43.1°N, 141.3°E)	2, 3		
	Sendai	(38.3°N, 140.9°E)	2, 3		
	Takamatsu	(34.3°N, 134.1°E)	2, 3		
	Tokyo	(35.7°N, 139.8°E)	1, 2, 3		
	Tsukuba	(36.1°N, 140.1°E)	2, 3		

Member	Station		GOES 1. M-DUS 2. S-DUS 3. Movie	NOAA 1. HRPT 2. APT	Meteosat 1. P-DUS
Lao People's Democratic Republic					
Macao, China	Macao	(22.2°N, 113.5°E)	2, 3		
Malaysia	*Petaling Jaya*	(3.1°N, 101.7°E)	1	1	
	Kuching	(1.5°N, 110.3°E)	2		
	Kota Kinabulu	(5.9°N, 116.0°E)	2		
Philippines	Quezon City	(14.7°N, 121.0°E)	1, 3	1	
Republic of Korea	Seoul	(37.6°N, 127.0°E)	1, 2, 3	1	
	Seoul/Kimpo Int. Airport	(37.6°N, 126.8°E)	2, 3		
	Munsan	(37.9°N, 126.8°E)			1
	Seosan	(36.8°N, 126.5°E)		1	
	Pusan	(35.1°N, 129.0°E)	2, 3		
	Kwangju	(35.2°N, 126.9°E)	2, 3		
	Taejon	(36.4°N, 127.4°E)	2, 3		
	Kangnung	(37.5°N, 130.9°E)	2, 3		
	Cheju	(33.5°N, 126.5°E)	2, 3		
	Taegu	(35.9°N, 128.6°E)	2, 3		
	Taegu/Air Traffic	(35.9°N, 128.7°E)	2, 3		
	Chonju	(35.8°N, 127.2°E)	2, 3		
	Chongju	(36.6°N, 127.4°E)	2, 3		
	Ullung-Do	(37.5°N, 130.9°E)	2, 3		
	Mokpo	(34.8°N, 126.4°E)	2, 3		
	Chunchon	(37.9°N, 127.7°E)	2, 3		
	Masan	(35.2°N, 128.6°E)	2, 3		
	Tongyong	(34.9°N, 128.4°E)	2, 3		
	Inchon	(37.5°N, 126.6°E)	2, 3		
	Huksando	(34.7°N, 125.5°E)	2, 3		
	Suwon	(37.3°N, 127.0°E)	2, 3		
	Sokcho	(38.3°N, 128.6°E)	2, 3		
	Pohang	(36.0°N, 129.4°E)	2, 3		
	Kunsan	(36.0°N, 126.7°E)	2, 3		
Sigapore*	Changi Airport	(1.4°N, 104.0°E)	GVAR	1	1
Thailand	Bangkok	(13.7°N, 100.6°E)	1	1	
USA	Guam	(13.4°N, 144.6°E)	1, 2	1	
Viet Nam	*Hanoi*	(21.0°N, 105.5°E)	2, 3	2	
	Ho Chi Ming City	(10.5°N, 106.4°E)	2, 3	2	
	Da Nang	(16.0°N, 108.2°E)	2, 3		

* Singapore receives MODIS(TERRA), MODIS(AQUA), FY2B(S-VISSR) and FY1(CHRPT).

Name of the Member **Hong Kong, China**

Item	Method	Type of output
Name of the method Description of the method	**Operational Regional Spectral Model (ORSM)** 20-km resolution ORSM (running at a 3-hourly analysis-forecast cycle) one-way nested into 60-km resolution ORSM (running at a 6-hourly analysis-forecast cycle) Data assimilation : Observations : - conventional data - automatic weather station data over southern China - wind profiler data - Doppler weather radar data - tropical cyclone bogus vortex with asymmetric structure Analysis method : - 3-D multivariate optimal interpolation Initialization : - Non-linear normal mode initialization Forecast model : Dynamics : - Primitive hydrostatic equations - Semi-implicit time integration - Spectral discretization in the horizontal - Finite difference on 36 sigma-P hybrid levels in the vertical Physics : - Modified Arakawa-Schubert cumulus parametrization - Moist convective adjustment - Grid-scale condensation and evaporation - Non-local planetary boundary layer scheme - Short-wave and long-wave radiation - 4-layer soil model	Tropical cyclone position forecasts, surface and upper level prognoses up to 72 hours from 60-km ORSM and up to 42 hours from 20-km ORSM

	Model domain : 60-km ORSM : 9 °S – 59 °N, 65-152 °E 20-km ORSM : 10–35 °N, 100-128 °E Forecast range / frequency : 60-km ORSM : 72 hours / 4 times a day (00, 06, 12, 18 UTC) 20-km ORSM : 42 hours / 8 times a day (00, 03, 06, 09, 12, 15, 18 and 21 UTC) Remarks : The ORSM was adapted from the Regional Spectral Model of Japan Meteorological Agency for short-range weather forecasting in Hong Kong.	

Operational Typhoon Track Forecast Methods Used by Typhoon Committee Members

Name of the Member: Republic of Korea

Name of the method: Double Fourier-series BARotropic typhoon model (DBAR)

Description of the method:

Governing equation: Shallow water equations
Resolution (horizontal/vertical): 0.3515625 deg./1 level
Initial field: a global analysis from GDAPS
Frequency of forecast: 4 times a day

Type of output: 6 hourly TC position up to 72 hours at 00/06/12/18UTC

(4) < Double Fourier-series BARotropic typhoon model (DBAR) >

Initial field:

Environmental field from a GDAPS global analysis (3DOI)
Specified vortex based on GFDL-Type Initialization scheme
Height field obtained by solving the balance equation

Operation:

(schedule)

Four times (00, 06, 12 and 18 UTC) a day

(integration time)

72 hour from 00, 06, 12 and 18UTC

Prediction model:

(dynamics)

- shallow water equations

(horizontal resolution)

- grid (lat*lon): 1024*512
- grid space: 0.3515625 degree at both latitude and longitude

(vertical level)

- 1 level

(spectral transform method)

- double Fourier series

Products:

6-hourly TC location (lat./lon.) in the western North Pacific up to 72 hours

Name of the method :

Operational Regional Spectral Model

Description of the method :

Meteorological data assimilated by the analysis scheme of the ORSM are as follows:

(A) From GTS

SYNOP, SHIP	surface data and ship data
TEMP, PILOT	radiosonde and pilot data
AIREP, AMDAR	aircraft data
SATEM	satellite thickness data
TOVS, ATOVS	virtual temperature profiles
SATOB	satellite wind data

(B) From RSMC Data Serving System (DSS) of JMA

GMS digital data - total cloud amount, mean cloud top temperature and its standard deviation for moisture bogus

GMS cloud motion vectors during tropical cyclone situations

(C) From NCEP data server

Daily sea surface temperature analysis at 1-degree resolution

(D) Through regional data exchange

Data from automatic weather stations over the south China coastal region

(E) Local data

Tropical cyclone bogus data during tropical cyclone situations

Automatic weather station data

Wind profiler data

Doppler weather radar data

Three-dimensional multivariate optimal interpolation is performed four times a day based on 00, 06, 12 and 18 UTC data for the 60-km outer domain. For the inner domain, the same objective analysis scheme is performed 8 times a day based on 00, 03, 06, 09, 12, 15, 18, and 21 UTC. All analyses are applied to 36 vertical levels.

The horizontal domains of both inner and outer models compose of 151 x 145 model grids in Mercator projection. The first guess fields of the model analyses are provided by their respective latest forecasts.

Hourly rainfall information derived from real-time calibration of radar reflectivity with rain gauge data as well as from the GMS digital cloud data, are incorporated into the

model through a physical initialization process. In this process, the moisture of the initial field (between the lifting condensation level and the cloud top inferred from the cloud top temperature) at the point where rain is observed is adjusted to allow precipitation process to be switched on. The heating rate of the precipitation process is also adjusted to correspond to the rainfall amount observed. The rainfall information in the hour preceding analysis time is used in the outer model. For the inner model, pre-runs for 3 hours preceding analysis time are performed to incorporate the rainfall information.

Non-linear normal mode initialization is performed before the forecast model is run.

Basic equations	Primitive hydrostatic equations
Vertical	Sigma-P hybrid coordinate, model top at 10 hPa.
Forecast parameters	ln (surface pressure), horizontal wind components, virtual temperature, specific humidity.
Initialization	Non-linear normal mode initialization
Physical processes	
Radiation scheme	Sugi *et al.*(1990)
Short wave	Calculated every hour
Long wave	Calculated every hour
Moisture processes	
Cumulus convection	Arakawa-Schubert (1974)
Mid-level convection	Moist convective adjustment proposed by Benwell and Bushby (1970) and Gadd and Keers (1970)
Large-scale condensation	Included
Grid-scale evaporation and Condensation	Included
Planetary boundary layer	Scheme proposed by Troen and Mahrt (1986) in which non-local specification of turbulent diffusion and counter-gradient transport in unstable boundary layer are considered.
Surface	4-layer soil model
	Daily sea-surface temperature analysis (fixed in forecast)
	Climatological snow and sea ice distribution

	Climatological evaporation rate, roughness length and albedo
Numerical methods	
Horizontal	Double Fourier
Vertical	Finite difference
Time	Euler semi-implicit time integration
Topography	Envelope topography, derived from 30-second latitude/longitude resolution grid point topography data
Horizontal diffusion	Linear, second-order Laplacian
Boundary conditions	For the outer model, 6-hourly boundary data including mean sea level pressure, wind components, temperature and dew point depression at 16 pressure levels (1000, 925, 850, 700, 500, 400, 300, 250, 200, 150, 100, 70, 50, 30, 20, 10 hPa) and the surface, are provided by JMA's GSM. For the inner model, hourly boundary data are provided by the outer 60km model.

RSMC tropical cyclone advisory

WTPQ20 RJTD 150000
RSMC TROPICAL CYCLONE ADVISORY
NAME STS 0320 NEPARTAK (0320)
ANALYSIS
PSTN 150000UTC 12.6N 117.8E FAIR
MOVE WNW 13KT
PRES 980HPA
MXWD 055KT
50KT 40NM
30KT 240NM NORTHEAST 160NM SOUTHEAST
FORECAST
24HF 160000UTC 14.7N 113.7E 110NM 70%
MOVE WNW 11KT
PRES 965HPA
MXWD 070KT
48HF 170000UTC 16.0N 111.0E 170NM 70%
MOVE WNW 07KT
PRES 970HPA
MXWD 065KT
72HF 180000UTC 19.5N 110.0E 250NM 70%
MOVE NNW 09KT
PRES 985HPA
MXWD 050KT =

COLLECTION AND DISTRIBUTION OF INFORMATION RELATED TO TROPICAL CYCLONES

Type of Data	Heading	Receiving station TD	BJ	BB	HH	MM	SL	NN	KK	IV	PP	MC
Enhanced surface observation	SNCI30 BABJ	BJ	O	HH	BJ	TD	TD	BJ	BB			
	SNHK20 VHHH	HH	HH	HH	O		TD	BB	BB			
	SNJP20 RJTD	O	TD		TD		TD					
	SNKO20 RKSL	SL	TD		TD		O					
	SNLA20 VLIV			IV				BB		O		
	SNMS20 WMKK			KK					O			
	SNMU40 VMMC	HH	MC		BJ		TD					O
	SNPH20 RPMM	MM	TD	TD	TD	O	TD		BB			
	SNTH20 VTBB	BB	TD	O	TD		TD	BB				
	SNVS20 VNNN			NN				O				
Enhanced upper-air observation	USCI01 BABJ	BJ	O		BJ	TD	TD	BJ				
	USCI03 BABJ	BJ	O		BJ	TD	TD	BJ				
	USCI05 BABJ	BJ	O		BJ	TD	TD	BJ				
	USCI07 BABJ	BJ	O		BJ	TD	TD	BJ				
	USCI09 BABJ	BJ	O		BJ	TD	TD	BJ				
	UKCI01 BABJ	BJ	O		BJ		TD	BJ				
	ULCI01 BABJ	BJ	O		BJ		TD					
	ULCI03 BABJ	BJ	O		BJ		TD					
	ULCI05 BABJ	BJ	O		BJ		TD					
	ULCI07 BABJ	BJ	O		BJ		TD					
	ULCI09 BABJ	BJ	O		BJ		TD	BJ				
	UECI01 BABJ	BJ	O		BJ		TD					
	USHK01 VHHH	HH	HH	HH	O	TD	TD	BB	BB			
	UKHK01 VHHH	HH	HH	HH	O		TD		BB			
	ULHK0I VHHH	HH	HH	HH	O		TD	BB	BB			
	UEHK01 VHHH	HH	HH	HH	O		TD		BB			
	USJP01 RJTD	O	TD	TD	TD	TD	TD		BB			
	UKJP01 RJTD	O	TD	TD	TD		TD		BB			
	ULJP01 RJTD	O	TD	TD	TD		TD					
	UEJP01 RJTD	O	TD	TD	TD		TD					
	USKO01 RKSL	SL	TD	TD	TD	TD	O		BB			
	UKKO01 RKSL	SL	TD		TD		O					
	ULKO01 RKSL	SL	TD	TD	TD		O		BB			
	UEKO01 RKSL	SL	TD	TD	TD		O		BB			
	USMS01 WMKK	BB	TD	KK	TD	TD	TD		O			
	UKMS01 WMKK	BB	TD	KK	TD	TD	TD		O			
	ULMS01 WMKK	BB	TD	KK	TD	TD	TD		O			
	UEMS01 WMKK	BB	TD	KK	TD	TD	TD		O			
	USPH01 RPMM	MM	TD	TD	TD	O	TD					
	UKPH01 RPMM	MM	TD	TD	TD	O	TD					
	ULPH01 RPMM	MM	TD	TD	TD	O	TD					
	UEPH01 RPMM	MM	TD	TD	TD	O	TD					
(to be continued)	USTH01 VTBB	BB	TD	O	TD	TD	TD					

Type of Data	Heading	Receiving station TD	BJ	BB	HH	MM	SL	NN	KK	IV	PP	MC
Enhanced Upper-air observation	UKTH01 VTBB	BB	TD	O	TD		TD					□@
	ULTH01 VTBB	BB	TD	O			TD					□@
	UETH01 VTBB	BB	TD	O	TD		TD					□@
	USVS01 VNNN	BB	TD	NN	TD	TD	TD	O				□@
	UKVS01 VNNN	BB	TD	NN	TD		TD	O				□@
	□@											□@
	ULVS01 VNNN	BB	TD	NN	TD	TD	TD	O				□@
	UEVS01 VNNN	BB	TD	NN	TD	TD	TD	O	□@	□@	□@	□@
	URPA10 PGTW	*	*TD*	*TD*	*TD*	*TD*	*TD*					
	URPA11 PGTW	*	TD	TD	TD	TD	TD					
	URPA12 PGTW	*	*TD*	*TD*	*TD*	*TD*	*TD*					
	URPA14 PGTW	*	*TD*	*TD*	*TD*	*TD*	*TD*					
	URPN10 PGTW	*	TD	TD	TD	TD	TD					
	UZPA13 PGTW	*	*TD*	*TD*	*TD*	*TD*	*TD*					
	UZPN13 KNHC	*					TD					
	UZPN13 KWBC	*	*TD*				*TD*					
	UZPN13 PGTW	*	*TD*				*TD*					
Enhanced ship observation □@ □@ □@ □@ □@	SNVB20 VTBB			O								□@
	SNVB20 *RJTD*	O	*TD*		*TD*	*TD*	*TD*					□@
	SNVD20 RJTD	O	TD		TD	TD	TD					□@
	SNVE20 RJTD	O	TD		TD	TD	TD					□@
	SNVX20 RJTD	O	TD		TD	TD	TD					□@
	□@											□@
	SNVB21 RJTD	O	TD		TD	TD	TD					□@
	SNVD21 RJTD	O	TD		TD	TD	TD					□@
	SNVE21 RJTD	O	TD		TD	TD	TD					□@
	SNVX21 RJTD	O	TD		TD	TD	TD					□@
	SNVX20 RPMM	MM	TD		TD	O	TD	BB				□@
	□@											□@
	SNVX20 VHHH	HH	HH	HH	O	TD	TD	BB				□@
	SNVX20 VNNN	BB	TD	NN	TD		TD	O	□@	□@	□@	□@
Enhanced radar observation □@ □@ □@ □@ □@ □@ □@	SBCI30 BABJ	BJ	O	HH	TD	TD	TD	BJ	BB			□@
	SCCI30 BABJ		O	HH	BJ				BB			□@
	SBCI60 BCGZ		O	HH				BJ				□@
	SCCI60 BCGZ	HH	O	BJ								□@
	SBHK20 VHHH	HH	HH	HH	O	TD		BB	BB			□@
	□@											□@
	SBJP20 RJTD	O	TD		TD	TD	TD					□@
	SDKO20 RKSL						O					□@
	SDMS20 WMKK	BB	TD	KK	TD							□@
	SDPH20 RPMM	MM	TD	TD	O		TD	BB				□@
	SDTH20 VTBB	*BB*	*TD*	*O*	*TD*							□@
	□@											□@
	SDVS20 VNNN	*BB*	*TD*	*NN*	*TD*	*TD*	□@	*O*	□@	□@	□@	□@
Satellite guidance □@ □@ □@	TPPN10 PGTW	*			TD							□@
	TPPN10 PGUA	*			*TD*							
	TPPA1 RJTY	*	TD	TD	TD	TD						□@
	TPPA1 RODN	*	*TD*	*TD*	*TD*	*TD*						□@
	TCNA20 RJTD	O	TD	TD	TD	TD	TD	BB				□@
	TCNA21 RJTD	*O*	*TD*	*TD*	*TD*	*TD*	*TD*	*BB*	□@	□@	□@	□@

Type of Data	Heading	Receiving station TD	BJ	BB	HH	MM	SL	NN	KK	IV	PP	MC
Tropical cyclone forecast	FXPQ24 RJTD	O	TD	TD	TD	TD	TD	BB	BB			
	FXPQ25 RJTD	O	TD	TD	TD	TD	TD	BB	BB			
	FXPH20 RPMM	MM	TD	TD	TD	O	TD	BB	BB			
	FXPQ29 VTBB			O								
Warning	WDPN31 PGTW	*	TD	TD	TD	TD	TD		BB			
	WDPN32 PGTW	*	TD	TD	TD	TD	TD		BB			
	WHCI28 BCGZ	HH	HH	BJ	BJ			BJ				
	WHCI40 BABJ	BJ	O	HH	BJ			BJ	BB			
	WSPH RPMM	*	TD			O	TD					
	WTMU40 VMMC	BJ	MC									O
	WTPN21 PGTW	*	TD	TD	TD	TD	TD	BB	BB			
	WTPN31 PGTW	*	TD	TD	TD	TD	TD	BB	BB			
	WTPN32 PGTW	*	TD	TD	TD	TD	TD	BB	BB			
	WTPH20 RPMM	MM	TD	TD	TD	O		BB				
	WTPH21 RPMM					O		BB				
	WTPQ20 VHHH	HH	HH	HH	O		TD	BB	BB			
	WTSS20 VHHH	HH	HH	HH	O			BB	BB			
	WTTH20 VTBB	BB	TD	O	TD			BB	BB			
	WTVS20 VNNN							O				
	WTPQ20 RJTD	O	TD	TD	TD	TD	TD	BB	BB			
	WTPQ21 RJTD	O	TD	TD	TD	TD	TD	BB	BB			
	WTPQ22 RJTD	O	TD	TD	TD	TD	TD	BB	BB			
	WTPQ23 RJTD	O	TD	TD	TD	TD	TD	BB	BB			
	WTPQ24 RJTD	O	TD	TD	TD	TD	TD	BB	BB			
	WTPQ25 RJTD	O	TD	TD	TD	TD	TD	BB	BB			
	WTKO20 RKSL	SL	TD		TD		O	O				
Prognostic Reasoning	WTPQ30 RJTD	O	TD	TD	TD	TD	TD	BB	BB			
	WTPQ31 RJTD	O	TD	TD	TD	TD	TD	BB	BB			
	WTPQ32 RJTD	O	TD	TD	TD	TD	TD	BB	BB			
	WTPQ33 RJTD	O	TD	TD	TD	TD	TD	BB	BB			
	WTPQ34 RJTD	O	TD	TD	TD	TD	TD	BB	BB			
	WTPQ35 RJTD	O	TD	TD	TD	TD	TD	BB	BB			
Others Best track	AXPQ20 RJTD	O	TD	TD	TD	TD	TD		BB			

LIST OF DATA ARCHIVED BY RSMC TOKYO - TYPHOON CENTER

(a) Level II-b

Kinds of data: Surface, ship, buoy, upper-air, RADOB, aircraft, ASDAR, advisory warning, SAREP, SATEM, SATOB, TBB grid value and cloud amount (GMS);

Area coverage:

SATEM : 90°E ~ 180°E and 0° ~ 45°N;

SATOB, TBB grid value and cloud amount : area covered by MTSAT.

Other data : within the area of 80°E ~ 160°W and 20°S ~ 60°N (hereafter A-area).

(b) MTSAT cloud pictures

Kinds of data: Imagery and tabular form data (Monthly Report);

Imagery (for DVD-RAM data).

Data form: Monthly Report (T.B.D);

DVD-RAM (specification is given in Appendix 7-A, Annex).

(c) Level III-a

Kinds of data: Grid point data of the objective analysis obtained by the global objective analysis system in RSMC.

Area coverage: Global area covered by 1.25 X 1.25 latitude-longitude grid system.

Time of analysis: 00, 06, 12 and 18 UTC

Element and layer:

Surface: Sea surface pressure (Ps), Temperature (Ts), dew point depression (Ts - Tds), wind (Us, Vs);

Specific pressure levels (1000 - 10 hPa):
Geopotential height (Z), temperature (T), wind (U, V);

Specific pressure levels (1000 - 300 hPa):
Dew point depression (T-Td).

Note: Specifications of the characteristics of the tapes for level II-b are given in Appendix 7-A, Annex.

APPENDIX 7-A, Annex

SPECIFICATION OF MTSAT IMAGER DATA ON DVD-RAM (DRAFT)

IMAGER data of MTSAT-1R are archived on DVD-RAM in a digital form. IMAGER Infrared Dataset contains the data of the infrared (IR1, IR2, IR3, IR4) channels, and IMAGER Visible Dataset contains the data of the visible (VIS) channel. The recording codes and file formats are selected taking into account of the convenience for use in personal computers and workstations. The specifications of the dataset volume are as follows:

Specifications of Dataset Volume

Item	Specification
Archive Medium	DVD-RAM, 4.7GB
Recording format	Universal Disk Format 1.5 (UDF1.5)
Code	ASCII code for character data IEEE754-1985 for float data
File type	Multi-file
Compression	Gzip

1) IMAGER Infrared Dataset

The IMAGER Infrared Dataset contains the HiRID data of IR1, IR2, IR3 and IR4 for all of the IMAGER observations.

Specifications of IMAGER Infrared Dataset

Item	Specification
Channel	IR1, IR2, IR3, IR4
Resolution	The spatial resolution of images at nadir is 5km.
Observations	56 (observations/day)
Image files	56*4 (files/day)
File size	T.B.D

2) IMAGER Visible Dataset

The IMAGER Visible Dataset contains the HiRID data of 30 images a day for the IMAGER Observations.

Specifications of IMAGER Visible Dataset

Item	Specification
Channel	VIS
Resolution	The spatial resolution of images at nadir is 1.5km.
Observations	30(observations/day)
Observation time	F00,F01,F02,F03,F04,F05,F06,F07,F08,F09,F21,F22,F23, S00,S00S,N01,N02,N03,N04,N05,N05S,S06,S06S,N07,N08,N09, N21,N22,N23,N23S.
Image files	30 (files/day)
File size	T.B.D

APPENDIX V

Activities of the RSMC Tokyo - Typhoon Center in 2003

1. Provision of RSMC Products

The RSMC Tokyo - Typhoon Center has been providing the Typhoon Committee Members with various kinds of products on tropical cyclones in the western North Pacific and the South China Sea through the GTS, the AFTN and the JMA radio facsimile broadcast (JMH). The Center extended the forecast period of tropical cyclone intensity from 48 hours to 72 hours reported in the RSMC Tropical Cyclone Advisory (WTPQ20-25 RJTD) on 13 June 2003. Table 1 shows the total numbers of the products issued by the Center in 2003 (as of 31 October 2003).

2. Track Forecast

Operational track forecasts for 19 tropical cyclones which attained TS intensity or higher in 2003 (as of 31 October 2003) were verified against best track data prepared by the Center. Figure 1 shows annual mean errors of 24-hour (from 1982), 48-hour (from 1988) and 72-hour (from 1997) forecasts of center positions. The annual mean position errors for this year are approximately 120 km for 24-hour forecast, 230 km for 48-hour forecast and 380 km for 72-hour forecast. The annual mean position errors for 24- and 48-hour forecast in 2003 are the smallest on record. Presumably this is mainly explained by the improvement of physical processes of Global Spectral Model (GSM) and Typhoon Model (TYM), as well as assimilation of QuikSCAT sea surface wind and direct assimilation of TOVS data into the Global and Typhoon Analyses. Position error statistics of 24-, 48- and 72-hour forecasts for each tropical cyclone are shown in Table 2.

3. Intensity Forecast

In June 2003, the Center extended the forecast period of tropical cyclone intensity from 48 hours to 72 hours based on the improvement of its numerical prediction models. Table 3 gives root mean square errors (RMSEs) of 24-, 48- and 72-hour intensity forecasts for each tropical cyclone in 2003 (as of 31 October 2003). The annual mean RMSEs of central pressure forecasts were 11.4 hPa, 15.9 hPa, and 19.8 hPa for 24-, 48- and 72-hours, respectively, while those of maximum wind speed forecasts for 24 hours were 5.2 m/s, 6.8 m/s and 8.3 m/s, respectively. The overall performance of intensity forecasts in 2003 was almost same as that in 2002

4. RSMC Data Serving System

JMA operates the RSMC Data Serving System (RSMC-DSS) that allows TC Members to retrieve numerical weather prediction products such as Grid Point Values (GPVs) and observational data through the Internet. On 17 July 2003, JMA enhanced the service by addition of high-density wave model products and by increase of GSM products for Asia region. RSMC-DSS is serving nine user countries/territories through the Internet as of 31 October 2003. The products and data being provided through the system are listed in Table 4.

5. Publication

The Center published:

1) "Technical Review (No.6)" in March 2003 that contains a paper on the development of guidance for forecast of maximum precipitation amount; and

2) "Annual Report on Activities of the RSMC Tokyo-Typhoon Center in 2002" in

November 2003. (will be soon available on the web page of JMA/RSMC Tokyo - Typhoon Center)

6. Training

<International seminar>

The "Third International Seminar on MTSAT/LRIT Data Utilization" was held from 12-14 February 2003 in Tokyo with participation of 8 experts from 8 countries; Bangladesh, Indonesia, Malaysia, Marshal Islands, Mongolia, Myanmar, Nepal, and Sri Lanka. The seminar focused on the application of SATAID, a computer aided learning software developed by JMA, for the maximum utilization of data from MTSAT-1R, the successor of GMS-5, through LRIT (Low Rate Information Transmission).

<Attachment to RSMC>

Two forecasters from China and Thailand stayed at the Center from 23 July to 1 August for the on-the-job training for typhoon operations. The training was carried out with the support of WMO in response to the proposal presented at the thirty-third session of the Typhoon Committee. During the two weeks the two forecasters were instructed to try analyzing and making forecasts for two typhoons TY LINGLING (0123) and TY HIGOS (0221) in reference to the operational procedures of the Center.

< Group Training Course in Meteorology>

JMA renewed the Group Training Course in Meteorology in 2003. The primary purpose of the renewal was to place special emphasis upon the subjects which are increasingly essential to developing countries for their operational forecasting. The new Training Course focuses on "Utilization of satellite data including nephanalysis", "Application of numerical predictions", and "Application of climate information". In September, the Training Course for 2003 started with 10 participants from 10 countries, including Cambodia, Laos and the Philippines.

<Typhoon Roving Seminar>

Typhoon Roving Seminar was held in Seoul, Republic of Korea, from 20 to 21 October 2003. The seminar was carried out with the support of WMO in response to the proposal approved at the thirty-fifth session of the Typhoon Committee, and the first one of three seminars being planned in 2003. Head of National Typhoon Center visited Seoul and gave lectures on the overview of the activities at RSMC Tokyo, as well as the typhoon analysis and forecast system at RSMC Tokyo, Numerical Weather Prediction (NWP) Models of JMA, bogusing technique for TCs, ensemble forecast of typhoon tracks, and Japanese Reanalysis Project (JRA-25).

7. Implementation Plan

Table 5 shows the implementation plan of the RSMC Tokyo-Typhoon Center for the period from 2003 to 2007. Note that transition from backup operation to full operation of MTSAT-1R as well as from WEFAX/HiRID to LRIT/HRIT for satellite imagery dissemination is likely to be postponed. JMA will duly issue announcement, at the earliest possible date, of its timing.

Table 1 Monthly and annual total numbers of products issued by the RSMC Tokyo - Typhoon Center in 2003 (as of 31 October 2003)

Product	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
TCNA20	9	0	0	57	48	37	49	73	73	77			423
TCNA21	16	0	0	60	46	40	60	84	98	81			485
WTPQ20-25	33	0	0	126	105	81	119	170	195	166			995
WTPQ30-35	9	0	0	31	24	21	30	43	46	43			247
FXPQ20-25	23	0	0	92	77	61	89	124	143	122			731
FKPQ30-35	16	0	0	65	53	41	61	84	96	82			498
AXPQ20	3	1	0	0	1	1	3	3	3	2			17
AUXT85 AUXT20	62	56	62	60	62	60	62	62	60	62			608
FUXT852 FUXT854	62	56	62	60	62	60	62	62	60	62			608
FUXT202 FUXT204	62	56	62	60	62	60	62	62	60	62			608

Notes:

- via the GTS or the AFTN -

SAREP	TCNA20/21 RJTD
RSMC Tropical Cyclone Advisory	WTPQ20-25 RJTD
RSMC Prognostic Reasoning	WTPQ30-35 RJTD
RSMC Guidance for Forecast	FXPQ20-25 RJTD
Tropical Cyclone Advisory for SIGMET	FKPQ30-35 RJTD
RSMC Tropical Cyclone Best Track	AXPQ20 RJTD

- via the JMH Meteorological Radio Facsimile -

Analysis of 850 and 200 hPa Streamline	AUXT85/AUXT20
Prognosis of 850 hPa Streamline	FUXT852/FUXT854
Prognosis of 200 hPa Streamline	FUXT202/FUXT204

Table 3 Root Mean Square Errors (RMSEs) of 24-, 48- and 72-hour intensity forecasts for each tropical cyclone in 2003 (as of 31 October)

Tropical Cyclone			RMSE of 24-hour Forecast			RMSE of 48-hour Forecast			RMSE of 72-hour Forecast		
			Central pressure (hPa)	Maximum Winds (m/s)	Number	Central pressure (hPa)	Maximum Winds (m/s)	Number	Central pressure (hPa)	Maximum Winds (m/s)	Number
TS	0301	YANYAN	4.0	2.6	5	8.0	5.1	1	.	.	.
TY	0302	KUJIRA	10.2	4.6	53	15.4	5.8	46	.	.	.
TY	0303	CHAN-HOM	11.6	4.8	23	14.3	6.2	19	.	.	.
STS	0304	LINFA	5.2	4.6	16	5.2	4.2	12	.	.	.
STS	0305	NANGKA	10.9	6.6	6	6.5	5.5	2	.	.	.
TY	0306	SOUDELOR	8.5	4.1	22	10.8	5.3	17	16.0	7.5	13
TY	0307	IMBUDO	11.5	4.5	27	14.1	5.6	23	15.5	6.4	19
STS	0308	KONI	6.4	4.0	14	10.5	6.0	10	9.0	3.6	6
TS	0309	MORAKOT	5.6	4.1	5	6.0	5.1	1	.	.	0
TY	0310	ETAU	9.9	5.7	22	10.4	6.3	18	7.8	5.2	14
TS	0311	VAMCO	.	.	0	.	.	0	.	.	0
TY	0312	KROVANH	10.2	5.8	19	11.6	8.4	15	5.2	2.7	11
TY	0313	DUJUAN	9.2	5.1	13	18.0	7.7	9	17.7	8.3	5
TY	0314	MAEMI	15.4	6.3	27	24.6	9.3	23	30.1	10.9	19
TY	0315	CHOI-WAN	10.9	4.1	16	8.8	2.7	12	12.6	3.7	8
TY	0316	KOPPU	7.2	3.3	10	7.9	3.0	6	11.2	3.6	2
TY	0317	KETSANA	9.9	4.4	25	14.1	6.1	21	11.5	4.4	16
TY	0318	PARMA	18.4	7.0	38	23.8	9.1	34	28.4	11.9	30
STS	0319	MELOR	8.9	5.6	13	13.6	8.9	9	19.6	13.3	5
Mean(Total)			11.4	5.2	354	15.9	6.8	278	19.8	8.3	148

Table 2 Mean Position Errors of 24-, 48- and 72-hour Operational Forecasts in 2003 (as of 31 October)

Tropical Cyclone			24-hour Forecast				48-hour Forecast				72-hour Forecast			
			Mean (km)	S.D. (km)	Num.	EO/EP (%)	Mean (km)	S.D. (km)	Num.	EO/EP (%)	Mean (km)	S.D. (km)	Num.	EO/EP (%)
TS	0301	YANYAN	309	88	5	125	349	.	1	.	.	.	0	.
TY	0302	KUJIRA	97	51	53	62	142	54	46	48	215	88	45	47
TY	0303	CHAN-HOM	152	52	23	77	299	80	19	63	471	148	15	59
STS	0304	LINFA	192	122	16	55	350	163	12	56	656	175	8	49
STS	0305	NANGKA	112	82	6	22	347	243	2	.	.	.	0	.
TY	0306	SOUDELOR	122	78	22	42	232	131	17	38	362	223	13	38
TY	0307	IMBUDO	127	66	27	83	265	117	23	86	431	126	19	79
STS	0308	KONI	126	74	14	67	230	80	10	65	204	111	6	41
TS	0309	MORAKOT	166	22	5	115	310	.	1	.	.	.	0	.
TY	0310	ETAU	104	65	22	39	208	83	18	28	292	133	14	22
TS	0311	VAMCO	.	.	0	.	.	.	0	.	.	.	0	.
TY	0312	KROVANH	128	43	19	118	221	67	15	65	229	118	11	32
TY	0313	DUJUAN	109	82	13	44	306	179	9	40	665	288	5	35
TY	0314	MAEMI	73	37	27	26	161	84	23	22	288	177	19	26
TY	0315	CHOI-WAN	115	81	16	33	327	168	12	33	781	311	8	43
TY	0316	KOPPU	117	46	10	59	128	147	6	79	308	114	2	0
TY	0317	KETSANA	93	46	25	44	188	70	21	51	427	204	16	69
TY	0318	PARMA	126	69	38	27	260	149	34	20	463	314	30	22
STS	0319	MELOR	157	103	13	85	401	212	9	81	628	251	5	67
Mean(Total)			121	75	354	49	233	136	278	38	381	246	216	37

EO/EP indicates the ratio of EO (mean position error of operational forecasts) to EP (mean position error of forecasts by the persistency method).

Table 4 List of GPV products and data on the RSMC Data Serving System

Area	20S-60N, 80E-160W	20S-60N, 60E-160W
Resolution	2.5×2.5 degrees	1.25×1.25 degrees
Levels and elements	Surface (P,U,V,T,TTd,R) 850hPa (Z,U,V,T,TTd,ω) 700hPa (Z,U,V,T,TTd,ω) 500hPa (Z,U,V,T,TTd,ζ) 300hPa (Z,U,V,T) 250hPa (Z,U,V,T) 200hPa (Z,U,V,T) 150hPa (Z,U,V,T) 100hPa (Z,U,V,T)	Surface (P,U,V,T,TTd,R)** 1000hPa (Z,U,V,T,TTd) 925hPa (Z,U,V,T,TTd,ω) 850hPa (Z*,U*,V*,T*,TTd*,ω,ψ,χ) 700hPa (Z*,U*,V*,T*,TTd*,ω) 500hPa (Z*,U*,V*,T*,TTd*,ζ) 400hPa (Z,U,V,T,TTd) 300hPa (Z,U,V,T,TTd) 250hPa (Z,U,V,T) 200hPa (Z*,U*,V*,T*,ψ,χ) 150hPa (Z,U,V,T) 100hPa (Z,U,V,T) 70hPa (Z,U,V,T) 50hPa (Z,U,V,T) 30hPa (Z,U,V,T) 20hPa (Z,U,V,T) 10hPa (Z,U,V,T)
Forecast hours	(00 and 12 UTC) 0, 6, 12, 18, 24, 30, 36, 48, 60 and 72 hours	(00 and 12 UTC) 0 – 84 every 6 hours In addition (12 UTC), * 96, 120, 144, 168 and 192 hours ** 90 – 192 every 6 hours
Frequency (initial times)	Twice a day (00 and 12 UTC)	Twice a day (00 and 12 UTC)

Area	Whole globe	Whole globe
Resolution	2.5×2.5 degrees	1.25×1.25 degrees

Levels and elements	Surface(P,R,U,V,T) 1000hPa(Z) 850hPa(Z,U,V,T,TTd) 700hPa(Z,U,V,T,TTd) 500hPa(Z,U,V,T) 300hPa(Z,U,V,T) 250hPa(Z,U,V,T)* 200hPa(Z,U,V,T) 100hPa(Z,U,V,T)* 70hPa(Z,U,V,T)* 50hPa(Z,U,V,T)* 30hPa(Z,U,V,T)*	Surface (P,U,V,T,TTd*) 1000hPa (Z,U,V,T,TTd*) 850hPa (Z,U,V,T,TTd) 700hPa (Z,U,V,T,TTd) 500hPa (Z,U,V,T,TTd*) 400hPa (Z,U,V,T,TTd*) 300hPa (Z,U,V,T,TTd*) 250hPa (Z,U,V,T) 200hPa (Z,U,V,T) 150hPa (Z,U,V,T) 100hPa (Z,U,V,T) 70hPa (Z,U,V,T) 50hPa (Z,U,V,T) 30hPa (Z,U,V,T) 20hPa (Z,U,V,T) 10hPa (Z,U,V,T)	Surface (P,U,V,T,RH,R,Cl) 1000hPa (Z,U,V,T,RH, ω) 925hPa (Z,U,V,T,RH, ω) 850hPa (Z,U,V,T,RH, ω,ψ,χ) 700hPa (Z,U,V,T, RH, ω) 600hPa (Z,U,V,T, RH, ω) 500hPa (Z,U,V,T, RH, ω, ζ) 400hPa (Z,U,V,T, RH, ω) 300hPa (Z,U,V,T, RH, ω) 250hPa (Z,U,V,T) 200hPa (Z,U,V,T, ψ,χ) 150hPa (Z,U,V,T) 100hPa (Z,U,V,T) 70hPa (Z,U,V,T) 50hPa (Z,U,V,T) 30hPa (Z,U,V,T) 20hPa (Z,U,V,T) 10hPa (Z,U,V,T)
Forecast hours	(00 and 12 UTC) 24, 48 and 72 hours In addition (12 UTC), 96 – 192 every 24 hours * 96 and 120 only	(00 and 12 UTC) 0 hours * 00UTC only	(00 and 12 UTC) 0 – 84 every 6 hours In addition (12 UTC), 96 – 192 every 12 hours
Frequency (initial times)	twice a day (00 and 12 UTC)		twice a day (00 and 12 UTC)

Area	Whole globe
Resolution	2.5×2.5 degrees
Levels and elements	Surface (P) 1000hPa(Z) 850hPa (T,U,V) 500hPa (Z) 250hPa (U,V) *Above GPVs are ensemble mean and standard deviation of ensemble forecast memers.
Forecast hours	Every 12 hours from 0 192 hours
Frequency (initial times)	Once a day (12 UTC)

Notes: Cl: cloud cover (total) P: pressure reduced to MSL R: total precipitation
RH: relative humidity T: temperature TTd: dew point depression
U: u-component of wind V: v-component of wind Z: geopotential height

ζ: relative vorticity χ: velocity potential ψ: stream function
ω: vertical velocity

Products/ Data	GMS data	Typhoon Information	Global Wave Model (GRIB)	Observational data
Contents	(a) Digital data (GRIB) • Cloud amount • Convective cloud amount • Equivalent blackbody temperature (b) Satellite-derived high density cloud motion vectors (BUFR)	Tropical cyclone related information (BUFR) • Position, etc.	• Significant wave height • Prevailing wave period • Prevailing wave direction Forecast hours: 0, 6, 12, 18, 24, 30, 36, 42, 48, 54, 60, 72, 78, 84 (00 and 12 UTC); 96, 108, 120, 132, 144, 156, 168 ,180 and 192 hours (12 UTC)	(a) Surface data (SYNOP, SHIP) (b) Upper-air data (TEMP, parts A-D) (PILOT, parts A-D)
Frequency (initial times)	(a) 4 times a day (00, 06, 12 and 18 UTC) (b) Once a day (04 UTC)	4 times a day (00, 06, 12 and 18 UTC)	Twice a day (00 and 12 UTC)	(a) Mainly 4 times a day (b) Mainly 2 times a day

Table 5 Implementation Plan of the RSMC Tokyo-Typhoon Center (2003-2007)

PRODUCT	2003	2004	2005	2006	2007	REMARKS
Satellite Observation						
GMS S-VISSR*						24 times/day (full-disk)
MTSAT HiRID						All observed cloud images (full or half-disk)
MTSAT HRIT						All observed cloud images (full or half-disk)
GMS/MTSAT WEFAX*						8 times/day (4-sector), 24 times/day (Image H), 20 times/day (Image I or J)
MTSAT LRIT						24 times/day (IR full-disk) 24 times/day (VIS,IR1,IR3,IR4 East Asia)
Cloud motion wind						4 times/day
Analysis						
SAREP (for tropical cyclones)						4-8 times/day Dvorak intensity (estimation included)
Report of typhoon analysis**						8 times/day
Sea Surface Temperature						10-day mean and its anomaly
Objective analysis						
pressure pattern, etc						FAX
stream lines						FAX***
Cloud distribution						GPV***
Long-wave radiation						GPV***
Forecast						
RSMC Prognostic Reasoning						2 times/day
RSMC Guidance for Forecast						TYM up to 84 hours 4 times/day GSM up to 90 hours 2 times/day
NWP products						
pressure pattern, etc						FAX, GPV (GSM)
stream line						FAX (GSM: 00,24,48 and 72 hrs)
Numerical TC Prediction Web Site						
tracks and prediction fields, etc						mostly updated 2 times/day up to 84 hrs
RSMC Tropical Cyclone Advisory**						4 times/day up to 72 hrs 8 times/day up to 24 hrs
Others						
RSMC Tropical Cyclone Best Track						GTS
Annual Report						
Technical Review						(as necessary)

SUPPORTING ACTIVITY	2003	2004	2005	2006	2007	REMARKS
Data archive						
Monitoring of data exchange						
Dissemination of products						RSMC Data Serving System

* WEFAX from GOES-9 GVAR is disseminated via GMS-5 and S-VISSR from GOES-9 GVAR is disseminated to registered NMHSs through the Internet in place of S-VISSR via GMS-5.
** "RSMC Tropical Cyclone Advisory" involves "Report of typhoon analysis"
*** Some of these products will be disseminated within the capacity of traffic of the GTS and JMH.

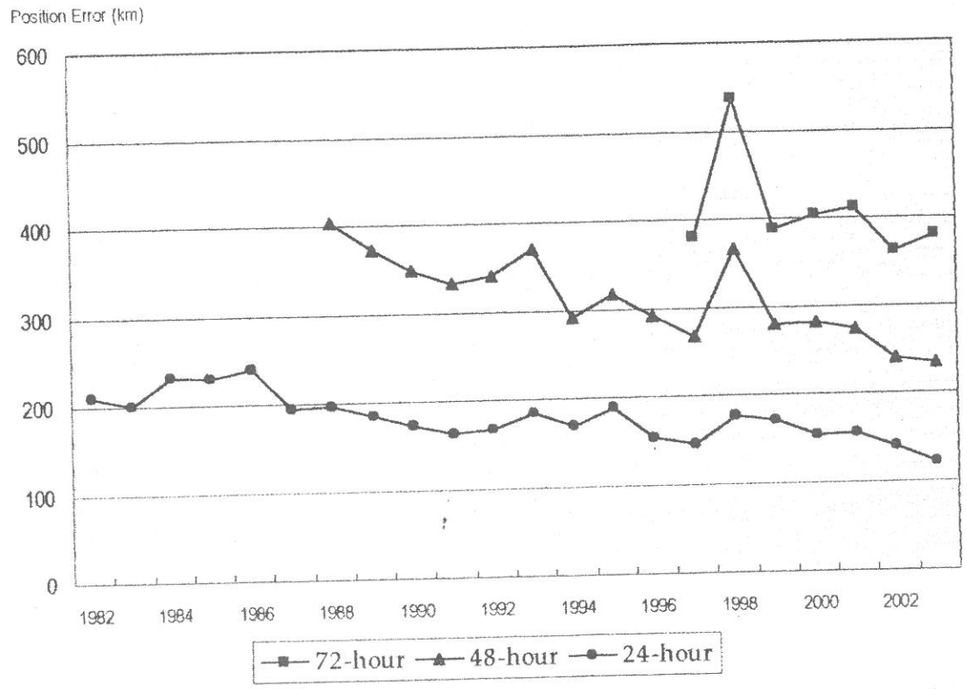


Figure 1 Annual means of position errors of 24-, 48- and 72-hour operational track forecasts

APPENDIX VI

REPORT OF THE PRE-SESSION OF HYDROLOGISTS

Nakhoda 3 Room, Armada Hotel, 14 December 2003

1. The Meeting was attended by 29 participants from China; Japan; Malaysia; Philippines; Republic of Korea; Thailand; USA; Viet Nam; ADPC, ESCAP; WMO and TCS, as listed in Annex 1. The Meeting elected Mr Kenzo Hiroki and Mr Liu Jin-Ping, Chairman and Vice Chairman of the Pre-Session.

2. The Meeting considered the Report of the Workshop on Implementation of the Hyrdological Component of the New Regional Cooperation Programme Implementation Plan of the Typhoon Committee, which was jointly organized by the Ministry of Water Resources of China, the Ministry of Land, Infrastructure and Transport (MLIT)of Japan, Infrastructure Development Institute (IDI)-Japan, the Japan International Cooperation Agency (JICA), United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP) and the Typhoon Committee Secretariat (TCS) in cooperation with the World Meteorological Organization (WMO) in Beijing from 22 to 26 September 2003. The Workshop was attended by 95 participants from 10 Typhoon Committee Members, namely Cambodia, China, People's Democratic Republic of Korea, Japan, Lao People's Democratic Republic, Malaysia, Philippines, Republic of Korea, Thailand, USA and Viet Nam. It was also attended by the Chairman of the Interim Working Group of the RCPIP, 7 experts from the Ministry of Land, Infrastructure and Transport of Japan, Japan International Cooperation Agency (JICA), Infrastructure Development Institute (IDI) of Japan, Foundation of River and Basin Integrated Communications, Japan (FRICS), Public Works Research Institute, Sabo Technical Center, JICA Caribbean Disaster Management Project, UNESCAP and TCS. As decided upon at the 35th TC Session, the participation of hydrologists of the Typhoon Committee was sponsored by the Typhoon Committee Trust Fund (TCTF) while the participation of the DPP experts of the Typhoon Committee and international experts were sponsored by the IDI- Japan.

3. The Meeting noted the continuing increase in the number of participants from the TC Members in the Workshop of this year as compared with those in the previous years and the participants included TC Hydrologists as well as DPP experts from TC members. It took note of the fact that the allocation from the TC Trust Fund of US$17,500 for the Workshop had generated over US$60,000 in kind contribution from various parties, especially from Ministry of Water Resources of China, MLIT and JICA and the total expenditures were estimated at about US$80,000.

4. With respect to the findings and recommendations of the Working Group on Hydrology, the Meeting endorsed the following recommendations and requested the Pre-session Chairman to submit them to the Committee for approval:

- To re-establish the Typhoon Committee Working Group on Hydrology (TC-WGH) with Mr Kenzo Hiroki, focal point for Japan on Hydrology and former Vice Secretary General of the Third World Water Forum Secretariat as the TC-WGH Chairman and Mr Liu Jin-ping of China as the Vice Chairman.

- In discussing the results of the survey conducted by ESCAP on the status of readiness of the Members in the implementation of the Hydrology and DPP Components, the Working Group was pleased to note some of the RCPIP activities could be effectively integrated into the socio-economic development of some Members. It however felt the strong need to assist several other Members to effectively integrate the visions and broad goals of the RCPIP into the socio-economic development

processes of the respective Members. The TC-WGH therefore requested IWG Chairman on RCPIP in cooperation with ESCAP, WMO and TCS to organize training seminars on application of strategic planning and management (SPM) approaches to hydrology and DPP. As part of the efforts on training on application of SPM, the TC-WGH requested that regular monitoring be made and roadmaps be drawn up for all priority activities.

- The TC-WGH and DPP TC-experts were pleased to note important progress made in the project on flood hazard mapping and the effective interaction during the discussions on this subject of all participants, which led to the establishment and adoption of the common roadmap on flood hazard mapping of TC, it was decided to recommend to the Typhoon Committee to adopt the following theme for the next Workshop of TC Hydrologists: "Living with Risk: Dealing with Typhoon-related Disasters as part of Integrated Water Resources Management". This theme was proposed with the expectation to enhance the visibility of the Typhoon Committee in the implementation of the Johannesburg Plan of Action of the World Summit on Sustainable Development in September 2002, especially to assist the TC Members to contribute to the preparation for the 13th Session of the Commission on Sustainable Development, which focused mainly on water issues. The TC-WGH expressed its appreciation to the Ministry of Construction and Transport of Republic of Korea for its kind agreement to host the Workshop pending approval of the Typhoon Committee of this proposal. The DPP experts and the TC-WGH recognized the important benefits of the interaction between the hydrologists and DPP experts at this joint session and strongly recommended to the Typhoon Committee to assist in mobilizing financial resources to maintain this interaction at the next workshop. The Meeting also requested the Committee to allocate a total amount of US$17,500 for this purpose in 2004, as shown in Annex 2. They also called on MLIT and IDI to continue their assistance in this respect.

- The TC-WGH expressed its satisfaction with the recognition of the work of the Typhoon Committee in the field of water-related disasters by several international organizations and the potential benefits in participating in the various international forums on this subject, including the Third World Water Forum in Kyoto, Japan in March 2003 and the Early Warning Conference – II in Bonn in October 2003. The TC-WGH welcomed the opportunity to collaborate with the Caribbean Disaster Emergency Response Agency (CDERA) to exchange its experiences on the "Pilot Project on the Preparation of Inundation and Water-related Hazard Maps". In line with enhanced visibility of the Committee's activities and opportunities to synergize efforts, the TC-WGH strongly recommended to the Committee to take an active part in the International Flood Network (IFNet) and its first project on Global Flood Alert System (GFAS). Similarly, in recognizing the importance of the opportunities provided by the Mid-decade review of the implementation of the Yokohama Action Plan to be held in Kobe in 2005 and the Fourth World Water Forum in 2006 in Mexico to the work of the Committee, the TC-WGH recommended that the Committee authorize the TC-WGH to make necessary preparation for possible active participation in these forums. In this connection, TC-WGH recommended to continue its cooperation with its sister organization of WMO/ESCAP Panel on Tropical Cyclones.

- The TC-WGH agreed in principle to the reporting format proposed by the IWG on RCPIP and requested that an overall assessment of the hydrological conditions be added. In addition, they also requested the IWG on RCPIP to elaborate details for each item of the format to ensure emphasis be made on the regional benefits of cooperation through the Committee.

- The Workshop took note of the important differences in the status of the pilot projects among the Members and especially in the approaches adopted by several countries. The participants also expressed their appreciation to the valuable advice and clarification provided by the Japanese expert team. The Workshop emphasized the importance in closing the gaps in the progress made among the Members so as to ensure effective transfer of know-how at the next workshop on evacuation planning. Mr. Ryosuke Kikuchi of IDI also informed the participants of the importance of mapping out a strategy to carry on the hazard mapping in the respective Members so as to ensure effective contribution of the project to the socio-economic development process of the Members beyond the completion of the current phase of the project in the year 2006.

- From the presentation of all country studies, the workshop recognized that all participating TC Members need to develop systems for forecasting and warning of sediment disasters. The participants also recognized the importance to close the gap in preparation of their respective pilot projects to enable them to benefit from the next steps of training in the project. In this connection, the participants appreciated very much latest development in Japan on this subject and the important achievements in the case studies in China and Malaysia together with the recent developments presented by the representative of the China Meteorological Administration, the participants recognized the high potential in exchange of experiences and the important benefits in synthesizing achievements in Japan.

  (a) To request the Japanese expert team to consolidate and analyze the experiences in developing of the critical line, warning and evacuation lines in Japan. Tentatively, it was hoped that initial results would be made available to all TC Members in April 2004.
  (b) All interested Members are requested to provide their tentative road maps to develop the critical lines together with available information to the Japanese expert team with copy to TCS and ESCAP before the end of 2003 indicating expected dates for establishment of the critical line for the pilot project. In order to facilitate planning of the expert team, it is preferable to have the critical lines developed before 30 June 2004.
  (c) Various TC Members expressed their requests for the Japanese expert team to visit their countries and pilot project areas so as to help expedite the development of the critical lines as well as to improve the initial findings.
  (d) The Workshop requested ESCAP and TCS to assist in submitting an official request to JICA or related Japanese authorities for necessary support.

- In discussing the other priority projects, the participants recommended the following actions be taken to ensure active participation of all Members and effectiveness of cooperation:

  (a) Detailed road maps be prepared by the respective project team leaders in cooperation with Chairperson and Vice Chairperson of TC-WGH, ESCAP, TCS and IDI. Tentative road maps, such as the one proposed for the "On the Job Training on Flood Forecasting between TC Members" were discussed and subsequently circulated to all participants. The Members were therefore requested to prepare their respective national road maps to ensure maximum interaction.
  (b) Several Members confirmed their willingness to participate in the project and would provide additional information to assist the project team leaders to improve the final products and enhance cooperation. The Committee may wish to request the Members to reconfirm their interest in these projects.

5. In order to maintain the momentum of cooperation under the hydrological component of the Committee, the Meeting decided to recommend to the Typhoon Committee plenary session to re-establish the TC Working Group on Hydrology. The Meeting noted with appreciation the contribution and dedication of Mr Junji Miwa as the Chairman of the Working Group during the last year, who would not be able to continue to serve as the Chairman of the Working Group due to other commitments. The Meeting elected Mr Kenzo Hiroki of Japan and Mr Liu Jinping of China as Chairman and Vice Chairman for 2004 respectively and recommended them to the Committee.

6. The Meeting noted with appreciation the active participation of several TC Meteorologists and DPP experts in the discussion at the pre-session. As pointed by the Chairman of the Interim Working Group on RCPIP, the Meeting recognized the importance of interaction among the three components of the Committee: meteorology, hydrology and DPP. It agreed that every effort should be made to involve TC meteorologists in the TC-WGH Workshop in 2004. The Meeting also agreed to request the Committee to establish regular mechanisms to encourage this kind of interaction. Three options were identified for the Committee to consider: (1) a full day be devoted as pre-session for the three components with three parallel sessions in the morning and a plenary in the afternoon, (2) the special lecture session be composed of two parts, part 1 devoted to interaction and part 2 on free subjects, and (3) a special item in the agenda for national reports on interaction between the components.

7. The Meeting expressed its appreciation to the Republic of Korea for its agreement to lead the project on "Development of guidelines for the dam operation in relation to flood forecasting" and requested interested Members to inform the focal point for Republic of Korea for further arrangements. It was planned that a brief report on the experiences of the Korea Water Resources Corporation (KOWACO) on this subject would be provided to the participants of 2004 TC-WGH Workshop.

8. The Meeting noted the opportunities provided by the 2004 Workshop to enhance visibility of the Committee and its WGH at the Kobe World Conference on Natural Disaster Reduction and called on interested Members and cooperating organizations and countries to increase their assistance to the TC-WGH in order to enable it to effectively cope with the increase of activities to meet the needs of the Members. In this connection, the Meeting expressed its appreciation to the MLIT and IDI of Japan and MOCT of Republic of Korea for their earmarked support to enable more TC experts to take part in the 2004 Workshop. The Meeting requested the TC-WGH Chair to establish a small Task Force composed of its Chair, Vice Chair and team leaders of all the projects to discuss detailed arrangements to ensure effectiveness of the 2004 Workshop.

9. The Meeting also called on ADPC and ADRC to continue their cooperation with the Committee and to take part in the work of TC-WGH.

ANNEX I

The 36th Session of ESCAP/WMO Typhoon Committee Kuala Lumpur, Malaysia

Pre-session for Hydrologists
14 December 2003

List of Participants

1.	Kenzo Hiroki	NILIM, MLII
2.	Liu Jinping	BOH, MWR, CHINA
3.	Chong Sun Fatt	DID, Malaysia
4.	Ti Le Huu	UNESCAP
5.	Ryosuke Kikuchi	Infrastructure Development Institute
6.	Bui Van Duc	VN Hydromet Service
7.	Duong Lien Chau	NHMS, Viet Nam
8.	Nguyen Xuan Dieu	CCFSC Viet Nam
9.	Hong, Il-Pyo	KICT, R.O.K
10.	Heo, Cheol	MOCT, R.O.K
11.	Kim, Ki-Suk	KOWACO, KOREA
12.	Kim, Sang Ug	KICT, R.O.K
13.	Nobutomo Osanai	PWRI JAPAN
14.	Katsuhiro ABE	WMO
15.	Imelda Abarquez	ADPC, Thailand
16.	Somsri Huntrakul	TMD, Thailand
17.	Norlida Mohd Dom	DID Malaysia
18.	Sampan Thaikruawan	TMD, Thailand
19.	Azmi Md. Jafri	DID, Malaysia
20.	Low Koon Sing	DID, Malaysia
21.	James C. Weyman	USA / RSMC Honolulu
22.	Dusadee Sarigabutr	Thai Meteorological Department
23.	Akiko Kondo	2nd Research Department
24.	Toshihiro Kikui	Sabo Department
25.	Park Jae-Gyu	Gyeong IN Canal Division
26.	*Masayuki Miyase*	Sabo Technical Center
27.	Nobuaki Sakai	Sabo Technical Center
28.	*Noata Mizuno*	IDI-JAPAN
29.	M.F. Rellin, Jr.	TCS, PAGASA, PHIL.

APPENDIX VII

SUMMARY OF THE REPORTS OF THE TYPHOON COMMITTEE MEMBERS, ESCAP AND WMO ON THEIR ACTIVITIES RELATED TO THE HYDROLOGICAL COMPONENT

The delegate from **China** reported that in the flood season of 2003, large floods occurred in Huaihe river, Weihe river, which is the biggest tributary of Yellow rive, and Hanjiang River, which is the second large tributary of Yangtze River. Flood caused severe losses. During Huaihe river flood, 9 detention areas and some diversion waterways were put into use. Affected population amounted to 37 millions, inundated farmland reached 3.8 million hectares, and the total direct losses of people's property and gross national product summed to 28.5 billions RMB Yuan. During the floods, hydrological department in china provided various kinds of flood forecasting and warning to meet the decision-making's requirements: (1) stream flood prediction combining with QPF from CMA for flood control preparedness; (2) updating flood forecasting 6-hourly for flood fighting activities and flood water dispatching; (3) recession flow prediction for flood disaster rehabilitation.

In 2003, China continuously focused on improving hydrological instrument and equipment. To facilitate the standardization of hydrological instruments, the standard for construction of hydrological telemetry and telecommunication equipment and instrument were approved. Up to now, 682 telemetric systems have been put into operation. The data transmission system has been promoting. A kind of real time data reporting machine that is cheap and very suitable for rural area was spread in the country. The State Flood Control Commanding System that is invested more than 1.5 billion RMB Yuan is under construction. In this flood season, more than 60 percent of real time hydrological data from all over the country can be transmitted to central government within 30 minutes.

China continued its capacity building in hydrology. Several hydrological operational systems, such as the National Flood Forecasting System (version 2), Flood Decision-Making Supporting System, Long Distance Flood Consulting System, Flood Information Public Issuing System and Flood-oriented Data Basin, have been perfected based on WebGIS and were put into operation.

China hydrology continued to take part in the international and regional activities, especially the activities of hydrological component of RCPIP of Typhoon Committee. For example, China held successfully the Workshop on Hydrology Component of New RCPIP of TC in September 2003, and made satisfactory achievements on flood hazard mapping, and flash flood and sediment forecasting and warning projects. Two projects led by China, "Extension of flood forecasting systems to selected river basin" and "Evaluation and improvement of hydrological instruments and telecommunication equipment", are starting up. In the flood season this year, China enhanced hydrological data sharing and exchange with neighboring countries Viet Nam, India, Kazakhstan, Russia, DPR of Korea and with the Mekong River Committee.

The delegate from **Hong Kong, China**, reported that the flooding situation in the low-lying areas of the New Territories has improved significantly after the completion of major river-training works and flood-control projects. A stormwater diversion scheme was underway.

Over 30 new hydrological gauging stations and video monitoring systems were being installed throughout the territory for real-time flood monitoring and collecting long-term data records for computer modelling of the drainage system. The development of a "Supervisory,

Control And Data Acquisition" (SCADA) system continued. The General Packet Radio Services (GPRS) mobile network and solar panels were being used in some out-stations.

A list of flooding blackspots was also compiled by the Drainage Service Department (DSD) to facilitate the deployment of resources to carry out immediate relief measures during adverse weather situations. DSD has also set up a 24-hour hotline to facilitate prompt response to flooding complaints. When situation warrants, an Emergency Control Centre overseen by senior professionals would be activated to coordinate emergency response.

Computer hydrological and hydraulic models for the drainage systems in Hong Kong have been developed to provide quantitative information on the risk of flooding, impacts of development and the performance of various flood loss mitigation options.

The delegate from **Japan** reported that all Class A river systems (109 river systems) involving 193 streams had the forecasting system in operation as of the end of April, 2003. A total of 253municipalities had a flood hazard map available for use as of the end of July, 2003. The revised Flood Fighting Law, which provides the basis for the flood fighting and forecasting activities and was revised in June 2002, is expected to accelerate the preparation of the map by more municipal governments. In relation to the action of "flood hazard mapping" and "establishment of sediment-related disaster forecasting and warning" in Regional Cooperation Programme Implementation Plan (RCPIP), Japan provided the technical and financial contribution to Workshop held in Beijing, China in September 2003. The Designated Urban River Inundation Prevention Act was formed in June 2003. The purpose of the Act is to prevent inundation damage in urban river basin through not only river improvement but also constructing stormwater retention and infiltration facilities, and taking other necessary measures. We are preparing the details of the Act to come in force soon.

The 3rd World Water Forum was successfully held in Kyoto, Osaka and Shiga in March 2003. We express many thanks to cooperation and participation of Member States of Typhoon Committee. At the Forum, the promotion of "Portfolio of Water Action (PWA)" was described in the Declaration of Ministerial Conference. Japan committed to promote the activities of International Flood Network (IFNet) on PWA, which is one of projects on PWA, to manage and mitigate flood disaster through sharing and exchanging the flood information, establishing flood alert system using the precipitation data observed by satellite and etc.

The delegate of **Malaysia** informed that the Drainage and Irrigation Department (DID) of Malaysia has installed early warning/alarm system in 2 hill resort areas to predict and monitor the occurrence of flash floods, mudflows and landslides. Its website, InfoBanjir (http://infobanjir.moa.my), displays online data of 233 rainfall stations and 190 river level stations in 38 river basins. It also contains current information such as flooded areas/roads, landslide risk, river forecast, current river and rainfall alarms. An automatic alerting system for their flood managers through Short Message System is in operation whenever defined rainfall thresholds or critical levels of telemetric stations are exceeded. Flood mapping, urban hydrology study, impacts of logging on reservoir and reduction of flood run-off quantity using roof interception and soil infiltration method are the research topics. Courses on frequency analysis of flood and drought, flood forecasting models, watershed modeling using rainfall-runoff model are conducted.

The delegate from the **Philippines** reported that there was no significant acquisition of facilities but routine maintenance and operations of the 4 major telemetered basins have been undertaken as well as computerization of services at regional river basin centers. Connectivity to Internet ensures greater accessibility by media and the general public. Under technical advancement, the following activities have been under taken: (1) flood hazard mapping, (2)

hydro-model, a user friendly window-based software package had been completed, and (3) community-based flood forecasting system.

The delegate from **Republic of Korea** reported that in 2003, the Ministry of Construction and Transportation (MOCT) expand and improve the hydrological monitoring facilities to strengthening the flood forecasting capabilities. Past one year, Republic of Korea installed 13 new rainfall stations and 9 new flow rating stations in MOCT side. There are totally 956 hydrological monitoring stations in MOCT side for operational flood forecasting system and water resources management.

With regard to the radar systems for the flood forecasting, MOCT made a master plan of 11 radar stations for the target year of 2011. And also planning to introduce a X-band radar in 2004 for the purpose of research. MOCT already opened one radar station at Kanghwa island for the purpose of the Imjin River system monitoring, and during the past one year it was fully operated for the system optimization in 2003.

Five Flood Control Offices are on operation nationwide. They issued 22 times of flood warnings for the last rainy season to notify the danger and also informed to public to evacuate from the flood and inundation. And the MOCT also improved the performance of the flood forecasting systems for Nakdong River, Geum River, Seomjin River and Yeongsan River respectively according to the annual research.

During the 14th typhoon, Maemi, about 700 million □ of flood was regulated from the total flood inflow of a billion □ by well organized dam operation.

MOCT expressed to execute two country leading projects of New RCPIP from 2004. The first one is "Project on the evaluation and improvement of operational flood forecasting system-focusing on model performance". The second one is "Development of guidelines for dam operation in relation of flood forecasting. MOCT also expressed to organize a 2004 hydrology component workshop in Seoul Korea. And MOCT will provide the financial resources for one hydrologist from each TC member country for 2004 Seoul workshop who participate the Republic of Korea leading project.

Four participants from MOCT attended the Beijing Workshop of Typhoon Committee Hydrology Component in September. In domestic, the nation wide flood forecasting experts training were held twice at the Han River Flood Forecasting Center before the 2003 flood season.

Korea International Cooperation Agency(KOICA) provide a financial support to organize a international training course for water related subjects. Korea Water Resources Corporation (KOWACO) has execute that training program for the foreign country participants from 14 countries including not only TC members but also the Middle East countries. The main subjects are 'Multipurpose Reservoir System Operation and Management', 'Water Management, Flood Management, Decision Making', etc..

Improving the Flood Forecasting Prediction system at the Nakdong River; According to the necessity of more accurate flood forecasting, the review on the flood prediction type optimization was studied with the topics of estimate flow type data, reservoir operation, etc. According to the 'Feasibility Study on Nationwide Hydrological Radar Networking System and Improvement of the Flood Warning and Forecasting System', MOCT determine the hydrological radar networks of 11 radar stations considering hydrological, meteological, geophysical and flood management aspects. MOCT has completed the pilot project of flood hazard map for the vulnerable areas of Han river basin. And also invest the project on developing the techniques of real time hydrological data quality control.

The delegate of **Singapore** informed the Committee that hydrological matters are handled by Public Utilities Board (PUB) in Singapore. Through sustained effort by PUB, the flood-prone areas have been reduced from 3,200 Ha in 1970s to the current 163 Ha. PUB targets to further reduce the flood-prone area to 110 Ha in 2007.

The delegate of **Thailand** informed the Committee that TMD has launched the Telemetering System Project consisting 3 phases :

- The first phase of the project had completed with 50 automatic rainfall stations in Bangkok Metropolis and 18 automatic hydro-meteorological stations as master station in 8 river basins.
- The second phase of the project for 43 automatic rainfall/hydro-meteorological stations in 3 main river basins in the South of Thailand and will complete in March, 2004.
- The third phase of the project will be started at the middle of the year 2004 for installation 50 automatic rainfall/hydro-meteorological stations in 5 main river basins in the upper part of Thailand.

Thailand will make use of Mike 11 on an experimental basis in Nan, Pasak , Tapi and Prachin Buri River basin and three important projects conducted by the Royal Irrigation Department in 2003 included the following:

1. Hydrodynamic Flow Measurement of the Chao Phraya river
2. Flood Management System on Lam Pao Sub-basin of the Chi River
3. Telemetering System of Tha Taphao River Basin (Tha Sae – Rab Ro)

The delegate of **USA** provided a brief review of the USA country report highlighting facility upgrades in the Micronesian islands, implementation of the Integrated Forecast Preparation System, and implementation of the 96 and 120-hour tropical cyclone forecasts. Hydrological highlights included use of a cooperative observer network for collection of rainfall data, and application of algorithms to NEXRAD data to assist in flashflood warnings.

The delegate from **Viet Nam** reported on the improvement of facilities which included the establishment of one new hydrological station, 7 others upgraded, and 7 automatic raingauge installed in hydrological stations. It also made important technical advancement on the following: some new technologies based on TANK model and regression method have been applied for the flood process forecasting in main rivers in Central and South of Central Viet Nam; and developed a new software for the preservation of hydro-meteorological database, for hydrological data collection, processing and timely transmitting information and forecasts to end-users. It also undertook the following researches: (1) research to improve "The guideline on the operation of Hoa Binh hydropower" for strengthening the reasonable water resources management; and (2) application of a new hydrodynamic model to assimilate and predict flood flow for the lower of Red river.

ESCAP

Cooperation within the framework of ESCAP Work Programme in support of activities of various Members of the Committee continued to be expanded rapidly in 2003 in relation to various international initiatives. Among these were activities related to the Third World Water Forum, the Second International Conference on Early Warning (EWC-II), Partnership on Disaster Reduction in South-East Asia and lately the International Flood Network (IFNet) in cooperation with WMO on its initiative on Global Flood Alert System (GFAS).

With respect to the Third World Water Forum, financial resources were provided by the Ministry of Land, Infrastructure and Transport of Japan (MLIT) to enhance the participation of the Typhoon Committee in the Forum with a view to increase visibility of the Committee's programmes on hydrology, particularly flood management and disaster prevention and preparedness. Further details are provided in the report of the Working Group on Hydrology.

ESCAP joined WMO in supporting the initiative of Japan in the establishment of the International Flood Network (IFNet), which was formally launched in August 2003 during the World Water Week held in Stockholm. ESCAP expects cooperation through IFNet, especially in connection its initiative on GFAS, would be strengthened, as the Director of WMO Department on Hydrology and Water Resources was elected as IFNet Chairman and the Secretariat headed by the Director of the Second Research Branch of the Infrastructure Development Institute-Japan as its Secretary General.

Apart from the above activities, ESCAP continued to provide advisory services, on request, in the field of water resources planning and development including hydrological network development, flood loss prevention, normally for periods ranging from one to two weeks at any one time depending upon the terms of reference for the services.

WMO

Preparedness and response actions of the various disaster management authorities around the globe to prevent or mitigate flood-related disasters are highly dependent on the availability and proper use of accurate and timely meteorological and hydrological forecasting products and the dissemination of adequate and relevant information to civil protection bodies and the general public.

To improve the situation, WMO under its Hydrology and Water Resources Programme (HWRP) is planning a special Initiative on Floods as a cross-departmental and inter-commission effort in collaboration with National Meteorological Services (NMSs) and Hydrological Services (NHSs). With a view to assessing the current situation and drafting key elements of the Initiative, an Expert Meeting on Improved Meteorological and Hydrological Forecasting for Flood Situations was held in Geneva from 1 to 2 April.

Participants agreed on the need for an action programme to focus on the ability of NMSs and NHSs to cooperate in an effective manner to provide improved flood forecasting services. The objective of the Initiative is to improve the capacity of National Meteorological and Hydrological Services to jointly deliver timely and more accurate products and services required in flood forecasting and warning in collaboration with disaster managers active in flood emergency preparedness and response. The expert meeting recommended that improved quantitative and qualitative weather forecasting products, including those derived from numerical weather prediction models, were needed in a form that could be directly used for flood forecasting. Further, medium-range weather forecasting and climate prediction tools should be applied to extend warning times and produce pre-warning information.

Interaction workshops at national and regional levels are envisaged as important means to effectively facilitate the exchange and transfer of knowledge of, and access to, advanced forecasting methodologies and tools and to initiate discussion on the development of improved forecasting products among meteorological and hydrological experts.

Implemented as a joint programme of WMO and UNESCO, the principal goal for World Climate Programme (WCP-Water) is to promote hydrological activities in the World Climate Programme and related international environmental conventions, and to provide the water

community with current data and information on hydrological and water resources conditions and variations.

In 2003, major activities of WCP-Water included the preparation of technical reports on the development of a data-analysis system for the detection of changes in hydrological time-series and application of the system for the detection of change in worldwide hydrological time-series of maximum annual flow. Another technical report on global trends in peaks-over-threshold and drought index in long hydrological time- series is being prepared.

Regional activities

In RA II, activities focused on the development of flood-related hydrological data and information systems in the context of planned regional projects of the World Hydrological Cycle Observing System (WHYCOS).

The Third World Water Forum (WWF3) was held from16 to 23 March in Kyoto, Shiga and Osaka, Japan. The Secretary-General attended the opening ceremony and delivered statements and keynote addresses during the opening plenary of the sessions on Water and Climate, Africa Day and Flood Days.

WMO convened a joint session entitled "Integrated flood management: IFM", together with a session entitled "People, floods and vulnerability reduction" and Africa Day, which was officially opened on 17 March. The Secretary-General and other dignitaries, including the President of Botswana, three Ministers and the Crown Prince of Orange addressed the plenary. WMO convened a session entitled "Climate change and variability impact on water resources in Africa". WMO also organized a session on water and information.

WMO participated in the launching of the International Groundwater Assessment Centre being set up with the financial support of The Netherlands under the auspices of WMO.

WMO and the Associated Programme on Flood Management's (APFM) activities were promoted at an exhibition which was visited by more than 1 500 representatives of intergovernmental, governmental, non-governmental and research organizations. There was great demand for information on climate-change issues and for material dealing with operational hydrology. Some 160 requests for literature and publications were received.

WORLD HYDROLOGICAL CYCLE OBSERVING SYSTEM (WHYCOS)—

Under the WHYCOS, status of components are:

Hindu Kush Himalaya (HKH)-HYCOS: in March, representatives of the participating countries (Bangladesh, Bhutan, China, India, Nepal and Pakistan) endorsed the project proposal with some amendments. Country consultations are being undertaken to obtain detailed information on all technical and administrative aspects necessary for the implementation of the project. So far, Bangladesh, Bhutan and China have been visited.

MEKONG-HYCOS: a concept paper was jointly prepared and agreed upon by WMO and the Mekong River Commission (MRC) in July. The objective of the planned MEKONG-HYCOS is to establish and operate a real-time flood information system in the Mekong basin as part of the MRC's Flood Management and Mitigation Strategy with Cambodia, Lao, Thailand and Vietnam as participating countries. The first consultation meeting was held in Phnom Penh, Cambodia, in October. The amended concept paper will be circulated again to all participating countries and the constituent bodies of the MRC for endorsement.

APPENDIX VIII

SUMMARY OF THE REPORTS OF THE TYPHOON COMMITTEE MEMBERS AND INTERNATIONAL ORGANIZATIONS ON THEIR ACTIVITIES RELATED TO DISASTER PREVENTION AND PREPAREDNESS

The delegate from **China** reported that on September 21, 2003, the meeting about the reconstruction work of disaster areas was held by the Ministry of Civil Affairs in Beijing to solve the basic living problems of all the people in the disaster stricken areas in the coming winter. On October 10, 2003, the Ministry of Civil Affairs organized a flash flood rescue maneuver in Linli, Hunan Province, where flood disaster occurs frequently. The goal of the maneuver is to test the efficiency of the disaster management information system. The International Day for Disaster Reduction this year falls on October 8, with the theme entitled "Living with risk -Turning the tide on disasters towards sustainable development". In order to better publicize the campaign, a special TV program, produced by Hua Feng Group of Meteorological Audio and Video Information, was put on shown by CCTV through a series program named Meteorology Today. The special program contains the background information of the International Day and the information about the theme this year and tells the people the role of meteorological observation, forecasting, warning and other information service in the disaster reduction and mitigation.

The delegate from **Hong Kong, China** reported that the Hong Kong Observatory (HKO) continued to make annual liaison visits to relevant government departments and other organizations to review disaster preparedness and prevention procedures and to improve the preparation for the tropical cyclone and rainy season. Briefings were also held for government departments and transport operators to promote effective use of the Weather Information Server and other weather information channels provided by HKO.

Senior meteorologists in HKO continued to give hourly briefings to the media during the close approach of typhoons, for example Imbudo and Dujuan in 2003. To provide an early alert to fishermen regarding the possible development of tropical cyclones in the next 3 days in the South China Sea, information on the locations of significant low pressure systems and their potential for development were added to the weather bulletins for the South China Coastal Waters.

The total number of participating Members of the WMO pilot website "Severe Weather Information Centre" increased to 19. The web site would be extended to cover other severe weather types, starting with heavy rain in the coming year.

The WMO pilot website "World Weather Information Service" on world city forecasts supplied by Members continued to gain wide acceptance. Climatological information from 997 cities was made available on the pilot website. Up to the end of September 2003, 87 countries were actively providing forecasts of 824 cities for the website.

Since October 2001, the Server for International Exchange started to provide products of HKO's ORSM in GRIB and graphic formats for 10 Typhoon Committee Members and other related organizations. The Server continued to gain popularity.

The delegate from **Japan** reported that monsoon rain fronts and typhoons caused major damage by the sediment disaster and flood particularly during summer and early autumn in 2003. The national government, with local governments, took measures with concerted efforts for each disaster.

The Government of Japan is considering to host the United Nations World Conference on Natural Disaster Reduction in January 2005 in Kobe, Hyogo, Japan. We would like to discuss the

results of the review and propose recommending means of implementation of effective disaster reduction measures for the coming decade in close coordination and cooperation with the United Nations, government and relevant organizations.

Japan has provided emergency assistance to afflicted countries and areas, and has made every effort to develop the multilateral cooperation in the Asian area, cooperating with the United Nations. Asian Disaster Reduction Center (ADRC), together with UN-ISDR, Cabinet Office of Japan and the relevant organizations held "Asian Conference on Disaster Reduction 2003" in Kobe, Japan, in January 2003. Further, ADRC and OCHA Kobe, with the support of the ASEAN Foundation, Cabinet Office of Japan and others, hosted a workshop and a conference on "Total Disaster Risk Management (TDRM)" this June and December respectively, in order to promote the holistic approach to disaster management in Japan.

As indicated in the 34th session of the Typhoon Committee, Asian Disaster Reduction Center (ADRC), with the Cabinet Office of Japan, has reproduced the video "Protect yourself from Storms and Floods," and distributed 1 copy each to Typhoon Committee members on the occasion of the 35th session, so that it could be used as reference material for members to develop public awareness and education. ADRC also drew attention of the Typhoon Committee members to "Living with Risk-A global review of disaster reduction initiatives" which was published on August 2002 by the UN-ISDR secretariat with the support of the Government of Japan, the Asian Disaster Reduction Center and WMO. This is the first UN comprehensive report on disaster reduction initiatives carried out worldwide and would be useful for DPP component of Typhoon Committee members. ADRC made 1 CD-ROM available for members. The UN-ISDR secretariat intends to revise this publication, and Typhoon committee members are invited to provide examples of best practices of disaster reduction activities for inclusion in the revised edition.

Regarding the DPP component of the country report, the Cabinet Office of **Japan** reported an outlook of disasters and disaster management activities in 2002. In the theme of international cooperation activities for disaster reduction, the Cabinet Office on behalf of the Government of Japan expressed its gratitude to those countries and organizations that supported the initiative of Japan to host the UN World Conference on Disaster Reduction in Kobe, in January 2005.

The delegate from **Macao, China** reported that during the year, several activities related to public awareness were carried out and a campaign was launched on Macao TV, radio and newspaper. A leaflet and other contingency guides were renewed according to the needs and were sent to Macao's citizens for the purpose of advising the prevention measures to be adopted.

The Typhoon Contingency Plan was updated and revised and an exercise which involved all institutions was held in the beginning of May with the purpose of testing the communication systems and procedures and training of personnel of several departments. A general meeting of the structure the Civil Defense Operation Centre was usually held before the exercise.

Training and preventive activities on the evacuation of schools were conducted. About 90 Sino-Portuguese schools were examined and were sent adequate suggestions and proposals for better evacuation during risky situations. Continuous training on preventive measures during tropical storms in Education Establishment and different Institutions were conducted and leaflets on preventive measures were distributed.

The delegate from **Malaysia** reported that as an input to the disaster prevention and preparedness component, the National Security Division of the Prime Minister's Department has introduced the Vision of Disaster Reduction for Sustainable Development through the formulation

of Total Planning Doctrine – a guiding principle for sustainable development. The Division also proposes disaster prevention with regard to landslide mitigation, especially on slope maintenance. The Social Welfare Department provides aid and rehabilitation to victims of natural disaster based on the National Security Division's Directive No. 20.

The delegate from the **Philippines** reported that disaster preparedness and prevention activities have been undertaken in collaboration with the Office of Civil Defense, Disaster Coordinating Councils, Local Government Units, such as:

- Providing information like forecasts and warnings, lectures, exhibits and press releases.;
- Conducting training/seminars for the media in natural disasters, post typhoon flood damage assessment by local governments and community based flood forecasting.
- Disaster Preparedness and Prevention awareness in schools through audio visuals
- Including/incorporating PPP in elementary and secondary school curricula.

The delegate from the **Republic of Korea** reported that from 12 to 13 September 2003, Typhoon "Maemi" hit Korea causing record-breaking various damages after Typhoon RUSA, last year. The maximum wind velocity, hourly and daily precipitations reached 60 m/s in Jeju Island, 79.5 mm and 400 mm respectively. The example of disaster-resilient community in the Jeju Island was presented to the Committee that despite the record wind and heavy rains, the community suffered only small damage with two people lost and damage of US$40 million in property. On 22 September 2003, the Government of Republic of Korea declared heavily damaged sites as "special disaster areas" to mobilize various related agencies and personnel for a rapid and massive disaster recovery process. About US$6 billion was allocated to recover and improve the damage sites with the help from the private sector, military, NGOs and volunteers. In this year, the Government established a nine-year inter-agency plan on "Comprehensive Countermeasures Against Flood-related Disasters" involving nine Ministries. This plan includes 76 projects on river improvement, dam construction, improvement of disaster-prone areas, flood forecast systems with a total investment of about US$40 billion in the next nine years. In this connection, the Government established the "National Disaster Management System Task Force" to renovate the current disaster management system.

The delegate from **Singapore** reported that because the surge of demand for information during emergency is usually many times of the normal requirement and the disaster situations are infrequent, Singapore has adopted a multi-agency approach with the establishment one information centre with a large communication bandwidth to handle many types of emergency information.

The Emergency Public Information Centre (EPIC) Project is spearheaded by the Ministry of Home Affair. The first phase is the development of a web-site with 6 agencies participating, including Meteorological Services. A call centre will be setup in the next phase with more agencies participating.

The delegate from **Thailand** reported that TMD would undertake the following projects on DPP: the Departmental Operation Center (DOC) would integrate meteor-hydrological data/information; the Village Meteorological Volunteers would extend the ideas of Village Meteorological Volunteer to reach the local communities; and the Watch and Warn Measures with 3 doppler radars are being planned to implement in the remote and mountainous areas of Khao Kheaw, Krabi, and Samui. It was also reported that the Department of Disaster Prevention and Mitigation would focus its efforts on the following three main components of DPP: (1) information and communication technology system, (2) community-based training, and (3) simple raingauge and hand-spin warning siren system project. The information and communication technology system aimed at enhancing disaster management capacity and efficiency in

disseminating and receiving disaster-related information. The community-based training aims to produce trainers on disaster management activities to for all communities in Thailand. In addition, a workshop on establishment of community-based disaster prevention and mitigation human network was organized to build up the people network in flood-prone communities. Meanwhile, the project was expected to provide indispensable instruments such as raingauges, manual sirens to flood prone villages. Villagers will be trained to operate these instruments and send out warning alarms.

The delegate from the **United States of America** stressed the importance of continued efforts in education and outreach for all sectors of government and the public to maintain an effective disaster prevention and preparation program. The overview concluded with a review of training activities, especially the Micronesian Meteorologist Intern Program and the Pacific Desk program conducted by RSMC Honolulu.

The delegate from **Viet Nam** reported that in 2002, the following disaster prevention and preparedness activities were carried out: (1) Regular maintaining and upgrading the dikes systems and hydraulic structures for flood and storm prevention; (2) Carried out the Riverbank Erosion Control program by building new riverbank protection's structure; (3) Improving and upgrading the infrastructure for floos retention and diversion area; (4) Implementing the emergency relief and recovery program for overcome disasters consequences; (5) Implementing the bamboo's planting to protect dykes from water's waves; (6) Each province continuously implements the national program in term of disaster mitigation by building new reservoirs for multi-purposes at upstream of the main rivers; implementing the 5 hectares forestry program in each region and a program for new transportation infrastructure networks to ensure flood discharge; (7) Implementing a program to relocate residents living in disasters prone areas; and (8) Implementing a program for building residential clusters for people living in Mekong Delta.

ESCAP

ESCAP in cooperation with the United Nations International Strategy on Disaster Reduction Secretariat, Governments of Indonesia and Germany organized a regional consultation workshop on early warning systems in Asia and the Pacific in May 2003 in Bandung, Indonesia and several experts from various Members of the Committee were invited to take part in the exchange of experience. The results of this Regional Consultation Workshop were presented at EWC-II held in Bonn, Germany in October 2003. Several experts from the Committee Members participated in the Conference and a Special Session was organized by MLIT of Japan to present progress of work and experiences of the Working Group on Hydrology.

A one-year project on Partnership on Disaster Reduction for South-East Asia, Phase II was recently funded by the European Commission Humanitarian Office (ECHO) to ESCAP and ADPC aiming at promoting community-based disaster management. Efforts are being made by ESCAP to synergize this project's activities and expected follow-up action with the activities of the Committee in the Hydrology and DPP Components. Expected outputs would include the preparation of a set of guidelines on community-based disaster management, which had been identified as one of the priority areas in the New RCPIP.

In October 2003, ESCAP in cooperation with ADPC and various Departments of the Royal Thai Government organized an annual ESCAP-ADPC Forum on Natural Disaster Reduction to commemorate the International Day on Natural Disaster Reduction in Bangkok. Several policy-makers were invited to give keynote speeches on information management for better living with risks.

Lately, several regional initiatives were jointly undertaken by ESCAP in cooperation with UN/ISDR, UNDP, ADPC and ADRC aiming at preparing for the Second International Conference

on Natural Disaster Reduction to be held in Japan in 2005. In this context, ESCAP expects to use these opportunities to further strengthen cooperation among the Committee Members and to assist in capacity building on typhoon-related disaster reduction.

WMO's Disaster Reduction Activities in 2003

International Strategy for Disaster Reduction (ISDR)

WMO participated in the activities of all the working groups established under the ISDR framework, including the ad hoc group on drought. Regular El Niño monitoring, El Niño outlooks and the establishment of the International Research Centre for El Niño in collaboration with the Government of Ecuador were tangible results of those activities. Projects to establish a climate alert system and to link climate and disaster databases on floods were developed.

WMO participated actively in the Second International Conference on Early Warning that aimed to achieve better integration of early warning into public policy. It also collaborated in the review of the Yokohama strategy.

WMO is a member of the ProVention Consortium and is represented in the Consortium Steering Committee. The Consortium aims at helping developing countries to cope with disasters. WMO is also a Special Supporting Organization of the International Consortium on Landslides, which aims to promote related research and capacity building.

New major crosscutting programmes

In view of the increasing importance of the space-based component of the WWW Global Observing System (GOS), Congress initiated the WMO Space Programme.

Congress also initiated the Programme on Natural Disaster Prevention and Mitigation. The main objectives are to develop a mechanism to respond to the requirements of Members and to ensure that WMO participates fully in the ISDR.

Asian Disaster Reduction Center (ADRC)

ADRC (Asian Disaster Reduction Center) was established in 1998. ADRC has 24 member countries in Asia. Its main pillars of activities are information sharing, capacity building and cooperation. ADRC recognizes the importance of information sharing among major players in disaster reduction and in this regard would like to contribute to TC activities by providing relevant website list of TC members..

The representative of ADRC emphasized that disaster reduction is a must for sustainable development in Asia since we have seen cases that a single disaster can wipe out substantial portion of the national economy thus natural disasters can be the biggest obstacle to social security of a country. Only when abnormal natural phenomena affects a vulnerable community natural disasters occur. Various expertise must be mobilized and coordinated to achieve disaster reduction and these expertise must reach the people at risk. There exist the critical links, for example the typhoon warnings must properly reach the residents in low basins to save their lives.

In pursuit of developing better ways to reduce flood damage through better risk communication among the local authorities and residents, ADRC has organized a workshop in June 2003 with combining the methodology developed by MLIT and IDI of Japan (Flood Hazard Map Manual for Technology Transfer) with the "On-site Town-Watching Method" which ADRC possessed. ADRC is ready to transfer this methodology to typhoon affected countries and would

like to provide it's expertise to the proposed 2004 Seoul workshop. ADRC sees this as a good area where the meteorological, hydrological and DPP expertise can be combined.

ADRC has organized a special session "Water and Poverty" at the Third World Water Forum in March 2003. ADRC would like to continue to provide further opportunities to promote disaster reduction in Asia and to contribute to the success of the Jan 2005 UN World Conference on Disaster Reduction.

APPENDIX IX

SUMMARY OF THE REPORTS OF THE TYPHOON COMMITTEE MEMBERS ON THEIR ACTIVITIES RELATED TO THE TRAINING COMPONENT

The delegate from **China**, reported that CMA held the 32nd China Study tour from 31 March 19 to 9 April. Eleven participants from 10 countries visited Beijing, Shanghai and Nanjing. During this period, the participants attended the International Symposium on Climate Change and establishment ceremony of Beijing component of WMO RMTC Nanjing. From 8 April to 7 July, 16 participants from 11 Asian countries attended a training course on the Use and Maintenance of Meteorological Instrument hold by Nanjing Institute of Meteorology in Nanjing. As one of Typhoon Committee research fellowship projects, two members from the Central Forecast Research Institute in DPRK visited Shanghai Typhoon Institute from Oct. to Nov. in 2002. The study on how to improve a TC bogus scheme and a consensus method for TC track forecasting were carried out effectively in the two months.

The Shanghai Typhoon Institute hosted a Typhoon Committee Roving Seminar from 27 to 29 Oct. 2003, which focused on use and interpretation of satellite and radar data in tropical cyclone forecasting. Dr. Mark A. Lander from the University of Guam and Dr. P.W. Li from the Hong Kong Observatory were invited to speak at the seminar, and about 40 researchers and forecasters attended it. The training of master's degree in computer and software engineering has launched this year in Hohai University, and 47 students are form the Hydrology departments. In 2003, some Chinese and foreign experts in the field of flood control, hydrology and water resource, and computer science were invited to gave some thought-provoking lectures. China sent a number of hydrological experts to USA, Europe and Japan for training and experience exchange as usual.

Co-sponsored by ESCAP, TCS and Japan, China successfully held the Workshop on Implementation of the Hydrological Component of the New Regional Cooperation Program Implementation Plan RCPIP of the Typhoon Committee in Beijing in September 2003. The officers from ESCAP, TCS, Department of International Cooperation, Science and Technology of MWR, BOH of MWR, China, MLIT of Japan, USA extended important message in the opening ceremony. About 100 experts and participants from 11 countries of Asia and the Pacific Region gathering together, discussed hotly and exchange their ideas about the hydrological cooperation projects of Typhoon Committee, such as Flood Hazard Mapping Project, Sediment Disaster Forecasting and Warning System and Extension of Flood Forecasting System. With the immense support Chinese government provided, the workshop achieved extensive success and furthermore, it will promote the work of disaster prevention and mitigation greatly, strengthen the close cooperation in the field of hydrology among countries of Asia and the Pacific Region.

Satisfactory achievements have been made on flood hazard map project in China, since the workshop on Integration of Risk Analysis and Management of Water-related Disasters into Development Process in the Typhoon Committee Area held in Manila, Philippines, in 2002. Chinese side strived to fulfill tasks scheduled in the implementation plan on this pilot project in the pilot area, Mengwa detention are in Huai River Basin, and made excellent progresses in aspect of drawing flood risk map, flood Propagation sketch map, evacuation road sketch map, collecting the information of dweller location and developing a simplified flood routing model special for Mengwa detention area. China also made efforts to explore the future plan in collecting information of relocation area for evacuated dwellers, determining relocation scheme according to the state flood control plan and drawing the flood hazard map.

China has conducted careful and in-depth preparation work for the project on sediment disaster forecasting and warning system and goes smoothly. A simplified regional warning system to monitor landslides and mudslides has been built up in Dazhou region of Sichuan Province, the upper reaches of the Yangtze River, a region that is seriously plagued with geographical disasters. The system, made up of 3 central monitoring spots, 7 rain stations has achieved progress in investigation of historical sediment disaster sites; determination of rainfall observation stations around selected sites; collection of historical rainfall data and setting of the sediment critical line using the methods provided by Japanese colleagues. The detailed working plan for next step has also been worked out as listed below: to prepare theme Maps; to link with the real time database; to establish operational forecast using the method provided by Japan and to issue warning message if necessary.

Two projects led by China, i.e. "extension of Flood Forecasting Systems to selected river basin" and "evaluation and improvement of hydrological instruments and telecommunication equipment", have provoked much interest from other members after the brief introduction in the Workshop held in Beijing. According to demands of other countries, we revised the questionnaries for them and will distribute in this annual meeting and hope an active response to push these two projects.

The delegate from **Hong Kong**, reported that HKO continued to organize training, workshops and seminars on various fields of meteorology. Meteorologists and meteorological technicians of HKO spent a total of 756 man-days in various training in HKO. Meteorological personnel from Oman, Bahrain, Egypt, Malaysia, Morocco, Philippines, Sri Lanka, Syria, Uzbekistan, Vietnam, and Yemen undertook a total of 245 man-days of training in HKO. Moreover, for the first time, HKO ran meteorological training courses for the public and other government personnel in 2003.

The delegate from **Democratic People's Republic of Korea**, reported that training activities were stressed to improve the scientific and technical qualification of experts. The following were the training activities:

- "Numerical weather forecasting " course for 25 graduates in the
- Central Meteorological Institute for 30 days (Jan. 10-Feb. 10).
- "General hydrology" course in the Hydrological Institute for 20 days.(Mar. 1-30)
- Three hydrology experts participated at the international training course on flood forecasting and sedimentation mechanics for 10 days (Sep. 20-29) in China.
- 30 hydrology and hydraulics experts participated at the international training course on flood forecasting and sedimentation mechanics for 7 days (Oct. 18-25) in Pyongyang, DPR of Korea.

The delegate from **Japan** reported that the "Third International Seminar on MTSAT/LRIT Data Utilization" was held from 12-14 February 2003 in Tokyo with participation of 8 experts from 8 countries; Sri Lanka, Malaysia, Mongolia, Nepal, Indonesia, Myanmar, Bangladesh, and Marshal. The seminar focused on the application of SATAID, a computer aided learning software developed by JMA, for the maximum utilization of data from MTSAT-1R, the successor of GMS-5, through LRIT (Low Rate Information Transmission).

Two forecasters from Thailand and China stayed at the RSMC Tokyo - Typhoon Center from 23 July to 1 August for on-the-job training for typhoon operations. The training was carried out with the support of WMO in response to the proposal presented at the 33rd session of the Typhoon Committee. During the two weeks the two forecasters were instructed on analysis and forecast of tropical cyclone using real-time data on two typhoons, TY LINGLING (0123) and TY HIGOS (0221), in reference to the operational procedures of the Center. JMA renewed the Group Training Course in Meteorology in 2003. The primary purpose of the renewal was to

place special emphasis upon the subjects which are increasingly essential to developing countries for their operational forecasting. The new Training Course focuses on "Utilization of satellite data including nephanalysis", "Application of numerical predictions", and "Application of climate information". In September, the Training Course for 2003 started with 10 participants from 10 countries, including Cambodia, Laos and the Philippines.

The delegate from **Macao, China**, reported that SMG personnel attended the following local and overseas training/Seminar/workshop.

Local

- Training Course for operational forecaster
- Observer Training Course
- 17th GD-HK-MC Seminar on Meteorological Science and Technology
- 7th GD-HK-MC Meteorological Operation Meeting
- LINUX installation and data processing technique
- Oracle 9i Administration 1

Overseas

- Workshop on the decode of GRIB and BUFR products for Aviation
- 4th Seminar on Urban Air Quality in Pearl River Delta Region
- 5th International Workshop on Tropical Cyclones
- 3rd Technical Conference on Management of Meteorological and Hydrological Services in RA II
- 5th Management Committee Meeting and Working Group meeting of COST Action 720 –Integrated ground-based remote-sensing stations for atmospheric profiling

- Meeting on the Cooperation of Meteorological Research between GD-HK-MO
- The Meeting on cooperation in the field of weather radar between CMA, Portugal Institute of Meteorology and Macao Meteorological and Geophysical Bureau
- 2nd Technical Conference on the Participation of Woman in Meteorology and Hydrology
- Visit to Guangzhou Institute of Geochemistry, Chinese Academy of Sciences
- International Symposium on Climate Change (ISCC)
- Exposition of "Computer 2003"
- Visit to Guangzhou Institute of Geochemistry, Chinese Academy of Sciences
- Second Workshop on South China Sea Storm Surge, Wave and Ocean Circulation Forecasting
- Visit to Hong Kong Observatory
- 10th Management Committee Meeting and Working Group meetings of COST Action 715 – Meteorological Applied to Urban Air Pollution Problems
- 6th Management Committee Meeting and Working Group meetings of COST Action 720 –Integrated ground-based remote sensing stations for atmospheric profiling

- Training Course in Seismology
- Visit to National Time Service Center, Chinese Academy of Sciences

The delegate from **Malaysia,** reported that during the year 2003, several meteorologists from MMS had participated actively in the following training events :

- 3rd International Seminar on MTSAT/LRIT Data Utilization, Tokyo, Japan, 12-14 February 2003

- Attachment Program on Surface Meteorological Instrumentation and Calibration, Seoul, Korea, 6 – 14 October 2003
- Typhoon Committee Roving Seminar, Hong Kong SAR, China, 22 – 24 October 2003
- WMO Workshop on Aeronautical Meteorology with Emphasis on Radar and Satellite Products Interpretation and NWP Application to Aviation, Toronto, Canada, 27 – 31 October 2003
- 2003 International Symposium on the Climate System of the Asian Monsoon and its interaction with society, Khon Kaen, Thailand, 10 – 13 November 2003.

The following Course / Workshop / Seminar related to flood hydrology were organized:

- "Frequency Analysis of Flood and Drought" at Kuala Lumpur from 25-27 February 2003.
- "Flood Forecasting Models" at Kuala Lumpur from 25 to 27 March 2003.
- "Watershed Modelling Using Rainfall-Runoff Model" at Kuala Lumpur from 27-29 April 2003.
- "Frequency Analysis of Flood and Drought" at Kuching, Sarawak from 15-17 July 2003.

The delegate from the **Philippines**, reported that PAGASA personnel attended the following overseas training courses/seminars/workshop:

- OJT in Typhoon Operation
- Workshop on Integration of Risk Analysis & Management of Water related Disasters into Dev't. Process in the Typhoon Committee Area
- Post Graduate Course on Satellite Meteorology and Global Climate
- Meteorology II
- International Research Institute
- (IRI) Intensive Course on Dynamical Downscaling of Seasonal to Inter-annual Climate Predictions
- IP Network Server Design
- Administration Practice
- Regional Workshop on Best Practices in Disaster Mitigation
- Filipino Invitation Program
- International Workshop on Reducing Vulnerability of Agriculture & forestry to Climate Variability & climate Change
- Technology & Policy for Meteorological Services Course
- Workshop on Web Enabling Technologies for Scientists
- Training Course on Automated Weather Observing Systems
- Office Technologies & Internet Applications
- WMO Training Seminar on Mgt. of Meteorological Training Institutions
- 3rd Int'l School on Atmospheric Radar (ISAR-3)
- 5th Int'l Workshop on Tropical Cyclones (IWTC-V)
- Lead Author's Meeting to elaborate the United Nations Development Programme-Global Environment Facility (UNDP-GEF) Adaptation Policy
- Global Climate Observing System/United Nations Development Program/Global Environment Facility (GCOS/UNDP/GEF) Regional Workshop For East & Southeast Asia
- WMO Technical Conference on Meteorological & Environmental Instruments & Methods of Observations
- 13th Session Of The Commission For Agricultural Meteorology Of The WMO

- ASCMG Project On Rainfall Estimation For Monitoring Of High Risk Fire Areas In Southeast Asia
- ESCAP/WMO – Typhoon Committee's 35th Session
- Exploitation Of Data From The European Space Agency (ESA) ENVISAT Mission
- Workshop On The Use Of The Guidelines For The Preparation Of National Communications From Non-Annex I Parties
- Conference On Monsoon Environments; And Workshop On The Theory & Use Of Regional Climate Models
- TC On Wx Forecasting For Operational Meteorologists
- GTC On Remote Sensing Technology III
- Workshop On Theory & Use Of Regional Climate Models
- 2nd Workshop On South China Sea Storm Surge, Wave And Ocean Circulation Forecasting
- Asia Pacific Network/Southeast Asian Regional Research Information Network (APN/SEARRIN)

Local Training/Seminars/Workshop/Conferences attended are the following:

- Statistical Process Control Tools & Problem Solving Techniques For Decision Making Seminar
- LINUX Workshop
- Advanced Microcomputer Hardware Servicing
- Basic Knowledge & Skills For Joint Consultations & Collective Negotiations
- Wireless Communication Training Course
- 25th Annual Scientific Meeting of the National Academy of Science & Technology
- Conference On Effective Control & Prevention Of Communicable Diseases Including SARS
- National Conference On Global Trends: Urban and Regional Development In The 21st Century

The delegate from the **Republic of Korea**, reported that since 1998, the KMA has held annual training courses on weather forecasting for operational meteorologists in the Asia-Pacific region, at its headquarters in Seoul, sponsored by the Korea International Cooperation Agency (KOICA). The course is conducted for weather forecasters from Asian National Meteorological and Hydrological Services (NMHSs), including those of the ESCAP/WMO Typhoon Committee (TC) Members.

In 2003, the training course was held for four weeks in Seoul from April 6 to May 3, 2003, and was attended by 17 participants from 13 WMO Member countries. The purpose of the training course was to provide the participants with advanced skills and knowledge of weather forecasts, including typhoon forecasting.

KMA also held the TC Roving Seminar on Interpretation of Typhoon Forecasts and Analysis in Seoul from 20 to 21 October 2003. It included lectures from Prof. H.-J. Kwon of the Republic of Korea and Dr. Nabutaka Mannoji of the Japan Meteorological Agency, and presentations on the application and analysis of typhoon forecasts by four typhoon experts from KMA, the China Meteorological Administration, the Hong Kong Observatory and the Malaysian Meteorological Service.

In addition, KMA organized one on-the-job training course for five Thai Meteorological Department staff members on 28 September–1 October 2003 in the field of weather forecasts, including typhoon forecasting.

A total of 15 KMA staff members participated in typhoon-related seminars/training courses/visits which were held in other countries, as shown in the following table.

Course/Field	Date	No. of participants	Country
Development of the Forecaster's Analysis System	1 April 2003–28 Feb. 2004	Three	U. S.
Development of typhoon model	16 June–14 Nov. 2002	One	Japan
Training for users of the Forecaster's Analysis System	12-25 Oct. 2003	Eight	U. S.
TC typhoon roving seminar in Hong Kong	22-24 Oct. 2003	One	Hong Kong, China
TC typhoon roving seminar in Shanghai	28-29 Oct. 2003	Two	China

The delegate from **Singapore**, reported that the Meteorological Services Singapore has participated in a number of international training seminars and workshops. These include:

- UNU-UNCRD Workshop on Catastrophic Flood Risk Assessment
- Workshop on ASEAN Peatland Management initiative
- Training Seminar on Data Processing and Forecasting System and Improvement of Public Weather Service.
- Training Workshop on Climate System Monitoring, Diagnosis and Prediction in the Asia Pacific
- WMO Conference in Meteorology and Hydrology
- Workshop on South China Storm surge, wave ocean circulation forecasting

Two newly recruited officers are now undergoing local on-the-job training.

The delegate from **Thailand**, reported that TMD staff attended the following overseas training:

- Training on Strategies on Climate Change and Development of National Inventories
- International Data Centre Training Course for Analysts
- Training Course on Weather Forecasting for Operational Meteorologists
- Training Workshop (RAII) on Remote Sensing Data Interpretation for Application in Agricultural Meteorology
- On-the-job Training in Typhoon Operation
- Training on Different Aspects of the Storm Surge Model and Its Formulation
- Training on Seismology and Earthquake Engineering
- Training Programme on IT and E-Governance
- Training on Acid Deposition Monitoring
- ACPC-UNESCAP Training Seminar on Information Management for Disaster Reduction
- The 2nd Training Course on Space Technology and Remote Sensing Applications of AP-MCSTA

Most operational and meteorological training mainly focused on computer courses assigned by the Government under the Chief Executive Officer (CEO) scheme in order to

enable TMD people to serve communities timely and effectively. However, the main training of the year 2004 will be shifted to more meteorology. In this connection, contributions in tropical cyclone expertise from the TC-member countries are needed and requested.

The delegate from the **United States of America**, reported that the MICRONESIAN INTERN MILESTONES - The joint National Weather Service-Micronesian (NWS-M) Meteorological Intern Trainee Program continues to make it possible for islanders to attend the University of Hawaii to obtain a degree in meteorology. Current graduates of this program are Meteorologists-in-Charge (MIC) for the WSOs at Yap, Palau, Pohnpei and Chuuk WSOs. These graduates are not only familiar with the NWS products, operations, training, and science, but will, for the first time, be able to develop their own effective outreach and preparedness programs using their own languages. The future Majuro Meteorologist-in-Charge recently graduated from the University of Hawaii with a Bachelor's Degree in Meteorology, and is currently completing 6-months of operational training at the WFO Guam.

WFO GUAM STAFF - Forecasters and Technicians have participated in hydro-meteorological training through several methods: residence in the U.S., correspondence courses, seminars and classes at the University of Guam, and teletraining.

The Guam Warning Coordination Meteorologist (WCM) conducted tropical cyclone and El Niño preparedness workshops for Emergency Management Office (EMO) officials and Weather Service Office (WSO) personnel in the Republic of Palau, the Republic of the Marshall Islands, the CNMI, and the Federated States of Micronesia (FSM) states of Yap, Chuuk, Pohnpei, and Kosrae. The workshop included a review of JTWC warnings, NWS Weather Forecast Office (WFO) Guam tropical cyclone products and procedures, hazards associated with tropical cyclones, response procedures, ENSO status and impacts, the hydrological aspects of meteorology, decision making, risk and vulnerability, and exercises.

Representatives of RSMC Honolulu attended the following meetings/ seminars/ workshops:

The Director, RSMC Honolulu, chaired the Interim Working Group (IWG) on the RCPIP meeting held at the kind invitation of the Japan Meteorological Agency (JMA) in Tokyo September 16-18, 2003. Attendance at this meeting was funded by the Typhoon Committee's Trust Fund. The 35th Session of the Typhoon Committee decided to establish an IWG on the RCPIP for a period of one year. The IWG on the RCPIP was formed to act as a "Think Tank" function to advise and offer options to the Typhoon Committee Members, the Typhoon Committee, the TCS Coordinator, and the TCS. The terms of reference for the IWG were to propose options to improve the efficiency and effectiveness of the Typhoon Committee; promote Members' roles in economic development and international cooperation; promote the use of advanced information technology and resource sharing among Members; improve the implementation of the RCPIP; and enhance the mobilization of resources. The Deputy Administrator, China Meteorological Service attended this meeting along with representatives from China, Philippines, Thailand, Japan, and Republic of Korea. The Director-General, JMA, hosted a reception for the IWG.

The Director, RSMC Honolulu, attended the WMO/ESCAP Typhoon Committee's Working Group on Hydrology as the U.S.A. representative September 22-26, 2003 in Beijing, China. Attendance at this meeting was funded by the Typhoon Committee's Trust Fund. The Director took part in the opening and closing ceremonies by addressing the participants on the hydrology connection to the RCPIP and the importance of regional cooperation to achieve regional goals and objectives. During the meeting, the Director made a presentation on the deliberations of the IWG on the RCPIP meeting the previous week in Tokyo.

The Director, RSMC Honolulu attended the meeting of South Pacific Regional Environmental Program's (SPREP) 9th Regional Meteorological Services Directors (9 RMSD), along with members from 18 Pacific countries meteorological services personnel, NGO agencies, WMO representatives, personnel from NOAA NWSH IA and NESDIS, and AusAid individuals. The meeting focused on solutions to problems identified in the 18 country reports and others items of interest mostly in the southern Pacific. The Director attended as a representative of the Pacific Island GCOS program and the WMO RA V Working Group on Climate Matters.

The Pacific Communications Workshop focused on ways for regional centers and countries' National Meteorological Services (NMS) to communicate weather data in partnership with data from education, health and other agencies. The workshop discussed the roles that RANET, EMWIN, HF radio, GTS, ICSC, and messengers play in transmitting data to the people who need it, especially to the remote villages and islands, "the last kilometer." The workshop emphasized the vital importance and requirement for a Pacific-tailored EMWIN broadcast.

The Director, RSMC Honolulu co-chaired Pacific Island Global Climate Observing System (PI GCOS) Meeting. The meeting discussed the current status of the PI GCOS program, e.g., Implementation Plan, hiring of a PI GCOS Project Officer, and status of the five projects currently underway. The participants then developed an action plan for the next year.

The AusAid's Enhanced Applications of Climate Predictions in Pacific Countries was the inaugural workshop for the AusAid and Australian Bureau of Meteorology (BOM) project. AusAid is spending $2.1 M (Australian) on this 3 ½ year project. At this workshop, BOM described the project, the goals and objectives of it, the software to be used, and the criteria to be used to select the seven participating countries. During the next 2 months, small Pacific Island Countries will complete a questionnaire and submit it to BOM for selection consideration.

The Director, RSMC Honolulu attended the East and Southeast Asia GCOS action plan writing team meeting in Beijing, China March 3-5, 2003. The team completed the East and Southeast Asia GCOS Action Plan at this meeting and proposed to present it to the GCOS Secretariat, the United Nation Framework Conference on Climate Change (UNFCCC) Subsidiary Body for Scientific and Technical Advice (SBSTA), and Association of Southeast Asian Nations (ASEAN) for concurrence. Once the East and Southeast Asia GCOS Action Plan is finalized and approved, donor agencies will be sought to fund the proposed projects.

The Director, RSMC Honolulu attended the core Pacific Islands Regional GCOS Implementation Team (PIRGIT) meeting in Auckland, New Zealand March 10-13, 2003. The core PIRGIT completed the PI-GCOS Implementation Plan which contains the PI-GCOS Goal, Objectives, Strategy, 31 specific project proposals, performance measures and indicators, and recommendations on methods to achieve an operational, sustainable PI-GCOS Program. It was determined that the PIRGIT will evolve into the PI-GCOS Steering Group to ensure the PI-GCOS Program maintains the momentum it has obtained.

At the invitation of the Niuen Government, the Director, RSMC Honolulu presented a two-day workshop in Alofi, Niue on Systematic Observations and the Pacific Island GCOS (PI-GCOS). Government participants included personnel from the National Meteorological Service, Climate Change Project Office, Water Management, Public Works, Public Health, Land Survey, Power Generation, and Airport Management. There was a great deal of discussion during the workshop on what type and format of climate observations, products, and services were needed by the Niue decision makers. Plans and projects were developed to meet these requirements. The 48-page final report will be submitted to the United Nation Framework Conference on Climate Change (UNFCCC) Subsidiary Body for Scientific and Technical Advice (SBSTA) as part of Niue's Climate Change Project reporting requirements.

The Senior Service Hydrologist, RSMC Honolulu, attended and made a presentation at the NWS and USGS co-sponsored an interagency flash flood workshop held on May 22, 2003. The Workshop has held to discuss agency roles, missions, capabilities, and potential local flood warning system projects. The workshop attendees included representatives from the NWS, USGS, the National Park Service, and the State Department of Land and Natural Resources.

Jack Beven from RSMC Miami conducted an extensive two-day training program for the CPHC hurricane specialists on May 6-7, 2003. The training consisted of a review of the Dvorak intensity analysis, recent research related to tropical cyclones, and a discussion of some of NHC's "best practices" which could be implemented at CPHC.

On July 22, 2003, RSMC Honolulu continued its recurring tropical cyclone/hurricane training program to maintain a high level of proficiency among the hurricane and satellite specialists. Two satellite specialists provide training on tropical cyclone analysis of intensity and location using the Dvorak scale. RSMC Honolulu has a large area of the central north and south Pacific for which it provides tropical cyclone fixes. This training was provided because of the number of new people on staff and also to standardize the fix information provided by the office.

On October 31, 2003, Mr. Allan Rarai from Vanuatu completed his 6 week International Pacific Desk Training Internship. Since 2001, thirteen students have completed the Pacific Desk Internship. The students have been from Fiji, Samoa, Tonga (2), Solomon Islands, Cook Islands, Tuvalu, Vanuatu (2), Tokelau, Papua New Guinea, Kiribati, and Niue. Ms. Mai Chi Nguyen from Vietnam is scheduled to attend this training from November 10, 2003 to December 19, 2003. The Pacific Region in coordination with WMO and US NWSH/International Activities is currently in the process of selecting attendees for 2004.

The delegate from **Viet Nam**, reported that in 2003, staff of Viet Nam NHMS participated in the various training courses and workshops foreign countries:

- One officer attended the Training course on Satellite Meteorology and global climate in India, from 31 July 2002- 30 April 2003.
- One officer attended the Training course on Advanced Operational Hydrolgy in Sweden, from 25 August to 26 September 2003.
- One Officer attended the Interim Training course for operational forecaster in Honolulu, USA from 10 November to19 December 2003.
- Two officers attended the Training course on Hydrological Forecasting in USA from 1 September to 31 December 2003.
- Two officers attended a seminar on Storm surge forecasting in the South China sea.
- Two officers attended the Training course for Advanced forecasters in Melbourne, Australia from 13 – 24 October 2003.
- One officer attended the Typhoon Committee Roving Seminar on the interpretation of satellite and radar data in Hong Kong, China from 22 to 24 October 2003.
- One officer attended the RA II/RA V Regional Training Seminar on Interpretation of DGPS Products and Improvement of Public Weather Service (PWS) in Brunei from 8 to 19 2003.

APPENDIX X

SUMMARY OF THE REPORTS OF THE TYPHOON COMMITTEE MEMBERS ON THEIR ACTIVITIES RELATED TO THE RESEARCH COMPONENT

The delegate from **China**, reported that in the past year, tropical cyclone (referred as TC hereafter) research was mainly carried out in the areas of TC landfalling, structure and structure change, extratropical transition (ET), vortex Rossby wave mechanism, track forecasting techniques, TC climate statistics and interannual variation etc..

More importance was attached to TC landfalling program with the acronym of CLATEX (China Landfalling Typhoon Experiment) in the past year. The scientific objective of the CLATEX is (a) acquisition of intensive data from various sources of boundary layer and upper level of landfalling typhoon (b) to get better understanding of the structure and intensity change and track turning arise from the topography impacts on the coastal typhoons. The experiment site was in Hailingdao island near the coast of Yangjiang in the west part of Guangdong province. A monitoring area in South China Sea for 24 and 48 hours surveillance and the rules of selecting the target typhoon were established. The standard of activation and termination for the intensive observation program (IOP) were setting up as well. Some advanced instruments such as wind profiler, Doppler radar, ultrasonic anemometer, optical rain-gauge, radiosonde, satellite observation, tower observation, automatic weather stations and conventional upper level and surface observation etc. were employed. Severe storm Vongfong (0214) was selected as a target typhoon put into field experiment. CLATEX made more account of the variation of boundary layer structure arisen from the topography effect around the period of landfall. Some of the analysis of IOP data shows that there are distinct different features between pre-landfall and post-landfall on turbulence flux and vertical motion structure□which change abruptly during landfall.

With the mesoscale mModel MM5, the extratropical (ET) transition process of a landfalling typhoon is simulated. Based on the results of simulation, the structure change characteristics were analysed. It is indicated that main ET process is transforming the TC barotropic symmetric structure into baroclinic asymmetric one due to the intrusion of cold air from the middle-upper troposphere and the warm temperature advection in the lower layer. The cyclone would be developed after in conjunction with the westly trough in the upper level and the import of warm and moist flow in lower layer, which is favorable to TC getting intensification in the ET process. An f-plane quasi-geostrophic barotropic vorticity equation model of high resolution is designed to investigate the propagation characteristics of vorticity and the effect of nonlinearity on the propagation within a typhoon circulation, wherein two mesoscale vortices coexist at different radial positions. The results of 10 sets of experiments suggest that inward propagations of vorticity would strengthen the TC intensity more distinct than the exist of only one vortex, vorticity detains in the inner region of typhoon circulation for a longer time, and the local maximum wind speed in the inner region increases obviously.

Study the TC intensity change with barotropical vorticity equation. Four sets of the numerical simulation were implemented. The main results demonstrated that the TC would strongly intensified when a MSV merged into the TC. On the other hand, TC intensity would have no obvious change if without the interaction with a MSV. Using the East China Sea Tropical Cyclone Forecasting Model developed by Shanghai Typhoon Institute, in connection with a variational assimilation of initial temperature and relative humidity fields based on meteorological satellite brightness temperature, the TC track forecast is addressed. The result shows that the assimilation of the 400~925hPa temperature, and temperature-relative

humidity initial fields has improved the TC track prediction in certain degree. With a barotropic primitive equation model, ensemble forecasting of tropical cyclone motion was studied by perturbing initial position and structure of TC. The results show that TC initial position perturbation makes its track different, but ensemble mean is close to control forecast. Experiments were also performed by perturbing TC initial parameters which were used to generate TC initial field indicating 60%~70% of all cases' skill is improved in selective ensemble mean.

Based MM5 and its four dimensional variational data assimilation (4D-Var) system an optimal initial condition is generated for a typhoon by using the bogus data assimilation (BDA) scheme. BDA is able to recover many of the structural features of typhoons including a warm-core vertex, the correct center position, and the strong circulation. With a BDA bogus surface low, the intensity forecast is improved. Some improvements are made in the track forecast, but more work still needs to be done. Apart from the TC dynamic and synoptic studies mentioned above in the past year, the climatic features of tropical cyclone were also investigated. Statistical study shows that the interannual and interdecadal variations of the landing typhoon frequency over China during summer exist certain relation with the intensity of East Asian summer monsoon circulation, the positions of the subtropical anticyclone over the western North Pacific, the situation of South Asian anticyclone at 200hPa, and the variations of the tropical atmospheric heat and moisture source. The total number of landfalling typhoon was above below normal while the intensity of East Asian summer monsoon circulation strengthened weakened , the position of the ridge-line of subtropical anticyclone over the western North Pacific was north bias south bias from the normal position and the east erly wind over the region 120~160°E 5~15°N at 200hPa became stronger weaker than the average.

The research work carried out by the members of Shanghai Typhoon Institute has been focused on the following aspects:

Cloud-derived-winds are assimilated into MM5 using a 4DVAR system and 48h simulation is carried out with the optimized initial field. Results show that the cloud-derived-wind is helpful in obtaining a better initial field, which describes important synoptic and sub-synoptic features more correctly, and the 4DVAR technique is an effective tool for adding the wind information into the model. Simulation with assimilation has a 24h tropical cyclone (TC) track error 36% less than that without, and 48h 8% less.

Variation assimilation technique is applied to construct a bogusing TC with AMSU temperature data and sea surface pressure field built artificially on the basis of minimum central pressure. Such a bogusing scheme solves to some extent the problems met by former one that there is always a quite large difference in intensity between the bogusing and real TCs, and a certain period of time is needed to finish the adjustment among different variables during the integration. Experiments demonstrate that TC intensity forecast can be markedly improved with this scheme.

The "best size" data compiled by JTWC are used to study the features of TC size in the western North Pacific in 2001. Results indicate that there are some differences in the statistical characteristics between the gale circle and the outer closed surface isobar surrounding the TC. If the TC size is defined as the radius of gale circle, it is large in August and October, while small in September and November. The TC enlarges (shrinks) in size with the increase of latitude at low- (mid-) latitudes. The radius of gale circle correlates fairly well to the minimum central surface pressure and the maximum wind speed near the center. The mature stage of a TC arrives in two days after it attained its lifetime maximum size. The TC moving northwestward is the biggest, and becomes smaller while deviating. Small (Large) TC

turns clockwise (anticlockwise) when the size increases. The TC size is also related to the radius of the maximum wind near the center and the pressure of outer closed surface isobar.

The method of estimating the TC size is investigated based on experiential model of TC wind distribution. The "best size" data of 2001 compiled by JTWC are used to determine the empirical constants of different models and compute their estimating precision. According to the asymmetric distribution of fitted size, we obtain the asymmetric model of TC wind distribution and ascertain basic features of parameters in the model, including seasonal variation, geographical distribution and so on. These findings provide new evidences for the study of TC size and asymmetry.

GMS-5 IR TBB data are used to examine the relationship between TC intensity and the symmetric and asymmetric components of convection. It is suggested that: 1) Significant negative correlativity exists between TC intensity and the symmetric TBB values at a distance of about 1~1.5 degree in latitude from the center; 2)There is large discrepancy between two TCs in the correlativity outside 2.5 degree radius; 3)The TC intensity is poorly related to the symmetric component of TBB near the center; 4)The asymmetric TBB is predominantly negatively (positively) correlated to TC intensity to the left (right) of the center. Besides, the Fourier decomposition technique is applied to analyze the distribution and evolution of asymmetric convection at different stages of an intense TC.

Using two sets of large-scale analyses data, the effect of TC-trough interaction on the intensity change of a TC is re-addressed by studying the evolution of eddy flux convergence of angular momentum (EFC) and vertical wind shear for two TCs in the western North Pacific. Special attention is paid to the values of EFC and vertical wind shear during their maintenance stage. It is concluded that a trough does not have to be either "good" or "bad", and can be "neutral" in terms of intensity change.

The structure of two mid-latitude troughs is compared to investigate its influence on the intensity change of TC recurving near China coast. It is found that strong TC-trough interaction extending downward to mid-troposphere is unfavorable for the intensification or maintenance of TC. Troughs in different structure can modulate the intensity of TC in different ways by imposing large or small vertical wind shear on the TC.

Favorable large-scale conditions are searched for abrupt intensification of TC in South China Sea before landfall through both case and composite studies. Evidence indicates the importance of the low-level convergence and vapor transportation by the southwesterlies, the upper-level outflow toward the tropics and appropriate collocation of mid-tropospheric sub-tropical high and westerly trough.

Wavelet analyses are performed on the time series of TC frequency, locations of formation and tracks. A predominant cycle of 2 to 4 years is discovered for all of them, with the amplitude showing an inter-decadal change. The inter-annual variation is related to the change of nearby cross-equator flow to some extent. However, compared with that in the western North Pacific, TC activity in South China Sea shows a poorer relationship with the cross-equator flow, which might be due to the particularity of the active season and the local circulation in the region.

Ensemble prediction techniques of TC track are investigated using primitive equation models. Compared are two methods (BGM and LAF) of perturbing TC circulation and/or environmental fields. It is concluded that slightly better track forecast can be obtained by perturbing the environmental fields via BGM method.

Co-operating with the Shanghai East China Model University, Shanghai Typhoon Institute developed a "Western North Pacific Tropical Cyclone Data Search and Service System", which was released for test to the National Meteorological Center and meteorological bureaus or observatories in all coastal provinces or cities by the Prevention and Disaster-Reduction Department of CMA in June 2003. The system is consisted of two parts. One is the western North Pacific TC databank and the other a bank of essential data-search methods. The former covers all the basic data of TC in the western North Pacific from 1949 till now, and the latter involves multiple search functions, including a series of analog and abrupt change searches.

The delegate from **Hong Kong** reported that a total of 36 research papers were completed in 2003 on various topics including tropical cyclones, rainstorms, numerical modeling, short-range climate forecasting, aviation meteorology, ozone studies and remote sensing. Forecasts on the annual rainfall and number of tropical cyclones expected to affect Hong Kong in 2003 were issued to the public in March 2003. A study on climate change in Hong Kong by analyzing the trend of a number of meteorological and oceanographic observations was completed. A technical report on the study results was prepared to form the basis of Hong Kong's contribution to the national communication as required by the Kyoto Protocol.

A joint project with the Hong Kong Polytechnic University to explore the use of GPS technology in operational forecasting and numerical modelling was in progress. A collaboration project with Guangdong Meteorological Bureau and Macao Geophysical and Meteorological Bureau on the development of a rainstorm nowcasting system for the Pearl River Delta has commenced.

The delegate from **Japan** reported that a cost-effective high-resolution typhoon model is currently under development at the Meteorological Research Institute (MRI) based on a non-hydrostatic model developed by JMA. The model has a multiply-nested movable mesh configuration with a two-way interactive nesting strategy and explicit microphysics to correctly represent typhoon inner-core structure and its evolution. A preliminary experiment using this model showed that the ring-shaped eyewall and its associated heavy precipitation are successfully simulated, when a horizontal resolution of 2 km is attained in the inner core region of the typhoon. Results suggest necessity of using such a high resolution model for an accurate typhoon intensity and precipitation prediction.

Structures of storms during the extratropical transition (ET) were studied at MRI using the global objective analysis dataset of JMA. These studies were intended to contribute to establishment of the international consensus on the definition of ET. Twenty-one ET cases in 2001-2002 were classified into three categories: 1) warm seclusion pattern (9 cases), 2) open wave pattern (10 cases), and 3) cold advection pattern (2 cases). Results showed that the warm frontogenesis precedes in most of the ET cases, suggesting the process of ET would be related to the asymmetric distribution of the heavy rainfall. Further studies on this subject will be conducted based on internationally exchanged views for the mutual agreement in the field of not only research but also operational forecasting.

The delegate from **Macao, China** reported that seven papers were presented in the 17th Guangdong-Hong Kong-Macao Seminar on Meteorological Science and Technology, as follows:

- The Analysis on Severe Tropical Storm "Hagupit" (0218);
- The South China Sea Tropical Cyclone Strong Wind forecast;
- Analysis on Rainstorm Process in Macao at August 9, 2002;

- The application of Q-vectors on rainstorm forecasts;
- The Preliminary Study of Heavy Rain Warning;
- Trial Operation of Wave Model;
- The preparation of meteorological data in Macao over the last century.

After a period of collection, arrangement, analysis and calculation of data recorded, a CD-ROM named "100-year of Macao Climate data" was published by SMG in March 23 this year, thus becomes one of the NMHSs in the world that have 100-year record of climatic data. The practice of meteorological observations has a relatively long history in Macao and was not ceased even during the World War II. The CD-ROM, currently in Chinese version, consists of 4 main data including temperature, pressure, wind and precipitation. Other data such as observed weather and sunshine duration were also included. More data information will continue to be added in the future. The CD-ROM contains also a paper introducing the main climatic feature of Macao. The published of the CD-ROM aims to contribute to the studies of both the regional and global climatic variation especially the climatic effects of the urbanization over the Southern China and the rapid development of Pearl River Delta region.

Meteorological research in collaboration with Department of Atmospheric Physics of Zhongshan University, China is continued. Eleven research papers were published in different scientific journals from 1 November 2002 to 31 October 2003, as follows:

- The activity of South Asia Anticyclone and the onset of South China Sea summer monsoon in 1998, Journal of Geosciences of China, Vol.4, No.3-4, Dec.2002 , pp62-69;
- Numercial Simulation of A Mesoscale Convective System(MCS) During the First Rainy Season Over South China, Acta Meteorologica Sinica, Vol.17 No.1, 2003, pp79-93;
- Climatic Characteristics of the Intensity and Position of the Subtropical High in the Western Pacific, Tropical Geography, Vol.23 No.1, 2003, pp35□39 (in Chinese);
- Effects of abrupt climate change on droughts in North China in 1970's, International Symposium on Climate Change (ISCC), March 2003;
- Numerical Prediction Experiment on Typhoon Maggie(9903), Acta Oceanological Sinica, Vol.25 No.4, 2003, pp29□35 (in Chinese);
- Multi-MCSs (Mesoscale Convective Systems) over the Heavy Rainfall Region During 23-24 May 1998 in South China□Acta Scientiarum Naturalium Universtatis Sunyatseni, Vol.42 No.3, 2003, pp73□78 (in Chinese);
- Numerical Prediction Experiment of an Advection Fog in Nanling Mountain Area, Acta Meteorologica Sinica, Vol.17 No.3, 2003, pp337-349;
- Advancement in the study of Typhoon Rainstorm, Journal of Tropical Meteorology, Vol.19 Suppl., 2003, pp152□159 (in Chinese);
- Features of the Surface Wind Distribution of Typhoon Vongfong Landfall Process based on QUIKSCAT Data, Journal of Tropical Meteorology, Vol.19 Suppl., 2003, pp88□96 (in Chinese);
- A Multi-selective Air Quality Model System, ChongQing Environment Science, 2003, No.11 (in Chinese)
- The Establishment of the South China Sea Summer Monsoon in 1998: The Northward Jump of South Asia Anticyclone and Its Effect on the Onset of South China Sea Summer Monsoon, Acta Meteorologica Sinica, Vol.17 Suppl, 2003, pp35-45

The delegate from **Malaysia** reported that efforts are being diverted to probe into the relationship of sea-surface temperature in the South China Sea and ENSO evolution as well as the in-depth studies of cold surges during the northeast monsoon.

In flood hydrology, on-going research projects are as follows:

- Flood mapping for Kelantan river using Radarsat.
- Urban hydrology study.
- Reduction of flood runoff quantity using roof interception and soil infiltration method.
- Impacts of logging on Muda and Pedu Reservoirs.

In the **Philippines**, the Research and Development program of PAGASA aimed to further develop and continually improve procedures, methods and techniques that would improve operational forecasting and warning capabilities as well as delivery of meteorological, hydrological geophysical and astronomical services to various users. Efforts were directed towards enhancing the application of meteorological information and knowledge in solving drought-related problems, water resources management, utilization and conservation of solar/wind energy, coastal zone development, urban and building planning and other developmental activities that need the services of the Agency. The following researches/studies were completed during the year:

- A study on tropical cyclone activity over northwest pacific, before, during and after the 1997-98 El Niño phenomenon
- Slope Movement Associated with Heavy Rainfall
- Impact of Long Duration Atmospheric Variability on Surface Water Supply
- Health risk Map Related to Tropical Cyclone Occurrences In Metro Manila
- Evaluation of Rainfall Forecasting using Mesoscale Model Version 5 (MM5)
- Extreme Rainfall Hazard Mapping in the Philippines
- Statistical Rainfall Forecast (Part I – Persistence and the Use of Past Year Data)
- Analysis of Heavy Rainfall and Flash Floods in Metro Manila
- Tropical Cyclone forecasts: Then and Now

The delegate from the **Republic of Korea** reported that improving the Flood Forecasting Prediction system at the Nakdong River; according to the necessity of more accurate flood forecasting, the review on the flood prediction type optimization was studied with the topics of estimate flow type data, reservoir operation, etc.

According to the 'Feasibility Study on Nationwide Hydrological Radar Networking System and Improvement of the Flood Warning and Forecasting System', MOCT determine the hydrological radar networks of 11 radar stations considering hydrological, meteorological, geophysical and flood management aspects.

MOCT has completed the pilot project of flood hazard map for the vulnerable areas of Han river basin. And also invest the project on developing the techniques of real time hydrological data quality control.

The delegate from **Singapore** reported that the Automated Meteorological Data Monitoring System (AMDMS) was first set up a in 1993 with the objective to monitor weather conditions, particularly rainfall throughout Singapore. The System comprises a network of rainfall, temperature, wind and water level stations linked together and to a master station located at Main Met Office, Changi Airport. The system has been of great value to the issuing of heavy rain warning. However, electronic gadgets especially tipping buckets used in AMDMS, generally require a lot of maintenance to ensure reliability.

In 2003, a project to upgrade the system was conducted. Most stations are now equipped dual tipping buckets for the measurements of rain intensity and rainfall. Two simultaneous measurements enhances confidence in the real-time use of the data for heavy

rain warning, and assist in the data quality control and management of preventive maintenance.Plan for further enhancing the system to include installation of wind sensors at selected at selected locations is being considered.

The delegate from **Thailand** reported that the joint research project between Royal Irrigation Department, Royal Forestry Department of Thailand and Lancaster University, Southampton University, Cambridge University of UK titled " Effect of Climate and Landuse Change on River Hydrology in Thailand incorporating an Integrated Analysis of Catchment Runoff at Different Spatial Scales" is on-going during phase II (2002 – 2005) supported by the British Council. The project is the continuation from phase I (1999 – 2002) which revealed using statistical analysis of meteorological and river discharge time-series data at Mae Chaem river basin, Chiangmai province by the software MicroCAPTAIN. In phase II the technology will include the Topography based hydrological model (TOPMODEL), the Rainfall – Runoff model (HYRROM) and the Hydraulics model (HEC-RAS v 3.0). Two hydrologists from RID had been trained on-the-job at the Universities in UK for a month this year.

The delegate from the **United States of America** reported that the U.S. Geological Survey (USGS) automatic rain gauges on Guam captured record rainfall rates during Typhoon PONGSONA, a 100+ year rainfall event. This event closely followed another 100+ year rainfall event caused by Typhoon CHATAAN in July 2002. These rainfall data are the subject of a research proposal from the Water and Environmental Research Institute (WERI) at the University of Guam to analyze the rainfall patterns and develop new 100-year rainfall flood maps.

Dr. Chen, University of Hawaii Meteorology Professor, and the Senior Service Hydrologist, RSMC Honolulu, submitted a COMET Cooperative Project Proposal on the "Application of High Resolution Mesoscale Models to Improve Weather Forecasting in Hawaii." If awarded, the research will continue work on the existing Mesoscale Spectral Model (MSM) then switch over to the Weather Research and Forecast (WRF) model when the source code becomes available. The WRF is planned to eventually replace the existing operational NCEP models.

The Mesoscale Spectral Model (MSM) is a high resolution numerical weather prediction model capable of producing weather forecasts in both real-time and research modes. A previous joint research project between the NOAA/NWS RSMC Honolulu and the University of Hawaii, Department of Meteorology enabled 1.5 km resolution forecasts out to 48-hours for the island of Oahu on a real-time basis to be accomplished. Model results are posted to a web page for access by operational forecasters. Ongoing development of the model physics package and especially the land surface model will help improve the representation of the mesoscale circulation features that play a large role in determining spatial and temporal distributions of wind and rain.

RSMC Honolulu is working closely with CIMMS, University of Wisconsin to implement the Advanced Objective Dvorak Technique (AODT) in Hawaii. RSMC Honolulu currently has the Objective Dvorak Technique (ODT) operational and wants to implement the AODT because of the improvements it offers in many areas of identification and intensity analysis.

The delegate from **Viet Nam** reported that:

- Research for correcting "The guideline on the operation of Hoa Binh hydropower" for strengthening the reasonable water resources management.
- Application of a new hydrodynamic model to assimilate and predict flood flow for the lower of Red river.

APPENDIX XI

REVIEW OF TROPICAL CYCLONES IN 2003

In **China**, the following typhoons occurred in2003:

Imbudo (0307)

Imbudo formed over the western North Pacific in the afternoon of July 17.After forming, it moved northwestward and intensified into a severe tropical storm in the morning of July 19 and a typhoon in that evening, at the same time, Imbudo speeded up to 25km/h. In July 22, it crossed Luzon Island and moved into northern part of South China Sea. This typhoon moved northwestward continually and made landfall over Yangxi-Dianbai, Guangdong province at 02:00UTC July 24 with the max winds of 38m/s near center. Only four hours after landing, Imbudo weakened to a severe tropical storm and moved into Guangxi province .In the morning of July 25, Imbudo became a tropical depression and then disappeared in Guangxi province. 29 persons died or were missing, and 859 persons wounded. The economic loss was estimated about US$411.9million.

Koni (0308)

In the afternoon of July 18, Koni formed over the central part of South China Sea. After forming, it moved northwestward and intensified gradually. In the morning of July 20, Koni became a severe tropical storm and moved into the northern part of South China Sea. On July 21, Koni made landfall over Wanning, Hainan province at 10:35UTC with the max winds of 21m/s near center. Then, Koni crossed Hainan province and moved into Beibu gulf. It moved with the former direction and weakened gradually. In the evening of July 22, Koni moved out of our responsible area. The economic loss was estimated about US$241.3 million.

Morakot (0309)

Morakot formed over the sea east of Philippines in the afternoon of Aug 2. After forming, it moved northwestward with the speed of 20km/h and crossed Bashi Channel and moved close to Taiwan province. In the afternoon of Aug 3,Morakot intensified into a severe tropical storm and made landfall over Taidong, Taiwan province at 13:50UTC that day. It had the max winds of 25m/s near center when landing. Then Morakot crossed the southern part of Taiwan and moved into Taiwan Strait. It made the second landfall over Jinjiang, Fujian province at 11:30UTC Aug 4 with the max winds of 18m/s near center. Morakot weakened into a tropical depression quickly and then disappeared in Fujian province. 7 persons died or were missing. 9 persons wounded. The economic loss was estimated over US$300 million.

Vamco (0311)

Vamco Formed over the western North Pacific, where is the sea southeast 500km to Taiwan in the afternoon of Aug 19. After forming, it moved northwestward quickly into East China Sea in the evening of that day. At 02:10UTC Aug 20, Vamco made landfall over Pinyang, Zhejiang province with the max winds of 23m/s. After landing, this tropical cyclone moved northwestward continually and weakened quickly. In the evening of Aug 20, Vamco became a tropical depression and disappeared in the Zhejiang province. The economic loss was estimated over US$888 million.

Krovanh (0312)

Krovanh formed over the western North Pacific in the evening of Aug 20 and moved westward after forming. In the next evening, it intensified into a severe tropical storm. And then it became a typhoon in the morning of Aug 22. During that day, Krovanh crossed Luzon Island and moved into the central part of South China Sea. In the evening of Aug 23, this typhoon moved into the northern part of South China Sea and turn to move northwestward gradually. At 20:10 Aug 24, Krovanh made landfall over Wenchang, hainan province with the max winds of 35m/s near center. Only two hours after its first landing, Krovanh landed again, and the landing-area is Xuwen, Guangdong province and it is still a typhoon when this landing. After its second landing, this tropical cyclone crossed the Southern part of Guangdong province named Leizhou-Peninsula and moved into Beibu gulf. At 22:30UTC Aug 25, Krovanh landed over the border of China and Vietnam and then disappeared here. 5 persons died or were missing. 336 persons wounded. The economic loss was estimated over US$345.5 million.

Dujuan (0313)

Dujuan formed over the western North Pacific at night of Aug 29 and moved west-northwestward with the speed of 20-25km/h after forming. It intensified into a typhoon quickly. In Sept 1, Dujuan crossed Bashi channel and moved into the northeast of South China Sea. Dujuan made its first landfall over Huidong, Guangdong province at 11:50UTC Sept 2 with the max winds of 40m/s. Then it moved westward continually into Daya-Bay. Only one hour later, it made its second landfall over Shenzheng, Guangdong province with the same intensity as the former landing. Dujuan moved into the estuary of Zhujiang-river soon and then made its third landfall over Zhongshan, Guangdong province with the max winds of 33m/s near center at 15: 15UTC that day. Dujuan weakened to a tropical depression quickly after the final landing and disappeared near the boundary of Guangdong province and Guangxi province. 44 persons died or were missing. 298 persons wounded. The economic loss was estimated over US$311.3 million.

In **Hong Kong, China,** in 2003, the occurrence of three tropical cyclones necessitated the issuance of local warning signals in Hong Kong .

During the passage of Typhoon Hagupit, 32 persons were injured in Hong Kong. Trees and scaffoldings toppled at various places in the territory in the high winds. The Government Flying Services of the Hong Kong Special Administrative Region rescued 37 fishermen on board three fishing boats over the rough sea.

The approach of Typhoon Imbudo caused 1 death and 11 injuries in Hong Kong. 18 passengers and four crew members aboard of a Macau-bound jetfoil were also injured when the boat traveled over rough seas near Hong Kong.

Typhoon Dujuan skirted 30 km north of Hong Kong on the night of 2 September 2003. Gale to storm force winds were generally experienced in Hong Kong, with a short interval of hurricane force winds in the northwestern part of the territory. Typhoon Dujuan also necessitated the issuance of the Increasing Gale or Storm Warning Signal No. 9, the first time since the passage of Typhoon York in 1999. During the passage of Dujuan, four fishermen in a boat were found missing off Sai Kung. 22 people were also injured by falling objects.

In **Japan**, in 2003, there were five tropical cyclones of tropical storm (TS) intensity or higher as of 23 October, among which STS Linfa and TY Etau made landfall over the country. STS Linfa (0304), TY Soudelor (0306), TY Etau (0310), TY Maemi (0314), TY Choi-wan (0315).

In **Macao, China**, the Tropical Cyclones entered into the zone of responsibility of Macao, China (Radius <= 800 Km) and affected our area in the period from 1st September 2002 to 31st August 2003 were:

Severe tropical storm	KONI(0308)	20-21JUL 2003.
Typhoon	IMBUDO (0307)	22-24JUL 2003.
Typhoon	KROVANH (0312)	23-25AUG 2003.
Typhoon	DUJUAN (0313)	01-03SEP 2003.

Severe Tropical Storm KONI (0308)

Around 00 UTC on 16th July, KONI formed as a tropical depression over the Pacific to the east of the Philippines (near 9.0°N, 130.5°E) and drifted to the west-northwest at a speed of 6 to 10 km/h. After traversed middle Philippines on 17th, it entered the South China Sea on the following day. It intensified into a tropical storm near 12.4°N, 119.3°E around 06 UTC on 18th, with central pressure of 998 hPa and maximum wind near center of 65 km/h. It then turned slightly to the northwest direction towards Hainan. Two days later, it intensified into a severe tropical storm near 16.2°N and 114.9°E around 00 UTC on 20th, with central pressure of 985 hPa and maximum wind near center of 92 km/h and approached Hainan steadily.

KONI was closest to Macao at about 470 km (near 18.5°N, 111.1°E) to the south-southwest around 08 UTC on 21st. It then crossed southern Hainan and weakened into a tropical storm over Gulf of Beibu around 18 UTC on the same day of 21st. KONI quickly downgraded into a tropical depression overland and continued to dissipate.

Typhoon IMBUDO (0307)

Around 06 UTC on 15th July, IMBUDO formed as a tropical depression over the Pacific to the east of the Philippines (near 6.5°N, 149.0°E) and drifted to the west-northwest slowly. It intensified into a tropical storm near 8.5°N and 140.9°E around 06 UTC on 17th, with central pressure of 996 hPa and maximum wind near center of 65 km/h. It then veered slightly to the northwest and approached Luzon. IMBUDO became a severe tropical storm near 10.6°N and 136.5°E around 18 UTC on 18th, with central pressure of 985 hPa and maximum wind near center of 92 km/h.

Twenty-four hours later, it attained typhoon strength over the Pacific (near 10.9°N, 133.5°E) around 18 UTC on 19th, with central pressure of 970 hPa and maximum wind near center of 121 km/h. It then moved steadily to the northwest and after traversed Luzon on 22nd, it entered the South China Sea quickly, at a speed of 25 to 30 km/h towards the coast of Guangdong. At around 01 UTC on 24th, IMBUDO made landfall near Maoming and kept moving to the northwest overland. It was closest to Macao at about 200 km (near 21.3°N, 1117°E) to the west-southwest around 02 UTC and downgraded into a severe tropical storm and then a tropical storm respectively later the day. It further weakened into a tropical depression near the border of China and Viet Nam the following morning on 25th.

Typhoon KROVANH (0312)

KROVANH developed as a tropical depression over the Pacific to the east of the Philippines (near 12.5°N, 144.7 °E) around 00 UTC on 17th August and moved to the northwest at a speed of over 10 km/h. Three days later, it intensified into a tropical storm near 19.0°N, 113.3°E around 12 UTC on 20th, with central pressure of 998 hPa and maximum wind near center of 65 km/h. It then turned slightly to the west-southwest, heading Luzon. One day later, it became a severe tropical storm near 17.8°N and 125.8°E around 18 UTC on 21st, with central pressure of 985 hPa and maximum wind near center of 92 km/h. Twelve hours later, it attained

typhoon strength offshore Luzon over the sea (near 17.7°N, 123.3°E) around 06 UTC on 22nd, with central pressure of 970 hPa and maximum wind near center of 120 km/h. It then traversed the northern Luzon during the night on 22nd. After entered the South China Sea the next morning, it veered to the west-northwest towards the coast of southern China. KROVANH was closest to Macao at about 300 km (near 19.6°N, 112.5°E) to the south-southwest around 14 UTC on 24th. Within day 25th, it crossed Leizhou Peninsula, weakened into a severe tropical storm overland, entered Gulf of Beibu and made landfall again near the border between China and Viet Nam. It then continued dissipating overland in Viet Nam.

Typhoon DUJUAN (0313)

DUJUAN gradually developed as a tropical depression over the Pacific to the east of the Philippines (near 19.0°N, 140.2 °E) around 06 UTC on 27th August and moved to the west at a speed of 19 km/h. It intensified into a tropical storm near 16.2°N, 134.6°E around 18 UTC on 29th, with central pressure of 998 hPa and maximum wind near center of 65 km/h. It continued drifting westwards initially, but then became quasi-stationary and veered to the northwest, heading Luzon. Twelve hours later, it intensified into a severe tropical storm near 16.5°N and 134.1°E around 06 UTC on 30th, with central pressure of 985 hPa and maximum wind near center of 92 km/h and gradually approached Bashi Channel. Another twelve hours later, it strengthened into a typhoon over the Pacific (near 18.5°N, 132.2°E) around 18 UTC on 30th, with central pressure of 970 hPa and maximum wind near center of 121 km/h. It passed Bashi Channel on 1st September entering into the South China Sea at a speed of 30 km/h and continued heading towards the Pearl River Delta region.

DUJUAN made the first landfall to the coast next to Daya Bay and continued travelling westwards across the north of Hong Kong. It then made the second landfall to the western coast of Pearl River Delta region between Macao and Guangzhou. DUJUAN was closest to Macao at about 80 km (near 22.8°N, 113.4°E) to the north around 16 UTC on 2nd, when weakened into a severe tropical storm at the same time. It then continued to dissipate quickly overland.

In the **Philippines**, there were 15 tropical cyclones that entered in its area of responsibility (PAR).

Typhoon AMANG (Kujira/0302), April 16 – 24, 2003

An advisory was issued as early as 3 pm when AMANG (Kujira/0302) was still in the vicinity of Caroline Islands. It became a typhoon of 160 kph winds on the 17th.as it entered the Philippine Area of Responsibility (PAR) at 13.9 °N and 134.7 °E. After moving westward for two days, AMANG (Kujira/0302) was about 400 km northeast of Samar in the morning of April 19. It turned to move in the northwest direction for the next four days over the sea. It slowed down for the last 48 hours where it begun to change to a more northward displacement. At the same time, it weakened into a tropical storm with maximum winds of 65 kph. By morning of April 23, the storm was near Batanes. From the eastern side of Luzon Strait, AMANG (Kujira/0302) recurved to a north northeast direction until it finally exited the PAR in the evening of 24th April. AMANG (Kujira/0302) was the first tropical cyclone in 2003 that directly affected the Batanes Group of Islands.

Tropical Depression BATIBOT, May 19 - 20, 2003

BATIBOT was a fairly weak tropical depression that managed to last 24 hours at about 460 km E of Northwestern Mindanao. So far, this was the only low latitude tropical cyclone to form in the PAR this year.

Tropical Storm CHEDENG (Linfa/0304), May 25 – 30, 2003

CHEDENG (Linfa/0304), the first TC formed over the South China Sea for the year 2003. It initiated the onset of the SW monsoon. It started as a tropical depression with 55 kph winds while at 200 km west of Luzon. It moved slowly towards land in a SE to E direction, at the same time gaining strength. CHEDENG (Linfa/0304) reached severe tropical storm strength with 105 kph winds and hit land in the morning of 27th. Terrain effect reduced its center winds down to 75 kph. It passed over Dagupan by noon that day and moved into the mountainous areas of Nueva Vizcaya and Isabela. By midnight, it cleared the eastern Coast of Isabela. It gained more latitude for the next two days while over the northern Philippine Sea and then accelerated towards the northern boundary of the PAR in the morning of May 30.

Tropical Storm DODONG (Nangka/0305), May 31 – June 03, 2003

TS DODONG (Nangka/0305) likewise formed over the South China as a tropical depression, a day after CHEDENG (Linfa/0304) left the PAR. It started with 50 kph maximum winds while it was 400 km west of Luzon, tracing the northwest boundary of the PAR within a period of 48 hours. DODONG (Nangka/0305) came very close to Luzon approximately 210 km northwest of Laoag City in the morning of June 02. This time, it attained a severe tropical storm strength, accelerated and followed an east-northeast track across Luzon Strait, until the final warning was issued at 2 pm of June 03.

Typhoon EGAY (Soudelor/0306), June 13 – 18, 2003

EGAY (Soudelor/0306) started out as an active low pressure area in the vicinity of northern Carolinas Group of Islands. It eventually entered into the PAR and formed into a tropical depression in the early morning of June 10. Within 36 hours, it developed into a tropical storm while moving towards Samar. Public storm warning signal (PSWS) #2 was raised over Samar and part of the Bicol region. EGAY (Soudelor/0306) came close to about 100 km of Samar in the afternoon of June 14 and began to turn northwestward within the next 18 hours By morning of June 15, it was located at 90 km east of Catanduanes. The storm developed further as it skirted the coast of Eastern Luzon for over two days. It was already a severe tropical storm to the east of Northern Aurora when EGAY (Soudelor/0306) became a typhoon in the morning of 17th June.

Tropical Depression FALCON, July 09, 2003

FALCON was a short-lived tropical cyclone. It formed into a tropical depression at 55 kph about 450 km west of Metro Manila or 360 km southwest of Zambales in the afternoon of July 09. Six hours later, it exited the PAR without any warning signal raised during its lifetime. It was the third tropical cyclone in 2003.that formed over the South China Sea.

Tropical Storm GILAS (Koni/0308), July 15 – 19, 2003

Tropical Storm GILAS (Koni/0308) formed as a tropical depression over the Pacific to the east of the Philippines (near 9.0°N, 130.5°E). It then drifted to the west-northwest at a speed of 19 to 21 kph. GILAS (Koni/0308) entered the PAR through the southern part of the Philippine Sea in the afternoon of July 15. It was the first tropical cyclone to cross the Visayas this year. Two days later, it intensified into a severe tropical storm near 16.2°N and 114.9°E around 00 UTC on 20th, with central pressure of 985 hPa and maximum wind near the center at 92 kph, exited the PAR through the South China Sea and approached Southern China steadily.

Super Typhoon HARUROT (Imbudo/0307), July 19 – 23, 2003

HARUROT (Imbudo/0307) was already a severe tropical storm before it entered the PAR. The initial warning on HARUROT (Imbudo/0307) was issued as early as 19th July, a day prior to TS GILAS (Koni/0308) exit in the PAR. Their presence in the area served to further deepen the monsoon trough across the country. Upon entrance in the PAR, HARUROT (Imbudo/0307) increased acceleration and took a generally west-northwest track over the Philippine Sea across the Northern Luzon and into the South China Sea. It peaked at 190 kph while about 280 km east of Catanduanes in the afternoon of the 21st July. Twelve hours later, HARUROT (Imbudo/0307) weakened to 130 kph at a location 200 km east of Northern Aurora. PSWS #4 was issued in places along the direct path of the typhoon. The province of Isabela suffered the initial brunt when the typhoon eye crossed over the area before noon of July 22, Subsequently, the rest of Northern Luzon suffered very heavily. HARUROT (Imbudo/0307) caused 64 deaths and injured 154 persons..

Tropical Depression INENG, July 30 – 31, 2003

One of the short lived tropical cyclones, INENG started out as a tropical depression 350 km east of Visayas in the afternoon of July 30.

Typhoon JUANING (Morakot/ 0309), August 01 – 04, 2003

Similar to about half of the tropical cyclones that formed inside the PAR, JUANING (Morakot/ 0309) was detected in the Central Philippine Sea as an active low pressure area (LPA) on the first day of August. It became part of the active monsoon trough that cut across the country. It came close to land at a position 250 km from the tip of Cagayan province. JUANING (Morakot/ 0309) followed a generally northwest course across the Central Philippine Sea to Luzon Strait. The typhoon hit Basco with 85 kph center winds in the morning of August 03.. It exhibited a more poleward movement while over Bushi Channel and hit southern Taiwan. Apparently influenced by another tropical cyclone in the vicinity, it changed course to the west-northwest and went out of the PAR on August 4.

Typhoon KABAYAN (Etau/0310), August 18 – 20, 2003

KABAYAN (Etau/0310) was already a severe tropical storm with 105 kph center winds, when it entered the PAR at 2 pm of August 4 (15.7 N/135 E). It rapidly deepened and intensified into a typhoon that peaked at 150 kph at sea at about 800 km east-northeast of Batanes. It crossed the northern Philippine Sea more than two and a half days, moving at 19 kph in the general direction of the southern islands of Japan.

Tropical Storm LAKAY, August 18 – 20, 2003

For two days, LAKAY stayed as a tropical depression with 45 kph winds in Luzon Strait. It looped due to terrain effect and had binary interaction with another tropical cyclone, later named as MANANG. It developed into a storm as it exited the PAR.

Tropical Storm MANANG (Vamco/0311), August 19, 2003

MANANG formed at a location northeast of Luzon or east of Taiwan on the 19th of August. It paired with LAKAY even as it was yet a low pressure area (LPA) system. It was quite far to have a direct effect to the country. It exited the PAR twelve hours after formation into a tropical depression.

Typhoon NIÑA (Krovanh/0312), August 20 – 23, 2003

NIÑA (Krovanh/0312) developed as a tropical depression over the Pacific to the east of the Philippines (near 12.5°N, 144.7 °E) on the morning of 17th August and moved to the northwest at a speed of over 10 kph. An initial alert warning was issued on NIÑA (Krovanh/0312) while it was still outside of PAR (19.3°N, 132.5 °E) in the morning of August 20. Twenty-four hours later, it intensified into a tropical storm near 19.0°N, 113.3°E. On 22nd August, NIÑA (Krovanh/0312) attained typhoon strength at about 240 km east of Cagayan-Isabela area. It moved with an increasing speed in a west-southwest direction for two days and placed northern Luzon in a grave threat with its apparent landfall. PSWS #3 was hoisted over Cagayan, Calayan, Babuyan and northern Isabela. NIÑA (Krovanh/0312) hit Cagayan at 4 pm on 22nd August. With the frictional effects of the Cordillera Mountain range, NIÑA (Krovanh/0312) deteriorated into a tropical storm. It later re-intensified into typhoon strength when it moved out of the South China Sea.

Typhoon ONYOK (Dujuan/0313), August 29 – September 01, 2003

ONYOK (Dujuan/0313) was already a storm when it entered the PAR. It experienced a rapid depressing and intensification while in the Northern Philippine Sea, while moving NW-west-northwest towards the Bashi Channel and Luzon Strait. ONYOK (Dujuan/0313) peaked at 150 kph winds, ten hours before it came near Batanes in the morning of September 1. That night, it was 35 km north of Itbayat or 60 km north of Basco. The final warning was issued 6 hours later in the early morning of September 2. It continued to move towards Formosa Strait.

In **Republic of Korea**, a total of four typhoons affected the Korean Peninsula both directly and indirectly from May to September in 2003; Linfa (0304), Soudelor (0306), Etau (0310), and Maemi (0314). Typhoon Maemi landed the southern part of Korean Peninsula, and Typhoon Soudelor passed through the Straits of Korea. However, Linfa and Etau were comparatively weak because of their movement far from the Korean Peninsula. The typhoons in 2003 resulted in 133 deaths and 420 billion Korean won worth of damage.

Soudelor (0306)

The tropical depression over the sea 1,100 km southeastward of Manila Philippines, quickly strengthened to Tropical Storm Soudelor 09UTC 13 June and gradually strengthened to a typhoon 12UTC 17 June. It reached a peak intensity estimated at 76 kt later that day, when the center came within 240 km of Taipei, Taiwan. The center rapidly moved to northward and passed through the Strait of Korea on 19 June. After that, the typhoon rapidly weakened to a low.

Maemi (0314)

A tropical depression formed at 1800 UTC 4 September, about 900 km southeast of Guam. The cyclone reached tropical storm status by 0600 UTC September 6. The cloud pattern continued to organize and the cyclone developed an eye, becoming a typhoon by 0000 UTC 9 September.

Maemi had moved toward the west-northwest by 0000 UTC 11 September. The cyclone gradually intensified and reached its maximum intensity of 54.1 m/s, with a minimum pressure of 910 mb, at 1800 UTC 10 September. Maemi then turned toward north-northeast and made landfall near Sacheon City in the southern part of Korean Peninsula around 1200 UTC 12 September with recorded 10-min sustained winds of 40 m/s and a minimum pressure of 958 hPa. The cyclone weakened to a extratropical low by 2100 UTC 13 September on Sahalin Island.

In **Singapore**, no tropical cyclones occurred in 2003.

In **Thailand**, there were 2 tropical cyclones named "KONI" (0308) and Tropical Depression that took place and passed Thailand in 2003 (1 January – 31 October). The brief description is as following :

Tropical storm "KONI" (0308)

An area of low pressure over the Western North Pacific Ocean, east of the Philippines, intensified into the tropical depression in the morning of 16 July. It moved northwestwards at first to traverse the Philippines on 17 July and tracked westwards to the South China Sea in the morning of the following day. It developed into the tropical storm "KONI" with centered latitude 12.3 degree north and longitude 119.1 degree east on the same day. KONI moved to the Bay of Tonkin before making landfall the upper Vietnam and weakened into the tropical depression over LAO PDR about 300 km east of Chiang Rai province, Thailand, at 01.00 am on 23 July. Tracking westwards, it then entered Thailand over Chiang Rai province and weakened into the low pressure cell before moving further inland to Myanmar and finally dissipated in the morning of the same day.

While KONI closed to the Bay of Tonkin, there was typhoon "IMBUDO" in the South China Sea. These caused Thailand dominated by the active southwest monsoon. Due to combined effect of the KONI and the active southwest monsoon, scattered to almost widespread rain with several heavy to very heavy fall and floods were reported in upper Thailand during 20-25 July.

Tropical Depression

An active low pressure cell in the Gulf of Thailand intensified into the tropical depression in the evening of 22 October with centered latitude 10.2 degree north and longitude 101.0 degree east. It was almost stationary at first but took on a more northerly course the next day. It made landfall between Amphoe Kui Buri and King Amphoe Sam Roi Yod ,Prachuap Khiri Khan province in the southern Thailand, in the evening of 24 October before moving further to Myanmar, the Andaman Sea and finally moved to the Bay of Bengal on the next day.

The heavy to very heavy falls associated with it caused serious flooding, especially in Phetchaburi and Prachaup Khiri Khan provinces. The economic loss was estimated at more than 1 billion baht.

In the **United States of America**, in 2003 the following tropical cyclones (TCs) of tropical storm intensity or greater occurred within WFO Guam's AOR. Individual narratives for tropical cyclones that reached minimal tropical storm intensity within the AOR follow: (please note that tropical cyclone intensity is expressed as a 1-minute maximum sustained surface wind in this section.)

0301 YANYAN (01W)

Forming in the near-equatorial trough on 13 January 2003, the weak circulation that became YANYAN first appeared to the south of Majuro (WMO 91376). As it tracked to the northwest towards Pohnpei (WMO 91348), the circulation was slow to develop. On 16 January, it passed by Pohnpei with an intensity of 30 knots. YANYAN reached minimum tropical storm intensity on 17 January, as it passed north of Chuuk (WMO 91334). Now the Mariana Islands, which were just recovering from PONGSONA's passage, were threatened. Fortunately, YANYAN recurved just east of the island of Saipan in the northern Marianas on 18 January. After reaching a peak intensity of 50 knots on 18 January, YANYAN tracked northeastward and weakened to a tropical

depression on 20 January. Dissipation occurred a day later. Tinian and Saipan suffered some flood damage to secondary roads and experienced localized power and phone outages. No reports of injuries were received.

0302 KUJIRA (02W)

Like YANYAN, the tropical disturbance that was to develop into KUJIRA formed near the equator southwest of Pohnpei (WMO 91348). On 6 April 2003, a surge of equatorial westerly winds began steering the disturbance eastward towards Kosrae (WMO 91356). Before reaching Kosrae, the track of the disturbance changed to the north. On 9 April, KUJIRA passed just to the east of Pohnpei with an intensity of 35 knots. Then, the track of the tropical storm became more westward in response to the steering flow associated with the subtropical ridge to the north. KUJIRA reached typhoon intensity as it passed to the north of Chuuk (WMO 91334) on 12 April. The typhoon continued to intensify, passing south of Guam (WMO 91212) on 15 April and north of Yap (91413) into the Philippine Sea on the 16th, where its intensity peaked at 135 knots for 12 hours. KUJIRA slowly weakened until it neared 130 E longitude where reintensification began. The typhoon reached 125 knots as it exited the AOR on 18 April. The southern parts of Guam received minor damage to crops, roads, houses, and the island experienced some localized power and phone outages. No reports of injuries were received.

0303 CHAN-HOM (04W)

As part of a multiple tropical cyclone outbreak in the Philippine Sea with Tropical Depression 03W, the tropical disturbance that became CHAN-HOM formed at the eastern end of the monsoon trough to the southwest of Chuuk (WMO 91334) on 17 May 2003. It tracked slowly to the northeast towards Chuuk in response to enhanced westerly winds near the equator. On 19 May, the system reached tropical storm intensity. A day later, the tropical storm executed a major track change to the northwest, as the system came under the steering influence of the subtropical ridge to the northeast. Intensification continued with CHAN-HOM becoming a minimal typhoon to the east-southeast of Guam (WMO 91212) on 22 May. The typhoon tracked slowly to the north until recurvature took place two days later. Then, CHAN-HOM accelerated to the northeast and exited the AOR on 25 May with an intensity of 115 knots. Chuuk and the Mortlock Islands to the south experienced heavy rains, and gusty winds, which resulted in significant crop damage. One fatality was reported. Of note: as CHAN-HOM moved east of Saipan, the western part of the circulation caused volcanic ash from the eruption of Anatahan Island (16.35N, 145.67E) in the northern Marianas to move over Saipan, closing the airport for 18 hours.

306 SOUDELOR (07W)

On 8 June 2003, a tropical disturbance formed southeast of Chuuk (WMO 91334) at the eastern terminus of the monsoon trough. Slow to develop, the disturbance that was to become SOUNDELOR drifted west-northwestward and passed over Yap (WMO 91413) as a tropical depression on 11 June. Two days later, SOUNDELOR reached minimal tropical storm intensity just before exiting the AOR on a track to the west-northwest. Both Chuuk and Yap experienced gusty winds and periods of heavy rain, but no reports of any injuries or damage were received.

307 IMBUDO (09W)

Forming south of Pohnpei (WMO 91348) on 14 July 2003, the circulation that became IMBUDO consolidated at the eastern end of the monsoon trough. The circulation passed south of Chuuk (WMO 91334) on 15 July and headed for Yap (WMO 91413). IMBUDO intensified to a tropical storm on 17 July and passed over Yap on 18 July with maximum sustained winds of 50 knots. Continuing to track west-northwestward along the axis of the monsoon trough, IMBUDO

became a typhoon later in the day. On 20 July, the typhoon reached a peak intensity of 130 knots as it exited the AOR on a path toward the west-northwest. During its lifetime, IMBUDO followed KONI along the axis of the monsoon trough. Gale-force winds and torrential rains associated with IMBUDO affected Yap and Ulithi (WMO 91204). Minor damage to housing and crops and localized loss of electric power occurred on Yap. No reports of injuries were received.

312 KROVANH (12W)

At the end of the second week of August 2003, a monsoon depression developed between Pohnpei (WMO 91348) and Chuuk (WMO 91334). This system tracked to the northwest, passing over Chuuk on 15 August and headed for the southern Mariana Islands. On the morning of 17 August, the tropical depression passed across Guam and began to slowly consolidate. KROVANH reached minimal tropical storm intensity on 20 August and exited the AOR on the following day on a track to the west. KROVANH was part of a multiple cyclone outbreak with VAMCO. No reports of damage or injuries were received.

313 DUJUAN (14W)

After KROVANH exited the AOR on 20 August 2003; tropical cyclone activity in the monsoon trough in Micronesia was suppressed until 26 August, when, multiple circulations formed along the axis of the trough. The circulation that became DUJUAN, located to the west of Guam (WMO 91212), developed and tracked west-southwestward along the axis of the trough. On 29 August, the circulation became a tropical storm and the next day a typhoon. DUJUAN with maximum sustained winds of 90 knots exited the AOR on 31 August. No reports of damage or injuries were received.

314 MAEMI (15W)

On 3 September 2003, as Typhoon DUJUAN coasted into southern China, a new circulation formed northeast of Pohnpei (WMO 91348) at the eastern terminus of the active monsoon trough. Tracking westward towards Guam, the circulation was slow to intensify. It crossed over Guam (WMO 91212) on 6 September and reached minimal tropical storm intensity the following day. Interaction with a weak circulation in the trough to its west resulted in MAEMI taking a more northwesterly track on 7 September. MAEMI became a typhoon later on the same day. Intensification continued, with the typhoon reaching 115 knots as it exited the AOR on 9 September. No reports of damage or casualties were received.

315 KOPPU (17W)

On 21 September 2003, a surge in the westerlies was associated with the formation of a circulation between Yap (WMO 91413) and Guam (WMO 91212). This circulation remained quasi-stationary for two days before moving away to the northwest. Then, as the steering flow from the ridge to the northeast weakened, the circulation stalled again. After resuming its northwest motion, KOPPU recurved on 26 September, reached minimal tropical storm intensity and accelerated along a track to the northeast. KOPPU exited the AOR the next day. No reports of damage or casualties were received.

317 KETSANA (20W) and 0318 PARMA (21W)

In mid-October 2003, the axis of the monsoon trough became reverse-oriented and extended from a low in the South China Sea to the northeast. By 17 October, two circulations were present in this trough in the Philippine Sea. The one that was to become KETSANA, was located to the northwest of Koror (WMO 91408) in Palau. The other that developed into PARMA

was located to the north of Guam (91212). As both circulations intensified, KETSANA became a tropical storm on 20 October and a typhoon a day later. PARMA reached tropical storm intensity on 21 October, exited the AOR, and moved off to the northeast. KETSANA remained quasi-stationary until 23 October. With PARMA to the northeast affecting the steering flow, KETSANA moved slowly northward and finally exited the AOR on 24 October. No reports of damage or injuries were received.

In 2003, 3 tropical cyclones have occurred in the **Central Pacific**: 2 tropical depressions and one hurricane.

Tropical Depression One-C

Early on August 15, 2003, Tropical Depression One-C formed to the southeast of the Hawaii Islands. The tropical system remained weak and moved westward. It dissipated on August 17, 2003 at 0000 UTC approximately 300 miles south of the Big Island of Hawaii.

Tropical Depression Guillermo

Tropical Depression Guillermo formed in the east Pacific and rapidly became a hurricane during the early part of August 2003. As it moved westward, it began to weaken and when it crosses 140W into the central Pacific, it was a weak depression. The system dissipated on August 13, 2003 at 0000 UTC, 18 hours after entering the central Pacific.

Hurricane Jimena

Hurricane Jimena formed in the east Pacific on August 28, 2003 at 0600 UTC. By August 28, 2003 at 1800 UTC it became a tropical storm, and within 18 hours of this it became a hurricane. Hurricane Jimena crossed 140W into the central Pacific on August 30, 2003 at 0600 UTC as a Category 2 Hurricane with winds of 85 knots. It maintained its intensity and continued due west along 17.5N latitude and past approximately 100 miles south of the Big Island of Hawaii. After passing the Big Island, Jimena began to weaken and by September 3, 2003 at 0600 UTC it became a tropical depression. It continued westward and crossed 180 into RSMC Tokyo's area of responsibility on September 5, 2003 at 0900 UTC as a tropical depression. After a brief intensification, it crossed 180, Jimena dissipated in the northwest Pacific.

In **Viet Nam**, in 2003, three typhoons either landed or directly affected Viet Nam and another one TD indirectly has its impact in the country.

Typhoon IMBUDO (0307)

Moving at a speed of 30 km/h, IMBUDO crossed the Luzon Island with an intensity of 75 kts on 22 July kts on 22 July 2003. Weakened slightly when entering the South China sea, IMBUDO continued its west-northwest track with the speed and attained its strength of 75 kts by noon of 23 July. Fifteen hours later, it landed on Quangdon (China) province. Maintaining its west-northwest movement, IMBUDO weakened gradually and moved further inland, aabout 100 km east of Viet Nam, Chian border and later dissipated as a low pressure area int eh evening of 25 July. At Mong Cai (48838), maximum sustained winds of 15 m/s, gust of 23 m/s and minimum pressure of 990.6 mb were recorded. IMBUDO brought heavy rains of 100 – 150 mm the norteastern part of Viet Nam, but no significant damage was reported.

Typhoon KROVANH (0312)

KROVANH upgraded into a tropical storm in the late afternoon of 20 August 2003. Moving steadily tot eh west-southwest at an average speed of 23 km/h, it gradually gained its

strength and reached typhoon intensity on the morning of 22 August. Keeping its track, KROVANH crossed the Luzon Island on the evening of the same day and weakened slightly due to the interaction with terrain before entering the South China Sea in the early morning of 23 August. Since then it took a west northwest to northwest track at a speed of 20 to 25 km/h while maintained its typhoon intensity. Early morning of 25 August, KROVANH landed on the southern part of Loishow peninsula then entered the north of Beibu Gulf in the same morning. KROVANH slowly weakened as it approached the coast of Viet Nam and landed on Quang Ninh province in the evening of 25 August where maximum wind of 25 m/s, gust 35 m/s and minimum seal level pressure of 975.9 mb were recorded at Mong Cai (48838). KROVANH weakened rapidly as it moved further inland and dissipated later as a low pressure area over the northwest border with China in the early morning of 26 August. Due to KROVANH, 1 person was dead, 8 were injured. Heavy rains of 100-150 mm occurred in most provinces of North Viet Nam bringing floods to some river system in this region. Total damage amounted to 1,4 million US$.

Severe Tropical Storm KONI (0308)

A Tropical Depression was formed on the morning of 16 July 2003 about 400 km east of the Philippines. Moving steadily to the northwest, it crossed central Philippines and entered the South China sea in the morning of 18 July. It upgraded into tropical storm KONI in the evening of the same day. Since then, KONI too a north northwest track at a speed of about 16 km/h and gained its gradually. KONI reached its peak intensity of 55 Kts in the evening of 20 July, just about 350 southeast of Hainan Dao. Continuing its path, KONI traversed Hainan Dao by night f 21 July and entered the Beibu Gulf early the next day with a slight decrease in intensity. KONI made landfall on Nam Dinh province in the afternoon n of 22 July where maximum sustained winds of 24 m/s, gust of 30 m/s and minimum pressure of 981.4 mb were recorded. KONI rapidly weakened into a low pressure area and dissipated over Laos.

Along its path, KONI left 6 people dead, 14 injured, 195 houses were collapsed. Total damage amounted to 2.4 millions US$.

Tropical Depression

Early morning of 8 September 2003, a low pressure area developed into a tropical depression, just about 200 km east of the central coast of Viet Nam. After formation, it moved towards the westnorthwest at an average speed of 12 km/h and landed on Nghe An province in the early morning of 9 September. Due to the interaction with cold air from the north, heavy rains of 200-300 mm occurred in coastal provinces from Quang Ninh to Ha Tinh, especially in Nam Dinh and Thai Binh provinces, torrential rains reached 600 – 750 mm in 3 days which brought severe damage tot eh country. Due to this Tropical Depression, 22 persons were reported dead and the total damage amounted to 44 millions US$.

APPENDIX XII

SUMMARY OF THE 2003 TYPHOON SEASON

As of 31 October, 19 tropical cyclones of tropical storm (TS) intensity or higher generated in the western North Pacific and the South China Sea in 2003. The total number is fewer compared to the average frequency of 23.1 by the end of October. Twelve cyclones out of them (63% of the total) reached typhoon (TY) intensity. Four out of the remainder attained severe tropical storm (STS) intensity and the others reached only TS intensity (see Table 1).

Table 1 List of tropical cyclones which attained TS intensity or higher in 2003

Tropical Cyclone		Duration (UTC)					Minimum Central Pressure (UTC)	(N)	(E)	(hPa)	Max Wind (kt)
TS	0301 YANYAN	180600	Jan	-	201200	Jan	180600	14.1	146.5	1000	35
TY	0302 KUJIRA	110000	Apr	-	250300	Apr	151800	12.7	138.3	930	90
TY	0303 CHAN-HOM	201200	May	-	270600	May	231800	17.4	151.5	940	85
STS	0304 LINFA	260000	May	-	310000	May	291800	24.3	129.1	980	55
STS	0305 NANGKA	010000	Jun	-	031200	Jun	011800	19.5	118.7	985	50
TY	0306 SOUDELOR	130600	Jun	-	191500	Jun	180600	26.4	124.5	955	80
TY	0307 IMBUDO	170600	Jul	-	250000	Jul	201200	12.5	130.7	935	90
STS	0308 KONI	180600	Jul	-	221800	Jul	201800	18.1	112.1	975	60
TS	0309 MORAKOT	020600	Aug	-	041200	Aug	021800	20.1	122.9	992	45
TY	0310 ETAU	030600	Aug	-	091800	Aug	070600	27.5	128.5	945	85
TS	0311 VAMCO	190600	Aug	-	200000	Aug	190600	22.7	124.8	996	35
TY	0312 KROVANH	201200	Aug	-	260600	Aug	220000	17.6	124.6	970	65
TY	0313 DUJUAN	291800	Aug	-	030000	Sep	010000	20.8	125.3	950	80
TY	0314 MAEMI	060600	Sep	-	132100	Sep	100600	24.0	126.6	910	105
TY	0315 CHOI-WAN	180000	Sep	-	230000	Sep	210600	31.0	137.0	955	70
TY	0316 KOPPU	261800	Sep	-	300600	Sep	290600	28.3	141.9	960	70
TY	0317 KETSANA	190000	Oct	-	260600	Oct	211200	17.0	131.2	940	90
TY	0318 PARMA	210000	Oct	-	311200	Oct	240000	29.2	154.1	930	95
STS	0319 MELOR*	301200	Oct	-	031800	Nov	311800	16.3	122.9	975	60

(Note) * Data for STS MELOR (0319) is provisional.

The tropical cyclone season of this year began in the middle of January with the development of TS Yanyan (0301). After Yanyan dissipated in late January, no tropical cyclone of TS intensity or higher formed for about two and a half months until early April. TY Kujira (0302), generated in early April, kept the TS intensity or higher for a long period of 14 days and 3 hours.

From May to June, two tropical cyclones of TS intensity or higher generated in each month. In July, the genesis number of tropical cyclones of TS intensity or higher was also two, which means tropical cyclone genesis was inactive in July.

Tropical cyclone genesis turned to be active in August. Five tropical cyclones of TS intensity or higher generated in August and these tropical cyclones hit or closely approached the southern China except TY Etau (0310) which hit Japan and brought damage to this country.

In September, tropical cyclone genesis became inactive again. Three tropical cyclones of TS intensity or higher generated in September and TY Maemi (0314) made landfall on the Korean Peninsula and brought heavy damage to the Republic of Korea.

Tropical cyclone genesis was slightly below normal in October. Three tropical cyclones of TS intensity or higher generated in October and TY Parma (0318) took a large elliptical track over the waters southeast of Japan.

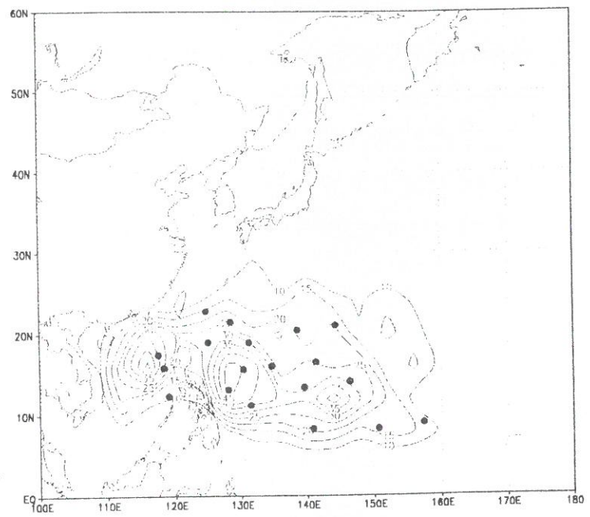


Figure 1 Genesis points of 19 TCs generated from January to October 2003 (dots) and frequency distribution of genesis points for 1951-2002 (lines).

Narrative Accounts of Tropical Cyclones in 2003

TS Yanyan (0301)

Yanyan formed as a tropical depression (TD) west of the Marshall Islands at 06UTC 15 January 2003. Keeping almost the same intensity, it moved west-northwestwards until it made an abrupt turn towards the north-northwest over the waters east of Guam at 00UTC 18 January. It developed into a tropical storm (TS) and reached its peak intensity with maximum sustained wind of 35kt southeast of Saipan at 06UTC 18 January. With the same intensity, it turned to the east-northeast and kept moving east-northeastwards with a speed of 25kt. It weakened into a TD east of the Mariana Islands at 12UTC 20 January. It transformed into an extratropical cyclone at 00UTC 21 January and dissipated far east of the Mariana Islands at 06UTC on that day.

TY Kujira (0302)

Kujira formed as a tropical depression (TD) south-southeast of Pompei Island at 00UTC 9 April 2003. It moved to the north, then to the northwest and became a tropical storm (TS) north of Pompei Island at 00UTC 11 April. It moved to the west and developed into a typhoon (TY) over the waters southeast of Guam at 00UTC 14 April. Then, it changed its direction to the west-northwest and reached the peak intensity north of Yap Island at 18UTC 15 April. It changed the direction to the west again at 18UTC 16 April, then to the northwest at 12UTC 18 April and moved northwestward east of Luzon Island. After it downgraded to the TS intensity near the Batan Islands at 18UTC 22 April, it changed the direction to the northeast. Keeping the TS intensity, it passed near Iriomotejima at around 10UTC 24 April and advanced to the East China Sea. Kujira downgraded to a TD west of Yakushima at 03UTC 25 April and dissipated west of Kyushu at 12UTC on that day.

TY Chan-hom (0303)

Chan-hom formed as a tropical depression (TD) near the Truk Islands at 00UTC 19 May 2003. After stamping at the initial place for 18 hours, it began to take a counterclockwise course and developed into a tropical storm (TS) east of Ulul Island at 12UTC 20 May. It changed its direction to the north and developed into a typhoon over the sea east of Saipan at 06UTC 23 May, then it reached its peak intensity with maximum sustained wind of 85kt over the sea northeast of Saipan at 18TUC 23 May. Keeping the same intensity, it turned its track from north to northeast. After passing over the sea east of Minamitorishima on 25 May, it weakened into TS over the sea far east of Japan at 00UTC 27 May. Then it transformed into an extratropical cyclone at 06UTC 27 May over the same waters and dissipated over the sea south of the Aleutian Islands at 12UTC 28 May.

STS Linfa (0304)

Linfa formed as a tropical depression (TD) over the sea west of Luzon Island at 06UTC 25 May 2003. It began to take a counterclockwise course and developed into a tropical storm (TS) over the same waters at 00UTC 26 May. It changed its direction to the east and developed into a sever tropical storm (STS) near the west coast of Luzon Island at 00UTC 27 May. Moving to the east, it landed on Luzon Island and weakened into a TS, then turned northeastwards at 12UTC 27 May. After leaving Luzon Island, it held a fairly straight northeastward track. Moving to the northeast, it redeveloped into a STS and reached its peak intensity with maximum sustained wind of 55kt over the sea south of Okinawa at 18UTC 29 May. I turned north-northeastwards and passed over the sea east of Kyushu. After landing on the western Shikoku, it transformed into an extratropical cyclone at 00UTC 31 May. It held a fairly straight northeastward track and entered the Sea of Okhotsk on 2 June, then dissipated over the same waters at 12UTC 4 June.

STS Nangka (0305)

Nangka formed as a tropical depression (TD) west of Luzon Island at 00UTC 30 May 2003. It moved to the west and made an abrupt turn to the northeast at 18UTC 31 May. It became a tropical storm (TS) over the same waters at 00UTC 1 June and reached its peak intensity with a maximum sustained wind of 50kt south-southwest of Taiwan at 18UTC on the same day. Holding a fairly straight northeastward track, it passed the Bashi Channel on 2 June and downgraded into a TD west of Minamidaitojima at 12UTC 3 June, then transformed into a extratropical cyclone south of the Kii Peninsula at 00UTC 4 June. It dissipated far east of Japan at 18UTC 7 June.

TY Soudelor (0306)

Soudelor formed as a tropical depression (TD) northeast of the Palau Islands at 00UTC 12 June 2003. It moved to the west-northwest and became a tropical storm (TS) east of the Philippines at 06UTC 13 June. It changed the direction to the west on 13 June, then to the north-northwest east of Samar Island on 14 June. Shortly after it changed the direction to the north, it upgraded into a typhoon south of Iriomotejima at 12UTC 17 June and passed Iriomotejima around half past 20UTC 17 June. Moving north-northeastwards in East China Sea, it reached its peak intensity with a maximum sustained wind of 80kt west of Okinawa at 06UTC 18 June. With gradual weakening, it passed Tsushima at STS intensity around 04UTC 19 June. Moving to the northeast, it transformed into an extratropical cyclone north-northeast of Oki Island at 15UTC 19 June. After it passed the northern part of Japan on 20 June, it dissipated far east of Japan at 06UTC 24 June.

TY Imbudo (0307)

Imbudo formed as a tropical depression (TD) south-southwest of the Truk Islands at 00UTC 15 July 2003. It moved to the north-northwest and changed the direction to the west at TD intensity. After changing the direction to the northwest around 21UTC 16 July, it became a tropical storm (TS) east-southeast of Yap Island at 06UTC 17 July. Imbudo held an almost straight west-northwest track until its dissipation. It upgraded into a severe tropical storm (STS) west-northwest of Yap Island at 18UTC 18 July and developed into a typhoon north-northwest of Palau Islands at 18UTC on the following day. It reached its peak intensity with a maximum sustained wind of 90kt east of Philippines at 12UTC 20 July. With gradual weakening, it made landfall on Luzon Island around 03UTC 22 July. It entered South China Sea around 09UTC 22 July and made a minor development over the same waters on 23 July. With rapid weakening, it made landfall west of Macao around 03UTC 24 July. It downgraded into STS at 06UTC 24 July, then into TS around Nanning at 12UTC on that day. It downgraded into TD around the border between China and Vietnam at 00UTC 25 July and dissipated over the same region at 18UTC on that day.

STS Koni (0308)

Koni formed as a tropical depression (TD) north of the Palau Islands at 00UTC 15 July 2003. It moved to the west and changed the direction to the west-northwest around 06UTC 16 July. It reached the southeastern edge of Samar Island around 00UTC 17 July and crossed the middle of Philippines at TD intensity on that day. Shortly after it entered South China Sea, it became a tropical storm (TS) north of Palawan Island at 06UTC 18 July. It changed its direction to the northwest around 18UTC 18 July and upgraded into a severe tropical storm (STS) over the middle of South China Sea at 00UTC 20 July. After it changed the direction to the west-northwest around 12UTC 20 July, it reached its peak intensity with a maximum sustained wind of 60kt southeast of Hainan Island at 18UTC on that day. With gradual weakening, it reached the southeastern coast of Hainan Island around 12UTC 21 July. It downgraded into TS over Hainan Island at 18UTC 21 July and entered Gulf of Tongking. After it landed on the coast of northern Vietnam around 08UTC 22 July, it downgraded into TD over the northern Laos at 18UTC on that day. It dissipated over the same region at 00UTC 23 July.

TS Morakot (0309)

Morakot formed as a tropical depression (TD) east of Luzon Island at 03UTC 1 August 2003. It took a counterclockwise track and began to hold an almost straight northwestward track around 18UTC 1 August. It became a tropical storm (TS) northeast of Luzon Island at 06UTC 2 August. It reached its peak intensity with maximum sustained wind of 45kt north of Luzon Island at 18UTC 2 August. It crossed Taiwan after 12UTC 3 August and weakened to a TD over Taiwan Strait at 12UTC 4 August. It dissipated over the same waters at 18UTC 4 August.

TY Etau (0310)

Etau formed as a tropical depression (TD) northeast of Yap Island at 18UTC 2 August 2003. It moved to the northwest and became a tropical storm (TS) north-northeast of Yap Island at 06UTC 3 August. Moving northwestwards, it developed into a severe tropical storm (STS) at 00UTC 4 August, then developed into a typhoon (TY) far southwest of Okinotorishima at 18UTC on the same day. It changed the direction to the north-northwest on 6 August and passed near Okinawa around half past 00UTC 7 August. It reached the peak intensity with a maximum sustained wind of 85kt north of Okinawa at 06UTC 7 August and changed the direction to the northeast. It passed near Amamioshima around half past 10UTC 7 August and made landfall around Muroto city, Kochi Prefecture at TY intensity before 13UTC 8 August. Then it passed near Awajishima around 18UTC 8 August and landed around Nishinomiya city, Hyogo Prefecture at STS intensity around 21UTC on that day. After traveling over Honshu with weakening, it entered the waters south of Hokkaido. It made landfall around Erimo Promontory at TS intensity around half past 16UTC 9 August and transformed into an extratropical cyclone over Hokkaido at 18UTC on that day. It entered Sea of Okhotsk and dissipated over the waters west of Kamchatka Peninsula at 00UTC 12 August.

TS Vamco (0311)

Vamco formed as a tropical depression (TD) east-northeast of Luzon Island at 06UTC 18 August 2003. It moved to the north-northwest and became a tropical storm (TS) and reached its peak intensity with a maximum sustained wind of 35kt over the sea south-southeast of Ishigakijima at 06UTC 19 August. It changed the direction to the northwest and weakened into a TD north of Taiwan Strait at 00UTC 20 August, then dissipated over the same waters at 06UTC on that day.

TY Krovanh (0312)

Krovanh formed as a tropical depression (TD) west of Pompei Island at 18UTC 13 August 2003. It moved west-northwestwards and changed the direction to the northwest over the sea south of Guam around 18UTC 16 August. Keeping TD intensity, it changed the direction to the west-southwest over the sea west-southwest of Okinotorishima at 12UTC 19 August. It became a tropical storm (TS) far south of Minamidaitojima at 12UTC 20 August and developed into a severe tropical storm (STS) northeast of Luzon Island at 06UTC on the following day. It developed into a typhoon and reached its peak intensity with a maximum sustained wind of 65kt east of Luzon Island at 00UTC 22 August, then it crossed the Island on that day. After it temporarily weakened to TS over the western coast of Luzon Island at 18UTC 22, it developed into a STS west of the Island at 00UTC on the following day and gradually changed the direction to the west-northwest. It developed into a typhoon and reached the second peak intensity with a maximum sustained wind of 65kt over South China Sea at 18UTC 24 August. After it passsed Leizhou Bandao around 00UTC 25 August, it landed on the northern coast of Vietnam at STS intensity around 12UTC on that day. It downgraded into a TS at 00 UTC 26 August and further downgraded into a TD over the northern part of Vietnam at 06UTC on that day. It dissipated over the northern part of Vietnam at 18UTC 26 August.

TY Dujuan (0313)

Dujuan formed as a tropical depression (TD) southeast of Okinotorishima at 18UTC 27 August 2003. It moved westwards and soon changed the direction to the southwest, and then it changed the direction to the west again south of Okinotorishima at 00UTC 29 August. It became a tropical storm (TS) south-southwest of Okinotorishima at 18UTC 29 August. Shortly after it changed the direction to the west-northwest, it developed into a severe tropical storm (STS) southwest of Okinotorishima at 06UTC 30 August and further developed into a typhoon west-southwest of the Island at 18UTC on that day. It reached the peak intensity with a maximum sustained wind of 80kt south of Miyakojima at 00UTC 1 September. It downgraded into a STS and made landfall around Hong Kong at 12UTC 2 September. Travelling over the southern coast of China, it downgraded into a TS west of Hong Kong at 18UTC 2 September. It downgraded into a TD east of Nanning at 00UTC 3 September and dissipated 6 hours later.

TY Maemi (0314)

Maemi formed as a tropical depression (TD) north of the Truk Islands at 00UTC 4 September 2003. It moved to the northwest and became a tropical storm (TS) west of the Mariana Islands at 06UTC 6 September. Holding a fairly straight northwestward track, it upgraded into a severe tropical storm (STS) far southwest of Okinotorishima at 18UTC 7 September, then upgraded into a typhoon (TY) south of Minamidaitojima at 18UTC on the following day. Still holding a northwestward track, it reached the peak intensity with a maximum sustained wind of 105kt southeast of Miyakojima at 12UTC 10 September. It passed near Miyakojima at the peak intensity after 19UTC 10 September and changed the direction sharply to the north-northeast. After it traveled over East China Sea, it made landfall on the southern coast of Korean Peninsula at TY intensity around 12UTC 12 September. It downgraded into STS near the eastern coast of Korean Peninsula at 18UTC 12 September and changed the direction to the northeast. It transformed into an extratropical cyclone over Sea of Okhotsk at 21UTC 13 September and dissipated over the adjacent waters of Chishima at 06UTC 16 September.

TY Choi-wan (0315)

Choi-wan formed as a tropical depression (TD) north-northwest of the Palau Islands at 00UTC 16 September 2003. It moved to the northwest, then changed the direction to the northeast around 00UTC 17 September. After the change of its direction to the northwest again around 12UTC 17 September, it became a tropical storm (TS) far south of Okinawa at 00UTC 18 September. Shortly after changing the direction to the north-northeast, it upgraded into a severe tropical storm (STS) south of Okinawa at 00UTC 19 September and passed the northeastern part of Okinawa around 0830UTC on that day. Then it passed Amamioshima around 2230UTC 19 September and turned east-northeastwards. It upgraded into a typhoon (TY) southeast of Kyushu at 15UTC 20 September. After reaching the peak intensity with a maximum sustained wind of 70kt south of Kii Peninsula at 21UTC 20 September, it turned northeastwards around 00UTC 21 September. Holding a fairly straight northeastward track, it downgraded into STS over the waters east of Honshu at 12UTC 22 September and transformed into an extratropical cyclone east of Hokkaido at 00UTC 23 September. It crossed the International Date Line on that day.

TY Koppu (0316)

Koppu formed as a tropical depression (TD) over the sea west of the Mariana Islands at 00UTC 24 September 2003. After moving toward west for about a day, it began to take an abrupt clockwise turn. Moving toward the northeast, it developed into a tropical storm (TS) over the sea east of Okinotorishima at 18UTC 26 September. While it developed slowly, it made a meandering track for about two days over the sea southwest of Chichijima. Then it reached Typhoon intensity at 00UTC 29 September near Chichijima. Soon, it reached its peak intensity with a maximum sustained wind of 70kt over the same waters at 06TUC on that day. Moving

toward the northeast, it weakened a little and transformed into an extratropical cyclone at 06UTC 30 September over the sea east of Japan and it turned north-northeastwards. After reaching the sea south of the Kuril Islands, it moved northeastwards and gradually changed the direction to the east over the sea south of the Aleutian Islands. It crossed the International Date Line at around 06UTC 3 October.

TY Ketsana (0317)

Ketsana formed as a tropical depression (TD) far east of Luzon Island at 06UTC 17 October 2003. It drifted west-northwestwards and became a tropical storm (TS) over the same waters at 00UTC 19 October. Shortly after changing the direction to the east-northeast, it upgraded into a severe tropical storm (STS) over the same waters at 18UTC 19 October and further deepened into a typhoon (TY) at 12UTC on the following day. It changed the direction to the north around 12UTC 20 October and reached the peak intensity with a maximum sustained wind of 90kt far east of Luzon Island at 00UTC 22 October. It turned northeastwards around 12UTC 22 October and traveled over the waters far south of Japan. Holding a fairly straight northeastward track, it downgraded into STS over the waters far southeast of Hachijojima at 18UTC 25 October. It transformed into an extratropical cyclone east of Honshu at 06UTC 26 October and dissipated over the same waters around 00UTC 27 October.

TY Parma (0318)

Parma formed as a tropical depression (TD) over the adjacent seas of the Mariana Islands at 00UTC 19 October 2003. It took a clockwise track and became a tropical storm (TS) over the same waters at 00UTC 21 October. It drifted northeastwards and upgraded into a severe tropical storm (STS) north of the Mariana Islands at 18UTC 21 October and further deepened into a typhoon (TY) at 06UTC on the following day. It took a clockwise elliptical track ranging about 9 and 21 degrees in latitude and longitude, respectively, from 00UTC 23 October to 12UTC 29 October. During this period, Parma reached its peak intensity twice. One of them is with a maximum sustained wind of 95kt north of Minamitorishima at 00UTC 24 October and the other one is 90kt west of the Island at 06UTC 29 October. After taking this elliptical track, it took a fairly straight east-northeast track and rapidly weakened into STS northeast of Minamitorishima at 00UTC 31 October. It transformed into an extratropical cyclone far northeast of Minamitorishima at 12UTC 31 October and crossed the International Date Line on 1 November.

STS Melor (0319) (provisional)

Melor formed as a tropical depression (TD) east of the Philippines at 00UTC 29 October 2003. It moved to the west and became a tropical storm (TS) over the same waters at 12UTC 30 October. It changed the direction to the northwest and upgraded into a severe tropical storm (STS) east of Luzon Island at 06UTC 31 October. It reached the peak intensity with a maximum sustained wind of 60kt off the eastern coast of Luzon Island at 18UTC 31 October and made landfall on the Island about 6 hours later. It downgraded into TS over Luzon Island and changed the direction to the north gradually. After changing the direction to the northeast over the Bashi Channel at around 12UTC 2 November, it reached the waters south-southwest of Iriomotejima at 12UTC on the following day and almost stationed there for more than a half day. It downgraded into TD over the same waters at 18UTC 3 November and began to move to the northwest about 12 hours later. It changed the direction to the northeast gradually near Yonagunijima from 12UTC 4 November. It transformed into an extratropical cyclone southwest of Kyushu at 18UTC 5 November and dissipated near Tanegashima around 06UTC on the following day.

APPENDIX XIII

REPORT OF THE INTERIM WORKING GROUP (IWG) ON THE REGIONAL COOPERATION PROGRAMME IMPLEMENTATION PLAN (RCPIP)

1. **Introduction.**

a. After a great deal of discussion concerning the roles/functions and responsibilities of the present Working Group on the RCPIP and those of the Typhoon Committee Secretariat (TCS), the 35th Session of the Typhoon Committee decided to establish an Interim Working Group (IWG) on the RCPIP for a period of one year. Based upon the *Guidance* provided by the Typhoon Committee in Appendix XVIII, TERMS OF REFERENCE OF THE INTERIM WORKING GROUP ON THE REGIONAL COOPERATION PROGRAMME IMPLEMENTATION PLAN (RCPIP), this Interim Working Group was to present options to the Typhoon Committee Members on various items described in the *Terms of Reference*. The option(s) selected by the Typhoon Committee will include a decision if a future Working Group on RCPIP is needed.

b. The following were the Duties and Assignments of the core Members of the IWG:

(1) Mr. James C. Weyman, USA, Chairperson, acted as an overall coordination function based on inputs/contributions provided by the members of the IWG of the RCPIP and prepared the draft changes to the ***Statute of the Typhoon Committee*** and the ***Rules of Procedure for the Typhoon Committee***.

(2) Ms. Tian Cuiying, China, Focal Point for Meteorology, sought inputs/ contributions in close consultation with the Members' focal points concerned on the basic framework of priorities for Meteorology and transmitted them to the Chairperson of the IWG of the RCPIP and prepared a draft document on overall options for the framework of priorities for activities of the Typhoon Committee.

(3) Mr. Junji Miwa, Japan, Chairperson, Working Group on Hydrology, sought inputs/contributions in close consultation with the Members' focal points concerned on the basic framework of priorities for Hydrology components and transmitted them to the Chairperson of the IWG of the RCPIP.

(4) Mr. Banchonsak Panthong, acting for Surapol Pongtadsirikul, Thailand, Focal Point for DPP, sought inputs/contributions in close consultation with the Members' focal points concerned on the basic framework of priorities for DPP and transmitted them to the Chairperson of the IWG of the RCPIP. With Mr. Koji Kuroiwa, Japan, Deputy Head, JMA Office of International Affairs, Planning Division, Administration Department, and the Director, RSMC Tokyo, he prepared a draft document, which describes recommendations by the Interim Working Group on the RCPIP to assist the Typhoon Committee in mobilizing resources to achieve the goals and objectives, as determined by the Typhoon Committee at its Thirty-Fifth Session.

(5) Mrs. Efigenia C. Galang, Philippines, Focal Point for Training, sought inputs/contributions in close consultation with the Members' focal points concerned on the basic framework of priorities for Training and transmitted them to the Chairperson of the IWG of the RCPIP and prepared a draft document on options and proposals on changes to the methodology and implementation of new technologies which may lead to efficiencies of the Typhoon Committee, TC Coordinator, and the TCS.

(6) Dr. Woo-Jin Lee, Republic of Korea, Chairman, TRCG, sought inputs/contributions in close consultation with the Members' focal points concerned of the Typhoon Committee Members on the basic framework of priorities for Research components and transmitted them to the Chairperson of the IWG of the RCPIP and prepared a draft document on options for reporting formats for the five components of the

RCPIP for the Typhoon Committee together with mechanisms aimed at improving the implementation of the RCPIP.

(7) Mr. Nobutaka Mannoji, Japan, Director, RSMC Tokyo, with Mr. Koji Kuroiwa, Japan, Deputy Head, JMA Office of International Affairs, Planning Division, Administration Department, and the Focal Point for DPP, prepared a draft document, which describes recommendations by the Interim Working Group on the RCPIP to assist the Typhoon Committee in mobilizing resources to achieve the goals and objectives, as determined by the Typhoon Committee at its Thirty-Fifth Session.

2. Activities of the Interim Working Group (IWG) on the Regional Cooperation Programme Implementation Plan (RCPIP).

c. **Work Plan.** On July 3, 2003, the chairperson of the IWG on the RCPIP sent, via e-mail, a work plan for the IWG identifying the duties and assignments of each core member of the IWG as given in Appendix XVIII, 35th Session of the Typhoon Committee, Terms of Reference of the IWG on the RCPIP. By August 27, 2003, each core member submitted their inputs according to their assigned duties and assignments. Ms. Efigenia Galang, Philippines, Focal Point for Training, prepared the initial draft of this document.

d. **Draft Documents.** After receiving each IWG core member's input by e-mail, the chairperson took the inputs, reformatted, integrated, and distributed them to all members of the IWG.

e. **Meeting.**

(1) The IWG of the RCPIP held a meeting in Tokyo, Japan on September 16-18, 2003.

(2) The seven core members of the IWG, given in 2 b. above, attended this meeting. In addition, the following people also attended the meeting as experts and advisors: Mr. Li Hung, China; Mr. Zheng Yunjie, China; Mr. Kenzo Hiroki, Japan; Mr. Ryosuke Kikuchi, Japan; Mr. Koji Kuroiwa, Japan; and Mr. Hiroshi Ishihara, Japan.

(3) The meeting was held in Tokyo, Japan at the very kind invitation of the Japan Meteorological Agency (JMA). Mr. Koichi Nagasaka, Director, Forecast Department, JMA, on behalf of the Director-General of JMA welcomed the participants and wished the meeting much success and all participants a comfortable stay in Tokyo. JMA provided outstanding, extensive support for the meeting which included a dedicated, fully equipped meeting room, computer and copying services, valuable reference materials, and much more which greatly enhanced the work of the Interim Working Group. In addition, the Director-General of JMA hosted a reception the first evening of the meeting to personally welcome the participants. The IWG expressed their deep appreciation to JMA for their superior support and active involvement in completing the work of the IWG.

(4) At this meeting, the members discussed the five deliverable documents required by the 35th Session of the Typhoon Committee and determined what these documents should contain. They then reviewed, edited, and revised each of the documents, and gave preliminary approval of the documents at the end of the meeting. In addition, the IWG prepared a sixth document for submission to the 36th Session of the Typhoon Committee which contained recommended changes to the ***Statute of the Typhoon Committee*** and the ***Rules of Procedure for the Typhoon Committee***.

3. Follow up. After the meeting through e-mail exchanges, the members finalized and approved the five required documents plus the one additional document. The Chairperson forwarded the final documents to the TCS on November 1, 2003 for circulation to all of the Typhoon Committee Members at least one month prior to the 36th Session of the Typhoon Committee as specified in Appendix XVIII Terms of Reference for the IWG of the RCPIP, 35th Session of the Typhoon Committee.

Options and Proposals on Changes to the Methodology and Implementation Of New Technologies Which May Lead to Efficiencies of the Typhoon Committee (TC), TC Coordinator, and the TC Secretariat (TCS)

1. Executive Summary (details provided below).

a. The 35th Session of the Typhoon Committee requested the Interim Working Group (IWG) to provide options to improve the efficiency and effectiveness of the Typhoon Committee, the TCS, and TCS Coordinator. The following are possible draft options/proposals developed by the IWG for the Typhoon Committee's consideration.

(1) Stronger, more involved role for the TC Chairperson, the TC Vice-Chairperson, and the five Component Focal Points/Chairpersons (attached).

(2) Establishment of Advisory Working Group (AWG) to assist the Chairperson of the Typhoon Committee and the TC Secretary (currently the Coordinator Position).

(3) Terms of Reference for Typhoon Committee (TC), TC Chairperson, TC Vice-Chairperson, Advisory Working Group, TC Secretary (formerly Coordinator), and TC Secretariat as shown in the attached.

(4) TC Sessions held every two years.

(5) Members volunteering to host the TCS (providing TC Secretary and TC Secretariat members) and/or providing seconding experts, as Members' resources and facilities permit.

(6) If Typhoon Committee considers and requests a final proposal on these five options/proposals, the IWG recommends that a working group be formed to work with Members to determine details and produce final proposal.

b. Other proposals for consideration:

(7) Formation of a Working Group on Training and Working Group on DPP.

(8) Strictly limit Members to 20 minutes maximum to present a summary of all five components of their Country Report at the TC Sessions.

(9) A more effective method be adopted to seek and obtain feedback/input from the TC Members.

(10) An expansion and reorganization of the current TCS website by the TCS and possible volunteer support from Members.

(11) TCS and Advisory Working Group (AWG) jointly develop a bi-annual operating/work plan and a 4 year strategic plan on their goals/objectives and performance measures for assisting Members in accomplishing the goals and objectives of the RCPIP.

(12) Recommend the Typhoon Committee Annual Review (TCAR) be published and distributed primarily on the Web and on CD ROM and be available on TC web site.

2. Options and Proposals.

The 35th Session of the Typhoon Committee requested the Interim Working Group (IWG) to provide options to improve the efficiency and effectiveness of the Typhoon Committee, the TCS, and TCS Coordinator. The following are possible options/proposals developed by the IWG for the Typhoon Committee to consider.

If Typhoon Committee considers and requests a final proposal on Options/Proposals a, b, and c, the IWG recommends that a working group be formed to work with Members to determine details and produce final proposals for the Thirty-seventh Session in two stages. Stage one is the request by the Thirty-sixth Session of the Typhoon Committee for a detailed, final proposal of these three items and the appointment of a working group to coordinate with the Members and to complete all of the required details associated with the these recommendations. Stage two is the activities of the working group (survey and coordination with Members on specific details), the

report to the Thirty-seventh Session of the Typhoon Committee by the working group on the details and options of the three proposals, and further discussions and decisions by the Thirty-seventh Session of the Typhoon Committee.

a. One proposal is that the TC organizational structure be changed from the current structure to the one proposed in the attached. In the proposed structure, the IWG recommends a series of checks and balances; stronger, more involved role for the TC Chairperson, the Vice-Chairperson, and the five Component Focal Points/Chairpersons; and consideration be given to the establishment of an Advisory Working Group (AWG) to assist the Chairperson of the Typhoon Committee and the TC Secretary (currently the Coordinator Position) to coordinate the implementation of TC decisions and to oversee and steer the TCS in between sessions. In addition, it is proposed changing the TC Coordinator to a TC Secretary position as stated in the original ***Statute for the Typhoon Committee***. A proposal for the general Terms of Reference for the Typhoon Committee (TC), TC Chairperson, TC Vice-Chairperson, AWG, TC Secretary (formerly Coordinator), and the TC Secretariat is attached. It is proposed that more detailed Terms of Reference and required checks and balances to ensure efficient/accountable actions be prepared by a future working group for these items. With the advances in Internet, it is expected that the AWG could accomplish most of its work via correspondence, supported by regular reporting from the TCS against a framework to be established by the AWG.

b. With the AWG in place, it is proposed that TC sessions be held biennially instead of yearly.

c. It is also proposed that Members share the burden by volunteering to host the TCS and/or seconding experts as Members' resources and facilities permit. It is recognized that continuity is important, so the hosting period should be ***at least*** a four year term with an additional term if approved by the Typhoon Committee. If the Members endorse the concept of changing the host for the TCS, then it is proposed that the TC Secretary and TC Secretariat positions be from the hosting Member.

If Typhoon Committee considers and requests a final proposal on Option/Proposal d, the IWG recommends that a working group be formed to work with Members to determine details and produce final proposals for the Thirty-seventh Session in two stages. Stage one is the request by the Thirty-sixth Session of the Typhoon Committee for a detailed, final proposal of this item and the appointment of a working group to coordinate with the Members and to complete all of the required details associated with the approval of this item. Stage two is the activities of the working group (survey and coordination with Members on specific details and Terms of Reference); the report to the Thirty-seventh Session of the Typhoon Committee by the working group on the details of the proposal, Terms of Reference, and options for consideration; and further discussions and decision by the Thirty-seventh Session of the TC.

d. At the working level, propose formation of a Working Group on Training and a Working Group on DPP with Terms of Reference to include:

   (1) To enhance capacity building through training and DPP activities and the provision of guidance materials to upgrade the capabilities of TC Members to provide better tropical cyclone, flood, and storm surge forecasts and warnings and DPP actions.

   (2) To organize TC workshops or seminars to train operational tropical cyclone forecasters and DPP personnel. Topics could include how to use new operational data, model products, such as the technique of consensus or ensemble forecasting, and DPP mitigation and response actions.

e. At each Typhoon Committee Session, IWG proposes that each Member be strictly limited to 20 minutes maximum to present a summary of all five components of their Country Report. The Members should present their 20 minute summary in PowerPoint format. Propose that an automated timer be used to signal the presenters when 5 minutes remains and then when their time is completed. The TC Chairperson has the responsibility to strictly enforce the 20 minute time limit. This proposal will provide more time for the Typhoon Committee to discuss items of importance, such as mobilization of resources, TC

budget, training, research, cooperation/collaboration, operational improvements, pilot studies, etc.

f. The IWG proposes a more effective method be adopted to seek and obtain feedback/input from the TC Members. Currently, the TCS, Component Focal Points, Working Groups, and TRCG, receive very little feedback or input on documents, questionnaires, requests for information, or any other items they send to Members for responses. The IWG proposes that each Member appoint one specific person who is overall responsible and one specific focal point for each of the five components for receiving, distributing, seeking comments/feedback, and forwarding information back to the TCS, Component Focal Points, Working Groups, and TRCG for that Member. If no response is received, then the Member's principal Typhoon Committee representative would be contacted for assistance.

g. It is proposed that an expansion and reorganization of the current TCS website be completed by the TCS and possible volunteer support from Members to include a Member's corner for posting notes of interest; special web-paged for TC sessions and AWG deliberations and documents; capacity building information; advances in TC forecasting techniques; exchange of ideas and comments on various sub-components of the TC for the enhancement of TC activities; for access to TC publications and for document service; timely exchange of information related to typhoons; as well a links to WMO's SWIC. This would assist in both vertical and horizontal communications among TCS and TC Members.

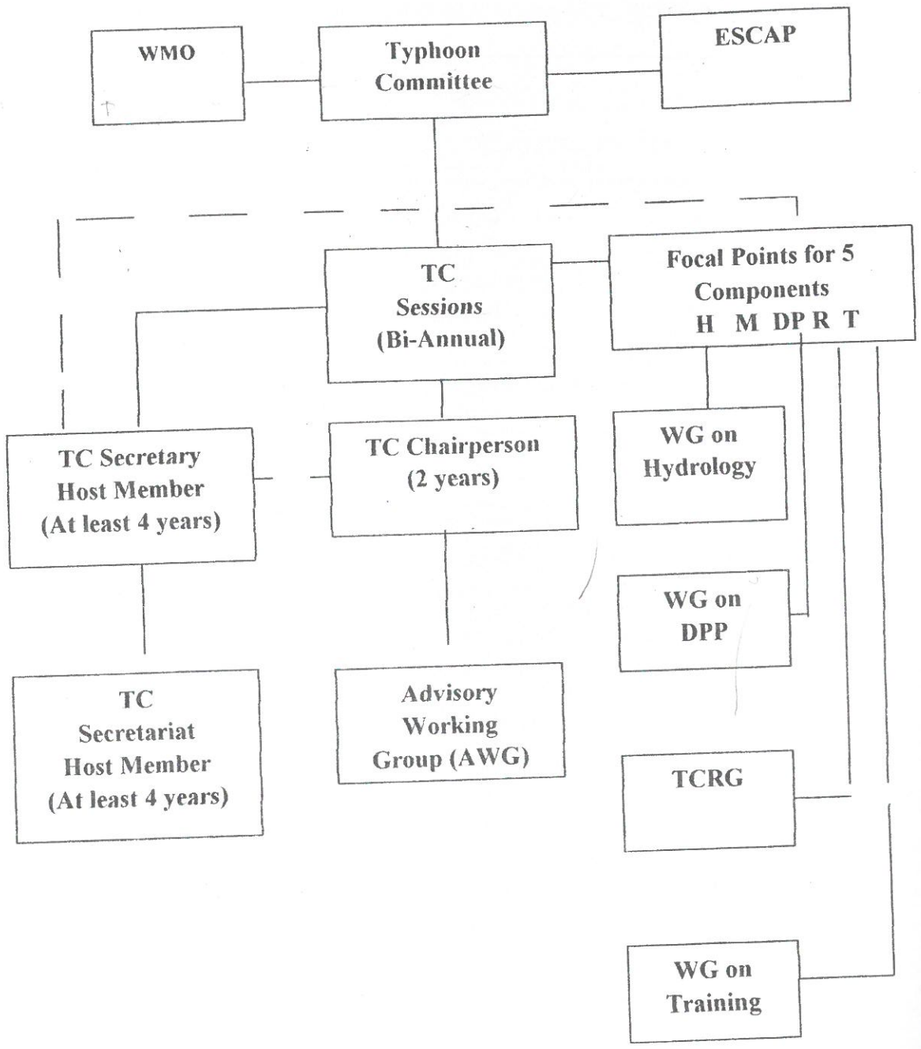
h. At the working level, propose the TCS and Advisory Working Group (AWG) jointly develop:

   (1) A bi-annual operating/work plan for a two year period on their goals/objectives and performance measures for assisting Members in accomplishing the goals and objectives of the RCPIP. The plan would be approved at each two year session by the Members of the TC. The TCS and AWG would jointly submit annual reports of their performance in assisting Members in accomplishing their goals and objectives of the RCPIP for the proceeding year and any required changes to the two year plan to the TC Secretary for distribution to all of the TC Members and to the TC Chairperson.

   (2) A 4 year strategic plan for assisting Members in accomplishing their goals and objectives of the RCPIP which the TC would discuss and approve at every other bi-annual session.

i. Propose the Typhoon Committee Annual Review (TCAR) be published and distributed primarily on the Web and on CD ROM and be available on TC web site.

Proposed Structure of the Typhoon Committee



Current Terms of Reference for Typhoon Committee
(As provided in the *Statute for the Typhoon Committee*)

The functions of the **Committee** are to promote and to co-ordinate the planning and implementation of measures required for minimizing typhoon damage in the ESCAP region. It shall, to this end:

a. Review regularly the progress made in the various fields of typhoon damage prevention;

b. Recommend to the participating Members concerned plans and measures for the improvement of meteorological and hydrological facilities needed for typhoon damage prevention;

c. Recommend to the participating Members concerned plans and measures for the improvement of community preparedness and disaster prevention;

d. Promote the establishment of programs and facilities for training personnel from Members of the region in typhoon forecasting and warning, flood hydrology and control within the region and arrange for training outside the region, as necessary;

e. Promote, prepare, and submit to participating Members and interested organizations plans for co-ordination of research programmes and activities concerning typhoons;

f. Coordinate resource mobilization activities and technical support for its plans and programmes;

g. Prepare and submit, at the request and on behalf of the participating Members, request for technical, financial, and other assistance offered under the United Nations Development Programme and by other organizations and contributors.

In carrying out these functions, the **Committee** will ensure that the plans/projects adopted by the appropriate bodies of the WMO as part of the World Weather Watch Programme, are fully respected at all times.

Proposed Terms of Reference for TC Chairperson
(Patterned after Terms of Reference for President of WMO)

The duties of the Chairperson of the Typhoon Committee shall be:

1. To preside over the sessions of the Typhoon Committee and sessions of the Advisory Working Group held during their term of office.
2. To guide and coordinate the activities of the Typhoon Committee and the Advisory Working Group.
3. To issue directives to the Secretary of the Typhoon Committee with respect to the fulfillment of their duties.
4. To carry out such specific duties as are prescribed by the decisions of the Typhoon Committee and by the ***Statute of the Typhoon Committee*** and ***Rules of Procedure of the Typhoon Committee.***
5. To take action on behalf of the Typhoon Committee, after consultation with the concerned Component Focal Points/Chairpersons and in accordance with the ***Statute of the Typhoon Committee*** and ***Rules of Procedure of the Typhoon Committee***, on any recommendation of a working group, Component Focal Point, WMO, or ESCAP, when the Chairperson considers that such action, in the interest of the Committee, cannot be deferred until the next session of the Typhoon Committee.
6. To furnish to each session of the Typhoon Committee a report which would include a summary of the Chairperson's actions and activities in support of the Typhoon Committee's decisions, directives, actions, goals, and objectives since the last session. Also this report should contain, particulars of any cases which has occurred since the previous session of the Typhoon Committee in which it was necessary for the Chairperson:

    a. To take action or adopt a decision or directive, under the provisions of 2 and 3 of these Terms of Reference which was not within the ambit of previous decisions by the Typhoon Committee or the ***Statute of the Typhoon Committee*** and ***Rules of Procedure of the Typhoon Committee*** or
    b. To take action under 5 of these Terms of Reference, in order that the Typhoon Committee may confirm such action, decision, or directive, failing which the action, decision, or directive shall be considered as rescinded.

7. To maintain files of their official correspondence as Chairperson of the Typhoon Committee and to send copies of this correspondence to the Secretary of the Typhoon Committee.

The Chairperson will be elected by a majority of the voting Members. The term of office of the Chairperson of the Typhoon Committee shall be from their election at the beginning of one session (after the past Chairperson opens the meeting, gives their opening remarks, and make their report of the summary of the Chairperson's actions and activities in support of the Typhoon Committee since last session) until the election of a new Chairperson at the beginning of the succeeding session. The Chairperson shall be eligible for one consecutive re-election.

Proposed Terms of Reference for TC Vice-Chairperson
(Patterned after Terms of Reference for first Vice-President of WMO)

1. If the Chairperson of the Typhoon Committee is not able or eligible to carry out the functions of that office, for any cause, the Vice-Chairperson of the Typhoon Committee shall serve as the Acting Chairperson for a period not to exceeding the remainder of the term of the Chairperson whom they replace. The Vice-Chairperson, acting as Chairperson, shall have the same powers and duties as the Chairperson.

2. In the absence of the Chairperson, the Vice-Chairperson will chair the Typhoon Committee Session or the meeting of the Advisory Working Group.

3. The Vice-Chairperson will perform other duties as directed by the Chairperson of the Typhoon Committee.

The Vice-Chairperson will be elected by a majority of the voting Members. The term of office of the Vice-Chairperson of the Typhoon Committee shall be from their election at the beginning of one session (after the election of the Chairperson) until the election of a new Vice-Chairperson at the beginning of the succeeding session. The Vice-Chairperson shall be eligible for one consecutive re-election.

Proposed Terms of Reference for Advisory Working Group (AWG)
(Patterned after Terms of Reference for IWG of the RCPIP)

Members:

Chairperson of TC will Be Chairperson of AWG
Vice-Chairperson of TC will be the Vice-Chairperson of AWG
The Focal Points/Chairpersons of the Five Components
Representatives of WMO and ESCAP will be ex-officio members

Guidance

In establishment of the Advisory Working Group, the Typhoon Committee provided the following guidance to accomplish the tasks in the ***Terms of Reference.***

- To improve the efficiency and effectiveness of the Typhoon Committee, the TCS, and TCS Secretary.
- To promote Typhoon Committee Members to play a more important role in the Members' economic development and international cooperation in the five components of Meteorology, Hydrology, Disaster Prevention and Preparedness, Training and Research.
- To promote the use of advanced information technology and resource sharing among Members of the Typhoon Committee.
- To improve the implementation of the RCPIP.
- To enhance the mobilization of resources.

Terms of Reference

The Advisory Working Group (AWG) will assist the Chairperson of the Typhoon Committee and the TC Secretary to coordinate the implementation of TC decisions and to oversee and steer the TCS in between sessions. The AWG will also act as a "Think Tank" function to advice and offer options to the Typhoon Committee Members, the Typhoon Committee, the TC Chairperson, TC Secretary, and the TCS.

- To provide options and proposals to enhance the effectiveness of the Typhoon Committee, TC Chairperson, the TCS Secretary, and the TCS.
- To provide overall options for the framework of priorities for activities of the Typhoon Committee.
- To provide options and assistance on reporting format for the five components of the RCPIP for the Typhoon Committee and mechanisms aimed at improving the implementation of the RCPIP.
- To provide options and assistance on collaborative activities among the five components of the RCPIP and priority options to the Typhoon Committee.
- To assist in mobilizing resources to achieve the goals and objectives as determined by the Typhoon Committee at its Thirty-Fifth Session.
- To monitor the progress of the RCPIP objectives and goals.

Proposed Terms of Reference for TC Secretary
(Patterned after Terms of Reference for Secretary General of WMO)

In carrying out the duties specified in these Terms of Reference, the TC Secretary shall comply with any directives issued by the Typhoon Committee or by the Chairperson of the Typhoon Committee. In addition to their duties under the ***Statute of the Typhoon Committee*** and ***Rules of Procedure of the Typhoon Committee***, the duties of the Secretary shall be:

1. To direct the work of the Secretariat.
2. To promote maximum compliance of Members of the Typhoon Committee with the decisions of the Committee.
3. To direct correspondence and maintain liaison with the Chairperson, Vice-Chairperson, the five Component Focal Points/Chairpersons, presidents of associations and commissions, Members of the Committee, Permanent Representatives, States or territories which are not Members of the Typhoon Committee, WMO, ESCAP, international organizations, and others, and to act as a representative in negotiations with these authorities.
4. To request and arrange for the nomination of TC Members on subsidiary bodies of other international organizations to attend meetings of these international organizations and to issue guidance to such representatives.
5. To act as the channel for communications (notifications, invitations, etc.) between the Typhoon Committee and its Members, between constituent bodies and other organizations and, when appropriate, between constituent bodies.
6. To ensure that, in the fields concerning them, the Chairperson, Vice-Chairperson, and the five Component Focal Points/Chairpersons is kept fully advised of the activities and recommendations of other constituent bodies and of other international organizations.
7. To maintain liaison and to collaborate as necessary with the Secretariats of other international organizations (e.g., WMO, ESCAP, etc.)
8. To designate a representative of the Secretary and other staff of the Secretariat, as necessary and funds permit, to attend Working Group sessions to assist the Chairperson, Vice-Chairperson, and the five Component Focal Points/Chairpersons in conducting the work of the group.

The Secretary will be elected by a majority of the voting Members. The term of office of the Secretary of the Typhoon Committee shall be for four years from the end of the session at which they were elected to the end of the session closest to four years after their election. The Secretary shall be eligible for one consecutive re-election. In the event of the post of Secretary becoming vacant in the interval between two sessions of the Typhoon Committee, the Advisory Working Group is empowered to appoint an Acting Secretary whose term of office shall not extend beyond the next session of the Typhoon Committee.

Proposed Terms of Reference for TC Secretariat
(Patterned after Terms of Reference for Secretariat of WMO and previous Terms of Reference for TCS)

The Typhoon Committee Secretariat is the Secretariat for the TC which is mandated to logistically support the Committee in its day-to-day work. Its main function is to logistically support the Committee to advise and assist Members for the implementation of improved meteorological, hydrological, disaster prevention and preparedness, training, and research components needed in the mitigation of typhoon damage. The general functions of the Secretariat shall be:

1. To serve as the administrative, documentary, and information centre of the Typhoon Committee.
2. To perform day-to-day programme-management functions under the guidance of the Typhoon Committee Chairperson and in close cooperation with the Vice-Chairperson, Advisory Working Group, and the five Component Focal Points/Chairpersons in connection with the scientific and technical programmes approved by the Typhoon Committee Session.
3. To conduct/coordinate technical studies on specific problems concerning typhoons as directed by the Typhoon Committee Session, the Chairperson, or the Advisory Working Group.
4. To organize and perform secretarial duties at Sessions of the Typhoon Committee, the meetings of the Advisory Working Group, and the meetings of the designated working groups within the limits of the appropriate provisions of these Terms of Reference and the ***Statute of the Typhoon Committee*** and ***Rules of Procedure of the Typhoon Committee***.
5. To arrange for the issue with the provisional agenda of an explanatory memorandum summarizing problems to be discussed in respect of each item on the agenda of the Typhoon Committee.
6. To support the Members in the preparation of applications for technical, financial, and other assistance for typhoon damage mitigation as directed by the Typhoon Committee Session, the Chairperson, or the Advisory Working Group.
7. To prepare or edit, arrange for the publication of and distribution the approved publications of the Typhoon Committee.
8. To provide an appropriate public relations service for the Typhoon Committee.
9. To maintain records of the extent to which each Member implements the decisions of the Typhoon Committee.
10. To maintain files of correspondence of the Secretariat.
11. To carry out the duties allocated to the Secretariat in the ***Statute of the Typhoon Committee*** and ***Rules of Procedure of the Typhoon Committee***, and as such work as the Typhoon Committee Session, the Chairperson, and the Advisory Working Group may decide.

The TCS also maintains close contact with the Members by correspondence to support Members on all matters relating to implementation of recommended programmes. As directed by the Typhoon Committee Session, the Chairperson, or the Advisory Working Group, it undertakes surveys, complies statistics, and prepares various reports and technical notes for circulation to Members.

Appendix XIII Annex II

Options and proposals for the framework of priorities for activities of the Typhoon Committee (TC).

1. Proposed General Guidelines for Determining Priorities

a. Direct impact on TC Members' operational mission of protection of life and property.
b. Applicable to many TC Members and enhances cooperation and coordination among Members.
c. Contributions to capacity building of TC Members.
d. Identifiable goals/objectives with appropriate measures/indicators for performance monitoring.
e. Cost of project completion.
f. Time to complete project.

Note: It is recognized that determining priorities is a judgment process in a multi-value situation and differences may exist among Members.

2. Proposed Specific Goals, Objectives, and Priorities for the Five Components.

a. The proposed updated Goals, Objectives, and Priorities for the five components are attached. A table form of the Goals, Objectives, Actions, and Priorities are also attached. The IWG recommends if the three component format of the Country Reports is approved, the RCPIP Goals, Objectives, Actions, and Priorities be reduced from 5 components to 3 with Training and Research included with Meteorology, Hydrology, and DPP.
b. Propose that the TCS formally sends the table form to each Member for comments/approval and requests responses within six months. The TCS should assume that all Members approve the Goals, Objectives, Actions, and Priorities if they do not provide comments/approval within 6 months after the TCS disseminated the five components.
c. Proposed that six months after the TCS formally disseminates the components' Goals, Objectives, Actions, and Priorities, the TCS publishes and disseminates the final list.

1. METEOROLOGY

Broad Goal. To produce and communicate accurate, timely, and informative guidance, forecasts, and warnings to mitigate the devastating impacts of tropical cyclones. These can be achieved through the use of the latest observational and forecasting technology, facilitating the sharing of data/latest information in accordance with WMO Resolution 40 of Congress 12, and effective communications methods.

1.1 To enhance in-situ and remote meteorological observing and communications systems to improve tropical cyclone forecasting through collaboration and coordination among Members.

- 1.1.1 Improve observations of tropical cyclone position and structure including rain bands and outer and inner wind structures through in-situ and remote meteorological observing systems, such as satellite, radar, and aircraft observations.
- 1.1.2 Upgrade facilities to receive and process MTSAT and FY satellite data.
- 1.1.3 Exchange information and methods on the effective use of in situ and remotely sensed data from satellite and ground-based observations (e.g., microwave sounders and imagers, Doppler radars).
- 1.1.4 Improve network communications to guarantee accessibility of meteorological data and products for all forecast centers.
- 1.1.5 Develop tools and techniques to combine the most useful observational and model data to aid the forecaster in real-time analysis and forecasting of tropical cyclone structure and intensity.
- 1.1.6 Establish and train human weather spotter networks to report significant rainfall, flooding, storm surge and high surf.

1.2 To develop, obtain, and effectively use current and new tropical cyclone numerical forecast guidance.

- 1.2.1 Improve the Typhoon Model output and to provide additional tropical cyclone forecasting guidance to Members by RSMC Tokyo.
- 1.2.2 Identify regional tropical cyclone forecasting guidance requirements.
- 1.2.3 Consider Members identified requirements, and if possible implement, by RSMC Tokyo.
- 1.2.4 Provide gust forecast guidance out to 72 hours by RSMC Tokyo.
- 1.2.5 Establish web site for dissemination and exchange of numerical model information.
- 1.2.6 Utilize consensus/ensemble/multi-model super-ensemble forecasting techniques to improve tropical cyclone track predictions. These products should be made available to all Tropical Cyclone Warning Centers. Training should be provided on how to apply these techniques in an operating setting.
- 1.2.7 Establish storm surge forecast and warning techniques and models, including river flooding and wave action. Conduct vulnerability assessments for all countries threatened by storm surge.
- 1.2.8 Exchange information through Internet on the validation of model in terms of size, asymmetries, rainfall, etc.

1.3 To improve meteorological forecasts and warnings accuracy, false alarm rates, and lead time, plus improve risk assessments of tropical cyclone impacts.

- 1.3.1 Utilize the newest techniques to improve tropical cyclone forecasting.
- 1.3.2 Establish standard verification rules for track and intensity forecasts, particularly for model outputs, and exchange of the scores through Internet.
- 1.3.3 Develop efficient, effective dissemination methods for advanced forecasts and analysis to the developing Members.

1.4 Other Important Objectives to Consider.

- 1.4.1 Update Typhoon Committee Operational Manual published primarily as a Web version, with limited hard copy and a CD ROM version.
- 1.4.3 Enhance the Typhoon Committee web site by posting operational studies, forecasting rules, and other relevant material.
- 1.4.4 Actively share all official tropical cyclone forecasts and warnings with other Members, media, public, and other agencies through actively contributing towards WMO pilot website on Severe Weather/Tropical Cyclones.
- 1.4.5 Identify relevant tropical cyclone analysis and forecasting publications and their sources and distribute to the Members.

2. HYDROLOGY

Broad Goal. To produce, disseminate, and share accurate and timely flood-related forecasts and warnings; assessments of the disaster risk; and hydrological data in accordance with WMO Resolution 20 of Congress 13 to assist in mitigating the negative impacts and enhance the beneficial effects of tropical cyclones.

2.1 To improve real-time meteorological/hydrological networks and exchange of data among Members.

- 2.1.1 Establish pilot project for data sharing between TC Members to enhance flood forecasting accuracy.
- 2.1.2 Evaluate and improve hydrological instruments and telecommunications equipment.
- 2.1.3 Develop and implement plans which include each Member's meteorological/ hydrological data requirements from other Members and methods to receive these required data.
- 2.1.4 Exchange experts and information to provide technical guidance on methods to evaluate and improve real-time meteorological/hydrological data collection networks.

2.2 To extend and improve flood-related forecasts and warnings for, plus assessments of disaster risks from tropical cyclones.

- 2.2.1 Implement on-the-job training on flood forecasting between TC members.
- 2.2.2 Extend flood forecasting system to selected rivers.
- 2.2.3 Develop an integrated hazard map of inundation and water-related hazards/disasters for a pilot project area in cooperation with disaster prevention and preparedness component.
- 2.2.4 Evaluate and improve operational flood forecasting/warning models.
- 2.2.5 Establish a community-based flood observation and forecasting system in a pilot project area in cooperation with DPP component.
- 2.2.6 Establish a flash flood and sediment disaster forecasting and warning system in a pilot project area in cooperation with disaster prevention and preparedness component.
- 2.2.7 Establish, evaluate, and improve the accuracy of operational flood forecasts and warnings and exchange this information among all Members.
- 2.2.8 Disseminate through meetings, conferences, and papers the lessons-learned and the basis for the integrated hazard map from the pilot project area.

2.3 To improve forecasts, products, services, and presentations to meet various users' requirements.

- 2.3.1 Develop guidelines for dam operations in relationship to flood forecasting.
- 2.3.2 Exchange experiences and examples of how to organize meetings to collect and understand users' requirements and methods to prepare questionnaires/surveys to send to users.
- 2.3.3 Implement changes or additions to forecasts, products, services, and presentations based upon the documented users' requirements.
- 2.3.4 Develop and extend activities between forecasting agencies and user groups of flood forecasting information in cooperation with disaster prevention and preparedness component.

2.4 Other Important Objectives to Consider.

2.4.1 Exchange the information on comprehensive countermeasures for flood disaster including the management structure River Basin Management Committee at regional level, provincial level, and local level.

3. DISASTER PREVENTION AND PREPAREDNESS

Broad Goal. To strengthen, in cooperation with Typhoon Committee Members, media, and other bodies concerned, programmes on tropical cyclone-related disaster mitigation to maximize public safety and minimize negative social and economic impacts on the sustainable development process.

3.1 To strengthen the disaster preparedness and prevention capacity of people at local level and encourage local level participation.

3.1.1 Provide Community Based Disaster Management (CBDM) training for every flood prone area.
3.1.2 Provide the necessary equipment and training for observing and notification of local flood conditions, forecasts, and/or warnings.

3.2 To improve public awareness of the impacts of tropical cyclones and options for mitigation and response actions.

3.2.1 Maintain effective communications with the media prior to, during, and after tropical cyclones occurrences.
3.2.2 Maintain effective communications between meteorological/ hydrological services and emergency management/disaster response agencies and participate in integrated preparedness programs.
3.2.3 Establish and maintain a closer working relationship/partnership with non-governmental organizations which play a crucial role in education, mitigation, and response activities.

3.3 To increase availability and dissemination of disaster preparedness and mitigation information.

3.3.1. Disseminate disaster preparedness and mitigation information via Internet.
3.3.2. Enhance list of Internet web sites which Members can access for disaster preparedness and prevention information.
3.3.3. Exchange relevant tropical cyclone resistant actions which Members have found effective and Members' building codes.
3.3.4. Ensure terminology used by meteorologists and hydrologists can be clearly understood by disaster preparedness and prevention agencies and the public.
3.3.5. Investigate the availability of amateur radio, HF, FM, and EMWIN networks and implement procedures for their use to report significant weather events and as backup communications/dissemination systems.
3.3.6. Exchange ideas on current and future communications systems in use or planned for warning dissemination.

3.4 Other Important Objectives to Consider.

3.4.1 Establish safety shelters in risk villages for emergency evacuation.
3.4.2 Establish and maintain effective operation and maintenance procedures for flood protection structures and facilities.
3.4.3 Implement flood proofing activities to avoid the loss of human life and reduce the disruption to normal activities before, during, and after flooding.
3.4.4 Facilitate the production and exchange of educational videos for tropical cyclone preparedness.

4. TRAINING

Broad Goal. To enhance capacity building for all Members through identification of operational tropical cyclone training needs and then achieve through collaboration the development and presentation of workshops, seminars, co-sponsored training courses, and computer-based and Internet-based courses to fulfill these needs.

4.1 To facilitate the transfer of the latest forecasting and analysis techniques among Members.

4.1.1 Exchange of experts and fellowships programme under Typhoon Committee Research Fellowship Scheme.
4.1.2 Exchange of typhoon forecasters among the Members.
4.1.3 Attachment of two forecasters to RSMC Tokyo.
4.1.4 Hold and attend annual workshops on South China Sea Storm Surge, Wave, and Circulation Forecasting.
4.1.5 Hold and attend international seminar on MTSAT/LRIT and FY data utilization.
4.1.6 Hold and attend workshops/seminars on how to use new observation data and model products, such as the technique of detecting tropical cyclones using Doppler radar, satellite, consensus or ensemble forecast and Dvorak techniques and typhoon bogussing in operation model.
4.1.7 Attend USA National Hurricane Center training course on tropical cyclone.
4.1.8 Research the availability of computer-based and Internet-based tropical cyclone training materials and publish sources.

4.2 To facilitate group training courses in meteorology, hydrology, and disaster prevention and preparedness to improve forecasts and warnings.

4.2.1 Attend training course on Weather Forecasting for Operational Meteorologists in the Asian Pacific Region.
4.2.2 Attend training course on Meteorology, River and Dam Engineering, and Disaster Mitigation and Restoration System for Infrastructure.
4.2.3 Conduct training and roving seminars to effectively build capacity of Members.

4.3 To develop, organize, and conduct meteorological and hydrology training courses to meet Members requirements.

4.3.1 Prepare a list of training requirements for meteorology and hydrology and circulate among members (see attached recommended list, not in priority order).
4.3.2 Determine sources of the required training.

4.4 Other Important Objectives to Consider.

4.4.1 To increase the availability and sharing to all Members of current and new training materials developed by Members especially via the Internet.

5. RESEARCH

Broad Goal. To effectively collaborate among Members on research activities applicable to more than one Member and to facilitate the transfer of technology and relevant research to all Members and into operational use.

5.1 To increase the knowledge and understanding of tropical cyclones through observational programmes to improve tropical cyclone forecasting.

5.1.1 Organize an International Intensive Observing Experiment.
5.1.2 Use the International Intensive Observing Experiment data set in numerical modeling of tropical cyclones. Improved boundary layer representation for coupled air/sea/land models

by, for example, exploiting results from field experiments/projects (e.g., improved parameterization of surface fluxes in high wind regimes and effects of seas spray on transfer coefficients).

5.1.3 Conduct additional research into use of current and future remote sensing data.

5.2 To improve techniques for tropical cyclone track, intensity, storm surge, destructive winds, rainfall, and flood forecasting.

5.2.1 Improve Dvorak technique for the diagnosis of position and intensity of a tropical cyclone, toward an objective technique blending with microwave imagery, which should be operationally feasible for application.

5.2.2 Improve utilization of multi-model ensemble through the application of systematic approach with interactive tools for track forecasting for the extended period beyond 48 hours. Enhance methods for identification and reduction of the occurrence of guidance and official track outliers, focusing on both large speed errors (e.g., accelerating "re-curvers" and stalling storms) and large direction errors (e.g., loops and unusual tropical cyclone tracks).

5.2.3 Improve operational procedures based on the latest findings associated with vertical shear, interaction with upper level trough, multi-scale interaction with convective systems, air-sea interaction, etc. for intensity forecasting

5.2.4 Establish the operational definition of formation and extra-tropical transition. Statistical models continue to be explored for the prediction of intensity along with the dynamical approach. The accompanied subjects associated with the intensity problem include (1) the prediction of heavy rainfall and other weather hazards associated with interaction between monsoon system and a tropical cyclone, based on the interpretation of numerical model output and latest observations available and (2) short-range forecasting or nowcasting of track and intensity for land falling tropical cyclone.

5.2.5 Evaluate skills of numerical models in forecasting tropical cyclone formation and intensity changes. Model validation techniques suitable for 3D high resolution verification for tropical cyclones in the process of extra-tropical transition or land-falling. Quality control of wind and rainfall evaluated from the microwave channel dataset (both from satellite and radar), and its climatology to construct conceptual models and validation of numerical models.

5.2.6 Investigate data assimilation of retrieved wind and rainfall from satellite, radar, and aircraft winds for the dynamical prediction of intensity in conjunction with the initialization of tropical cyclone vortex for numerical models.

5.2.7 Understand the structural change of tropical cyclone with the very high-resolution model (1 km) simulating the multi-scale interaction with convective clouds. The interface of atmospheric model with hydrological process and ocean waves and tides need to be further developed. The model inter-comparison is encouraged to stimulate the research.

5.2.8 Develop improved storm surge guidance models, including guidance on breaking waves and featuring high resolution input and output.

5.3 To facilitate the exchange of research results among Members.

5.3.1 Conduct exchange of meteorological experts among Members through the Typhoon Committee Research Fellowship Scheme.

5.3.2 Disseminate research results and case studies via Internet.

5.3.3 Organize workshops on typhoon forecasting research every two years.

5.4 Other Important Objectives to Consider.

5.4.1 Study the relationship between ENSO and tropical cyclone activity, formation, timing and impacts. The seasonal prediction of tropical cyclone development in terms of probability and frequency using individual members of the multi-model ensemble prediction data.

5.4.2 Explore the visualization of probability distribution function for track and intensity utilizing the output from the ensemble prediction system.

5.4.3 Quantitatively assess the impact study and development of comprehensive risk management for the mitigation of socio-economic loss from tropical cyclone.

5.4.1 Develop an expanded Best Track database to include storm surge, rainfall, and maximum winds.

5.4.2 Integrate track and intensity forecasts with GIS of inundated areas which is very beneficial for hydrological authorities and DPP management officials.

Attachment - List of Training Requirements
(Not in Priority Order)

1. Use of Doppler and non-Doppler radar data in real-time analysis and forecasting of tropical cyclone intensity and structure.
2. Use and Interpretation of ensemble forecast and consensus forecasting technique in operational forecasting. Development of guidelines for the use of multi-model tracks and intensities including systematic approach considering the error mechanism of dynamical models.
3. Use of satellite data in real-time analysis and forecasting of tropical cyclone intensity and structure and use of microwave channel information.
4. 3D/4D data assimilation techniques for numerical prediction of severe weather.
5. Radar and display processing systems maintenance training.
6. Waves and Storm Surge Prediction and Modeling.
7. Severe Weather Forecasting Techniques and Warning Strategies.
8. Intensity Forecasting of Typhoons (guidance and public forecasts such as minimum surface pressure, maximum wind speed, radius of 30 and 50 knots of typhoon).
9. Typhoon Bogussing in Operation Model.
10. Objective Dvorak techniques.
11. Forecast procedures for formation and extra-tropical transition of tropical cyclone.
12. Interpretation and error correction of QuikScat wind.
13. Conceptual model and operational procedures for intensity forecasting including wind and rainfall associated with TC including landfall, considering the latest understanding on the interaction of TC with vertical shear, upper troughs, meso-scale convective systems, and air sea interaction.
14. Training in the various techniques, statistical and dynamical for identifying the different stages of tropical storm formation, intensity and movement.
15. Numerical modeling of tropical storms and the possibility of sharing of computer codes.

Appendix III – Proposed Table of Revised RCPIP Components

1. **METEOROLOGY. Broad Goal.** To produce and communicate accurate, timely, and informative guidance, forecasts, and warnings to mitigate the devastating impacts of tropical cyclones. These can be achieved through the use of the latest observational and forecasting technology, facilitating the sharing of data/latest information in accordance with WMO Resolution 40 of Congress 12, and effective communications methods.

1.1 Objective 1: To enhance in-situ and remote meteorological observing and communications systems to improve tropical cyclone forecasting through collaboration and coordination among Members.		
Action	**Completion Date**	**Success**
1.1.1 Improve observations of tropical cyclone position and structure including rain bands and outer and inner wind structures through in-situ and remote meteorological observing systems, such as satellite, radar, and aircraft observations.	2005	All Members will meet 75% of their identified requirements for data and 50% of neighboring Members requirements.
1.1.2 Upgrade facilities to receive and process MTSAT and FY satellite data.	2004	Through assistance among Members, all interested Members will have operational satellite receiving systems for MTSAT and/or FY.
1.1.3 Exchange information and methods on the effective use of in situ and remotely sensed data from satellite and ground-based observations (e.g., microwave sounders and imagers, Doppler radars).	2005	Each Member will have one documented cases on the effective use of in situ and/or remotely sensed data obtained through exchanged of information or methods.
1.1.4 Improve network communications to guarantee accessibility of meteorological data and products for all forecast centers.	2005	Three documented significant network communications improvements within the region.
1.1.5 Develop tools and techniques to combine the most useful observational and model data to aid the forecaster in real-time analysis and forecasting of tropical cyclone structure and intensity.	2006	Three documented new tools and/or techniques on the combined use of observational and model data within the region.
1.1.6 Establish and train human weather spotter networks to report significant rainfall, flooding, storm surge and high surf and exchange data with other Members.	2004	Interested Members will establish one new network of trained human observers and exchange these data with at least one other Member.

1.2 Objective 2: To develop, obtain, and effectively use current and new tropical cyclone numerical forecast guidance.		
1.2.1 Improve the Typhoon Model output and to provide additional tropical cyclone forecasting guidance to Members by RSMC Tokyo.	2006	RSMC Tokyo/JMA will provide additional tropical cyclone forecasting guidance products to Members in consideration of efficiency and reliability of the products.
1.2.2 Identify regional tropical cyclone forecasting guidance requirements.	2004	All Members provide their prioritized requirements to RSMC Tokyo. Discuss requirements and establish prioritized regional requirements.

Action	Completion Date	Success
1.2.3 Consider Members identified requirements, and if possible implement, by RSMC Tokyo.	2005	RSMC Tokyo will implement regional requirements when they are prepared from both technical and administrative aspects.
1.2.4 Provide gust forecast guidance out to 72 hours by RSMC Tokyo.	2005	Guidance will include 72 hour gust forecast.
1.2.5 Establish web site for dissemination and exchange of numerical model information.	2004	RSMC Tokyo will establish web site and make accessible to all.
1.2.6 Utilize consensus/ensemble/ multi-model super-ensemble forecasting techniques to improve tropical cyclone track predictions. These products should be made available to all Tropical Cyclone Warning Centers. Training should be provided on how to apply these techniques in an operating setting.	2005 Use of ensembles 2006 Available to all centers 2007 Training provided.	All tropical cyclone centers reduce their track error by 12% and intensity error by 5%.
1.2.7 Establish storm surge forecast and warning techniques and models, including river flooding and wave action. Conduct vulnerability assessments for all countries threatened by storm surge.	2007	All Members affected by storm surge will use a local storm surge model or will have access to another Member's output for their area.
1.2.8 Exchange information through Internet on the validation of model in terms of size, asymmetries, rainfall, etc.	2005	All Members will receive model validation and verification information.

1.3 Objective 3: To improve meteorological forecasts and warnings accuracy, false alarm rates, and lead time, plus improve risk assessments of tropical cyclone impacts.

Action	Completion Date	Success
1.3.1 Utilize the newest techniques to improve tropical cyclone forecasting.	2006	All Members will improve track, intensity, storm surge, and/or rainfall forecasts, as appropriate, by 10% through introduction of new techniques.
1.3.2 Establish standard verification rules for track and intensity forecasts, particularly for model outputs, and exchange of the scores through Internet.	2005	A working group will develop with Members involved standard verification rules and submit to Typhoon Committee for approval.
1.3.2 Develop efficient, effective dissemination methods for advanced forecasts and analysis to the developing Members and their populations.	2005	All developing Members' NMHSs will receive guidance and have developed plans to get forecasts to all of the public.

1.4 Other Important Objectives to Consider.

1.4.1 Update Typhoon Committee Operational Manual published primarily as a Web version, with limited hard copy and a CD ROM version.

1.4.3 Enhance the Typhoon Committee web site by posting operational studies, forecasting rules, and other relevant material.

1.4.4 Actively share all official tropical cyclone forecasts and warnings with other Members, media, public, and other agencies through actively contributing towards WMO pilot website on Severe Weather/Tropical Cyclones.

1.4.5 Identify relevant tropical cyclone analysis and forecasting publications and their sources and distribute to the Members.

2. **HYDROLOGY. Broad Goal.** To produce, disseminate, and share accurate and timely flood-related forecasts and warnings; assessments of the disaster risk; and hydrological data in accordance with WMO Resolution 20 of Congress 13 to assist in mitigating the negative impacts and enhance the beneficial effects of tropical cyclones.

2.1 Objective 1: To improve real-time meteorological/hydrological networks and exchange of data among Members.

Action	Completion Date	Success
2.1.1 Establish pilot project for data sharing between TC Members to enhance flood forecasting accuracy.	2005	Two regional pilot projects on data sharing completed and information disseminated to all Members.
2.1.2 Evaluate and improve hydrological instruments and telecommunications equipment.	2006	Three documented improvements to hydrological instruments and telecommunications equipment and shared with all Members
2.1.3 Develop and implement plans which include each Member's meteorological/ hydrological data requirements from other Members and methods to receive these required data.	2004 Develop Plan 2006 Implement Plan	Interested Members will complete and implement plan through bilateral or multilateral cooperation or agreements.
2.1.4 Exchange experts and information to provide technical guidance on methods to evaluate and improve real-time meteorological/hydrological data collection networks.	2004	All Members will meet 75% of their identified goal in the improvement of real-time data collection networks.

2.2 Objective 2: To extend and improve flood-related forecasts and warnings for, plus assessments of disaster risks from tropical cyclones.

Action	Completion Date	Success
2.2.1 Implement on-the-job training on flood forecasting between TC members.	2007	All Members have participated in the on-the-job training either as a provider or receiver.
2.2.2 Extend flood forecasting system to selected rivers.	2005/2007	All Members will have extended flood forecasting to one additional river by 2005 and one additional by 2007.
2.2.3 Develop an integrated hazard map of inundation and water-related hazards/disasters for a pilot project area in cooperation with disaster prevention and preparedness component and spread to other areas.	2004 for Pilot 2006 Spread to other areas.	One completed pilot project in each Member's area by 2004 and spread to other areas by 2006.
2.2.4 Evaluate and improve operational flood forecasting/warning models.	2006	Demonstrated improvement of 10% in operational flood models performance.

Action	Completion Date	Success
2.2.5 Establish a community-based flood observation and forecasting system in a pilot project area in cooperation with DPP component.	2006	One community-based flood observation and forecasting system pilot project completed by each Member.
2.2.6 Establish a flash flood and sediment disaster forecasting/warning system in a pilot project area in cooperation with DPP component and spread to other areas.	2005/2007	Flash flood and sediment forecasting /warning pilot project completed by each member by 2005 and spread to other areas by 2007.
2.2.7 Establish, evaluate, and improve the accuracy of operational flood forecasts and warnings and exchange this information among all Members.	2004/2007	Establish and evaluate baseline accuracy by 2004 and improve accuracy by 20% by 2007
2.2.8 Disseminate through meetings, conferences, and papers the lessons-learned and the basis for the integrated hazard map from the pilot project area.	2004/2006	Well-develop network on sharing information by 2004 and one person from each Member attend one meeting per year on sharing information.

2.3 Objective 3: To improve forecasts, products, services, and presentations to meet various users' requirements.

Action	Completion Date	Success
2.3.1 Develop guidelines for dam operations in relationship to flood forecasting.	2005	Established and disseminated guidelines for dam operations.
2.3.2 Exchange experiences and examples of how to organize meetings to collect and understand users' requirements and methods to prepare questionnaires/surveys to send to users.	2004/2005	All Members will collect and prepare a document of users' requirements.
2.3.3 Implement changes or additions to forecasts, products, services, and presentations based upon the documented users' requirements.	2005/2006	All Members will implement 30-50% of documented users' requirements.
2.3.4 Develop and extend activities between forecasting agencies and user groups of flood forecasting information in cooperation with disaster prevention and preparedness component.	2005/2006	All Members will meet with users group once per year.

2.4 Other Important Objectives to Consider.

2.4.1 Exchange the information on comprehensive countermeasures for flood disaster including the management structure River Basin Management Committee at regional level, provincial level, and local level.

3. **DISASTER PREVENTION AND PREPAREDNESS. Broad Goal.** To strengthen, in cooperation with Typhoon Committee Members, media, and other bodies concerned, programmes on tropical cyclone-related disaster mitigation to maximize public safety and minimize negative social and economic impacts on the sustainable development process.

3.1 Objective 1: To strengthen the disaster preparedness and prevention capacity of people at local level and encourage local level participation.

Action	Completion Date	Success
3.1.1 Provide Community Based Disaster Management (CBDM) training for every flood prone area.	2006	All Members conduct training for at least 3 flood prone areas.
3.1.2Provide the necessary equipment and training for observing and notification of local flood conditions, forecasts, and/or warnings.	2006	All Members provide the necessary equipment and training for local system to at least 3 communities.

3.2 Objective 2: To improve public awareness of the impacts of tropical cyclones and options for mitigation and response actions.

Action	Completion Date	Success
3.2.1 Maintain effective communications with the media prior to, during, and after tropical cyclones occurrences.	2004 and After	Demonstrated long-term average decrease in the amount of damage and number of casualties.
3.2.2 Maintain effective communications between meteorological/ hydrological services and emergency management/disaster response agencies and participate in integrated preparedness programs.	2004 and After	Demonstrated long-term average decrease in the amount of damage and number of casualties.
3.2.3 Establish and maintain a closer working relationship/partnership with non-governmental organizations which play a crucial role in education, mitigation, and response activities.	2004 and After	Demonstrated long-term average decrease in the amount of damage and number of casualties.

3.4 Other Important Objectives to Consider.

3.3 Objective 3: To increase availability and dissemination of disaster preparedness and mitigation information

Action	Completion Date	Success
3.3.1 Disseminate disaster preparedness and mitigation information via Internet.	2005	Make information available on a central server
3.3.2 Enhance list of Internet web sites which Members can access for disaster preparedness and prevention information.	2004	Enhanced list of applicable web sites distributed.
3.3.3 Exchange relevant tropical cyclone resistant actions which Members have found effective and Members' building codes.	2005	Completion of exchange among all Members.
3.3.4 Ensure terminology used by meteorologists and hydrologists can be clearly understood by disaster preparedness and prevention agencies and the public.	2006	Seventy percent of the people in a test group(s) understand terminology used.
3.3.5 Investigate the availability of amateur radio, HF, FM, and EMWIN networks and implement procedures for their use to report significant weather events and as backup communications/dissemination systems.	2005	Interested Members implement one additional network and reporting procedures
3.3.6 Exchange ideas on current and future communications systems in use or planned for warning dissemination.	2005	Deduction in time for warning dissemination and relief operations communications.

3.4.5 Establish safety shelters in risk villages for emergency evacuation.

3.4.6 Establish and maintain effective operation and maintenance procedures for flood protection structures and facilities.

3.4.7 Implement flood proofing activities to avoid the loss of human life and reduce the disruption to normal activities before, during, and after flooding.

3.4.8 Facilitate the production and exchange of educational videos for tropical cyclone preparedness.

4. **TRAINING. Broad Goal.** To enhance capacity building for all Members through identification of operational tropical cyclone training needs and then achieve through collaboration the development and presentation of workshops, seminars, co-sponsored training courses, and computer-based and Internet-based courses to fulfill these needs.

4.1 Objective 1: To facilitate the transfer of the latest forecasting and analysis techniques among Members.

Action	Completion Date	Success
4.1.1 Exchange of experts and fellowships programme under Typhoon Committee Research Fellowship Scheme.	2006	Each interested Member will have at least one exchange of experts or fellowship.
4.1.2 Exchange of typhoon forecasters among the Members.	2006	Each interested Member will either host or send an exchange forecaster.
4.1.3 Attachment of two forecasters to RSMC Tokyo.	2006	Each interested Member will have at least two forecasters attached to RSMC Tokyo.
4.1.4 Hold and attend annual workshops on South China Sea Storm Surge, Wave, and Circulation Forecasting.	2006	Each participating Member will have at least two participants attend the workshop series.
4.1.5 Hold and attend international seminar on MTSAT/LRIT and FY data utilization.	2004	Each participating Member will have at least one participant attend the seminar.
4.1.6 Hold and attend workshops/seminars on how to use new observation data and model products, such as the technique of detecting tropical cyclones using Doppler radar, satellite, consensus or ensemble forecast and Dvorak techniques and typhoon bogussing in operation model.	2005	Each participating Member will have at least one participant attend each seminar and workshop.
4.1.7 Attend USA National Hurricane Center training course on tropical cyclone.	2006	Each participating Member will have at least one participant attend the training.
4.1.8 Research the availability of computer-based and Internet-based tropical cyclone training materials and publish sources.	2004 and update yearly.	List will be prepared and disseminated.

4.2 Objective 2: To facilitate group training courses in meteorology, hydrology, and disaster prevention and preparedness to improve forecasts and warnings.

Action	Completion Date	Success
4.2.1 Attend training course on Weather Forecasting for Operational Meteorologists in the Asian Pacific Region.	Annually through 2006	Highest priority Members requiring the training will have at least one participant attend the training.
4.2.2 Attend training course on Meteorology, River and Dam Engineering, and Disaster Mitigation and Restoration System for Infrastructure.	Annually through 2006	Highest priority Members requiring the training will have at least one participant attend the training.
4.2.3 Conduct training and roving seminars to effectively build capacity of Members.	Annually through 2007	Highest priority Members requiring the training for capacity building will have at least seminar in their area.

4.3 Objective 3: To develop, organize, and conduct meteorological and hydrology training courses to meet Members requirements.

Action	Completion Date	Success
4.3.1 Prepare a list of training requirements for meteorology and hydrology and circulate among members (see attached recommended list, not in priority order).	2004	Finalized list distributed to all Members.
4.3.2 Determine sources of the required training.	2006	Completion of at least one high priority training course annually from finalized list.

4.4 Other Important Objectives to Consider.

4.4.1 To increase the availability and sharing to all Members of current and new training materials developed by Members especially via the Internet.

5. **RESEARCH. Broad Goal.** To effectively collaborate among Members on research activities applicable to more than one Member and to facilitate the transfer of technology and relevant research to all Members and into operational use.

5.1 Objective 1: To increase the knowledge and understanding of tropical cyclones through observational programmes to improve tropical cyclone forecasting.

Action	Completion Date	Success
5.1.1 Organize an International Intensive Observing Experiment.	Before 2006	Completion of experiment.
5.1.2 Use the International Intensive Observing Experiment data set in numerical modeling of tropical cyclones. Improved boundary layer representation for coupled air/sea/land models by, for example, exploiting results from field experiments/projects (e.g., improved parameterization of surface fluxes in high wind regimes and effects of seas spray on transfer coefficients).	2006	Demonstrate and present an improvement in tropical cyclone forecasting in regional workshop/seminar for all Members.
Action	**Completion Date**	**Success**
5.1.3 Conduct additional research into use of current and future remote sensing data.	Continuing through 2006	Incorporation of additional remote sensing data with demonstrable improvement in tropical cyclone forecasting accuracy.

5.2 Objective 2: To improve techniques for tropical cyclone track, intensity, storm surge, destructive winds, rainfall, and flood forecasting.		
Action	**Completion Date**	**Success**
5.2.1 Improve Dvorak technique for the diagnosis of position and intensity of a tropical cyclone, toward an objective technique blending with microwave imagery, which should be operationally feasible for application.	2006	Operationally implement an objective method to determine position and intensity available to all Members.
5.2.2 Improve utilization of multi-model ensemble through the application of systematic approach with interactive tools for track forecasting for the extended period beyond 48 hours. Enhance methods for identification and reduction of the occurrence of guidance and official track outliers, focusing on both large speed errors (e.g., accelerating "re-curvers" and stalling storms) and large direction errors (e.g., loops and unusual tropical cyclone tracks).	2007	Reduce track error by 12% and intensity error by 5%.
5.2.3 Improve operational procedures based on the latest findings associated with vertical shear, interaction with upper level trough, multi-scale interaction with convective systems, air-sea interaction, etc. for intensity forecasting	2007	Reduce intensity error by 5%.
5.2.4 Establish and publish an operational definition of formation and extra-tropical transition.	2004	Coordinate, establish, and publish in Typhoon Committee Operations Manual – Meteorology Component.
5.2.5 Continue to explore statistical models for the prediction of intensity along with the dynamical approach.	2006	Publish results of statistical intensity models research and comparisons with dynamic models
5.2.6 Investigate the intensity problem including (1) the prediction of heavy rainfall and other weather hazards associated with interaction between monsoon system and a tropical cyclone, based on the interpretation of numerical model output and latest observations available and (2) short-range forecasting of track and intensity for land falling tropical cyclone.	2007	Improve operational intensity forecasts by 5%.

5.2.7 Evaluate and improve skills of numerical models in forecasting tropical cyclone formation and intensity changes. Use model validation techniques suitable for 3D high resolution verification for tropical cyclones in the process of extra-tropical transition or land-falling. Also include quality control of wind and rainfall evaluated from the microwave channel dataset (both from satellite and radar), and its climatology to construct conceptual models and validation of numerical models.	2007	Improve operational forecasts by 12% and intensity forecasts by 5%.
5.2.8 Investigate data assimilation of retrieved wind and rainfall from satellite, radar, and aircraft winds for the dynamical prediction of intensity in conjunction with the initialization of tropical cyclone vortex for numerical models	Continuing through 2006	Incorporation of additional remote sensing data with demonstrable improvement in tropical cyclone forecasting accuracy.
5.2.9 Understand the structural change of tropical cyclone using a very high-resolution model (1 km) simulating multi-scale interaction with convective clouds. The interface of atmospheric model with hydrological process and ocean waves and tides need to be further developed. The model inter-comparison is encouraged to stimulate the research.	Continuing through 2007	Improve operational track forecasts by 12% and intensity forecasts by 5%.
5.2.10 Develop improved storm surge guidance models, including guidance on breaking waves and featuring high resolution input and output.	Continuing through 2007	Improve storm surge forecasts by 10%

5.3 Objective 3: To facilitate the exchange of research results among Members.		
Action	**Completion Date**	**Success**
5.3.1 Conduct exchange of meteorological experts among Members through the Typhoon Committee Research Fellowship Scheme.	2006	At least 2 by 2006 with the completion of one research paper per exchange.
5.3.2 Disseminate research results and case studies via Internet.	2004 and updated annually	Complete central web site to host research results
5.3.3 Organize workshops on typhoon forecasting research every two years.	2005	At least 2 forecasters from each Member participating.

5.4 Other Important Objectives to Consider.

5.4.4 Study the relationship between ENSO and tropical cyclone activity, formation, timing and impacts. The seasonal prediction of tropical cyclone development in terms of probability and frequency using individual members of the multi-model ensemble prediction data.

5.4.5 Explore the visualization of probability distribution function for track and intensity utilizing the output from the ensemble prediction system.

5.4.6 Quantitatively assess the impact study and development of comprehensive risk management for the mitigation of socio-economic loss from tropical cyclone.

5.4.3 Develop an expanded Best Track database to include storm surge, rainfall, and maximum winds.

5.4.4 Integrate track/intensity forecasts with GIS of inundated areas which are very beneficial for hydrological authorities and DPP management officials.

5.4.5 Attachment - List of Training Requirements

(Not in Priority Order)

1. Use of Doppler and non-Doppler radar data in real-time analysis and forecasting of tropical cyclone intensity and structure.

2. Use and Interpretation of ensemble forecast and consensus forecasting technique in operational forecasting. Development of guidelines for the use of multi-model tracks and intensities including systematic approach considering the error mechanism of dynamical models.

3. Use of satellite data in real-time analysis and forecasting of tropical cyclone intensity and structure and use of microwave channel information.

4. 3D/4D data assimilation techniques for numerical prediction of severe weather.

5. Radar and display processing systems maintenance training.

6. Waves and Storm Surge Prediction and Modeling.

7. Severe Weather Forecasting Techniques and Warning Strategies.

8. Intensity Forecasting of Typhoons (guidance and public forecasts such as minimum surface pressure, maximum wind speed, radius of 30 and 50 knots of typhoon).

9. Typhoon Bogussing in Operation Model.

10. Objective Dvorak techniques.

11. Forecast procedures for formation and extra-tropical transition of tropical cyclone.

12. Interpretation and error correction of QuikScat wind

13. Conceptual model and operational procedures for intensity forecasting including wind and rainfall associated with TC including landfall, considering the latest understanding on the interaction of TC with vertical shear, upper troughs, meso-scale convective systems, and air sea interaction.

14. Training in the various techniques, statistical and dynamical for identifying the different stages of tropical storm formation, intensity and movement.

15. Numerical modeling of tropical storms and the possibility of sharing of computer codes.

Appendix XIII Annex III

Options for Reporting Formats for the Five Components of the RCPIP for the Typhoon Committee Together with the Mechanisms Aimed at Improving the Implementation of the RCPIP

1. Executive Summary (details provided below). Proposals.

a. Identified deficiencies with current TC Country Reports.
b. Propose standardized format, content, figures, statistics, and word processing for Country Reports.
c. Proposed options for reporting formats for the Country Reports are presented for five separate components and for three components – training and research combined with meteorology, hydrology, and DPP. The IWG recommends the three component option for Country Reports and RCPIP.
d. Propose in Country Reports, separate sections for Impacts of Tropical Cyclones Affecting Member and Resource Mobilization Activities.
e. Propose to use new Country Report formats to produce information for other reports and documents of the TC.
f. Propose publication of Country Reports on CDs only.

2. Options for reporting formats for the five components of the RCPIP for the Typhoon Committee together with the mechanisms aimed at improving the implementation of the RCPIP.

The IWG believes that proposed modifications to the TC Country Reports would provide a unified format of reporting and would improve the implementation of the RCPIP.

a. Identified deficiencies with current TC Country Reports.

(1) Much of the general information currently contained in the County Reports is not relevant to tropical cyclones activity. It is proposed that this general information be avoided in the revised format.
(2) The format of country report is not standardized which causes difficulty in reviewing Members activities in a systematic manner.
(3) The word processor used for Country Reports (style of the reporting, i.e., fonts, size of letter etc.) is different. It is difficult to extract, to merge, and to edit comparable part of the individual country report to make and format summaries or reviews because of the different word processing software used.
(4) Many parts of the Country Reports have often been used to extract articles for Typhoon Committee Annual Review, TC Newsletter, activity reports for RCPIP, and summaries of Members activities included in the TC Session report. It is difficult to gather the information required for these items from the current Country Reports. It is therefore desirable to satisfy all these needs with a single reporting format.

b. Proposals for new TC Country Reports format.

(1) Two proposed reporting formats for the Country Reports are presented in Appendixes I and II. Appendix I contains a reporting format with each of the five components (meteorology, hydrology, DPP, training, and research) listed separately. This would make reporting and reading of activities and achievements easier for RCPIP (which has goals and objectives for the five components separately). However, with the five components separated, there is duplication/overlap between the first three (meteorology, hydrology, and DPP) and training and research. Appendix II contains a reporting format with only three separated components (meteorology, hydrology, and DPP) and the appropriate training and research items combined under one of these three corresponding component. The IWG proposes using Appendix II format and also to give consideration to restructuring the RCPIP into only three components. Appendixes I and II are consensus, integrated formats based upon the proposal from

the Working Group on Hydrology (see Appendix III), the results of a survey sent by TCS, input to the core Members of the IWG, and deliberations of the IWG.

(2) Propose the reporting format should be designed to facilitate monitoring planned RCPIP activities while specifying the interrelationship among the five RCPIP components and combined progress. The training component, if separated, should contain such items as workshops, training seminars, and exchange of visits.

(3) In addition to the five components categories shown in Appendix I (or three shown in Appendix II), propose a sixth (fourth) one should be included which would discuss typhoons that impacted TC Members (as in the TCAR), and a seventh (fifth) one on mobilization of resources.

(4) Propose some sub-items in each component should correlate with the priorities as identified in the RCPIP.

(5) Propose analysis and forecasting results (including bogussing, model and verification scores) should be reported in a standardized format.

(6) Propose the new format should not be too complicated to follow.

(7) Considering the web-based environment, it is proposed that the TCS in consultation with the Members define a word processing software format with specification of fonts, font size, line space, etc. Microsoft word (window version) is proposed with specified guidelines provided in consultation with TCS. The format of figures in the text needs to be standardized by the TCS in consultation with the Members. The GIF or JPG file format is proposed for figures in the unified report. For the multi-purpose reporting, the unified report is proposed to be prepared once a year by 1 October. It is desired that the report would be updated by 1 April or other convenient dates, if necessary, to support for the publication of TCAR. Each report should contain the progress of activities during the inter-reporting period, with updates highlighted in red color.

(8) The report with a unified format could be used as a country report at Typhoon Committee, an activity report for RCPIP, source materials for Typhoon Committee Annual Review, and for sections of the TC Newsletter.

(9) The timing of reporting needs to be adjusted to meet these diverse requirements.

(10) Propose the publication of annual country reports on CDs instead of paper of other methods.

Proposed Reporting Format for the Annual Country Reports - Five Components. Corresponds with Five Components of RCPIP.

I. **Overview of Meteorological and Hydrological Conditions during the Year** (with focus on impacts of tropical cyclones (typhoons, tropical storms, and depressions) which occurred and affected Member).

1. Meteorological Assessment
2. Hydrological Assessment
3. Socio-economic Assessment

II. **Meteorology**

1. **Progress in Member's Regional Cooperation and Selected RCPIP Goals and Objectives:**

   a. Hardware and/or Software Progress (including in-situ and remote meteorological observing, such as satellite, radar, and aircraft observations improvements; communications systems improvements; upgrading facilities to receive and process satellite data; expansion of observational area coverage; improvements of hardware for forecasts and data compilation and analysis; web site additions and improvements; improvements of software in data processing and analysis; and improvements in forecast models, both meteorological and storm surge).

   b. Implications to Operational Progress (including exchange of in situ and remotely sensed data and uses; development of guidance and data requirements; improved use of consensus/ensemble model guidance; exchange of information with other Members via the internet; validation and verification activities; exchange/provision of information among Members; use of these exchanged data/information for improved forecasts; establishment of networks; expansion of the area coverage of forecasts and warnings; improvement of accuracy of forecasts/warnings; development of related tools and techniques; and improvement of timeliness of forecasts/warnings dissemination).

   c. Interaction with users, other Members, and/or other components (including improvement of meteorological products to meet users' requirements and expectation; enhancement of community participation; linkage with other components (hydrology and DPP); use of integrated meteorological products and services in capacity building and sustainability decisions; and development of regional requirements; new dissemination methods).

   d. Other Cooperative/RCPIP Progress.

2. **Progress in Member's Important, High-Priority Goals and Objectives** (towards the goals and objectives of the Typhoon Committee).

   a. Hardware and Software Progress (including in-situ and remote meteorological observing, such as satellite, radar, and aircraft observations improvements; communications systems improvements; upgrading facilities to receive and process satellite data; expansion of observational area coverage; improvements of hardware for forecasts and data compilation and analysis; web site additions and improvements; improvements of software in data processing and analysis; and improvements in forecast models, both meteorological and storm surge).

   b. Implications to Operational Progress (including exchange of in situ and remotely sensed data and uses; development of guidance and data requirements; improved use of consensus/ensemble model guidance; exchange of information with other Members via the internet; validation and verification activities; exchange/provision of information among Members; use of these exchanged data/information for improved forecasts; establishment of networks; expansion of the area coverage of forecasts and warnings; improvement of accuracy of forecasts/warnings; development of related tools and techniques; and improvement of timeliness of forecasts/warnings dissemination).

c. Interaction with users, other Members, and/or other components (including improvement of meteorological products to meet users' requirements and expectation; enhancement of community participation; linkage with other components (hydrology and DPP); use of integrated meteorological products and services in capacity building and sustainability decisions; and development of regional requirements; new dissemination methods).

d. Other Cooperative Progress.

3. **Opportunities for Further Enhancement of Regional Cooperation** (including identification of other meteorological-related topics and opportunities, possible further exchange of information and priority needs for assistance).

III. Hydrology

1. Progress in Member's Regional Cooperation and Selected RCPIP Goals and Objectives:

a. Hardware and Software Progress (including improvements in real-time in situ and remotely sensed data collection; expansion of observational area coverage; improvements of hardware for forecasts and data compilation/analysis; improvements of software in data processing and analysis; communications systems improvements; web site additions and improvements; improvements of software in data processing and analysis; improvements in hydrological forecast models; and evaluation and improvement of observing instruments).

b. Implications to Operational Progress (including expansion of the area coverage of forecasts and warnings; exchange of in situ and remotely sensed data and uses; development of guidance and data requirements; improved use of model guidance; exchange of information with other Members via the internet; validation and verification activities; exchange/provision of information among Members; use of these exchanged data/information for improved forecasts; establishment of networks; improvement of accuracy of forecasts/warnings; development of related tools and techniques; and improvement of timeliness of forecasts/warnings dissemination).

c. Interaction with users, other Members, and/or other components (including improvement of hydrological products to meet users' requirements and expectation; enhancement of community participation; linkage with other components (meteorology and DPP); and use of integrated meteorological products and services in capacity building and sustainability decisions).

d. Other Cooperative/RCPIP Progress.

2. **Progress in Member's Important, High-Priority Goals and Objectives** (towards the goals and objectives of the Typhoon Committee).

a. Hardware and Software Progress (including improvements in real-time in situ and remotely sensed data collection; expansion of observational area coverage; improvements of hardware for forecasts and data compilation/analysis; improvements of software in data processing and analysis; communications systems improvements; web site additions and improvements; improvements of software in data processing and analysis; improvements in hydrological forecast models; and evaluation and improvement of observing instruments).

b. Implications to Operational Progress (including expansion of the area coverage of forecasts and warnings; exchange of in situ and remotely sensed data and uses; development of guidance and data requirements; improved use of model guidance; exchange of information with other Members via the internet; validation and verification activities; exchange/provision of information among Members; use of these exchanged data/information for improved forecasts; establishment of networks; improvement of accuracy of forecasts/warnings; development of related tools and techniques; and improvement of timeliness of forecasts/warnings dissemination).

c. Interaction with users, other Members, and/or other components (including improvement of hydrological products to meet users' requirements and expectation; enhancement of community participation; linkage with other components (meteorology and DPP); and use of integrated meteorological products and services in capacity building and sustainability decisions).

d. Other Cooperative Progress.

3. **Opportunities for Further Enhancement of Regional Cooperation** (including identification of other hydrological-related topics and opportunities, possible further exchange of information and priority needs for assistance).

IV. Disaster Prevention and Preparedness (DPP)

1. Progress in Member's Regional Cooperation and Selected RCPIP Goals and Objectives:

a. Hardware and/or Software Progress (including provision of equipment for local flood observing and notification system; additional communications systems to report weather and also used as backup; improvements of communications systems; safety shelters in risk village; effective operations and maintenance for flood shelters and facilities; flood proofing and mitigation activities; improvements of hardware and/or software for emergency management monitoring and decision making; and web site additions and improvements).

b. Implications to Operational Progress (including providing community based disaster training; training on local flood observation/notification system; exchange/provision of information among Members; dissemination of DPP information via internet; establishment of dissemination networks; and development of related tools and techniques).

c. Interaction with users, other Members, and/or other components (including maintaining effective working relationship and communications with Media, meteorological/hydrological services, other government agencies involved in emergency management, and related NGOs; enhanced list of DPP related web sites; changes in terminology to make forecasts/warnings understandable; exchange of DPP information among Members via internet and other methods; improvement of DPP products and services to meet users' requirements and expectation; use of integrated DPP products and services in capacity building and sustainability decisions; enhancement of community participation; and linkage with other components (meteorology and hydrology).

d. Other Cooperative/RCPIP Progress.

2. **Progress in Member's Important, High-Priority Goals and Objectives** (towards the goals and objectives of the Typhoon Committee).

a. Hardware and Software Progress (including provision of equipment for local flood observing and notification system; additional communications systems to report weather and also used as backup; improvements of communications systems; safety shelters in risk village; effective operations and maintenance for flood shelters and facilities; flood proofing and mitigation activities; improvements of hardware and/or software for emergency management monitoring and decision making; and web site additions and improvements).

b. Implications to Operational Progress (including providing community based disaster training; training on local flood observation/notification system; exchange/provision of information among Members; dissemination of DPP information via internet; establishment of dissemination networks; and development of related tools and techniques).

c. Interaction with users, other Members, and/or other components (including maintaining effective working relationship and communications with Media, meteorological/hydrological services, other government agencies involved in emergency management, and related NGOs; enhanced list of DPP related web sites; changes in terminology to make forecasts/warnings understandable; exchange of DPP information among Members via internet and other methods; improvement of DPP products and services to meet users'

requirements and expectation; use of integrated DPP products and services in capacity building and sustainability decisions; enhancement of community participation; and linkage with other components (meteorology and hydrology).

d. Other Cooperative/ Progress.

3. **Opportunities for Further Enhancement of Regional Cooperation** (including identification of other DPP-related topics and opportunities, possible further exchange of information and priority needs for assistance).

V. Training

1. Progress in Member's Regional Cooperation Selected RCPIP Goals and Objectives:

a. Hardware and/or Software Progress (including computer-based and internet-based training development activities; improved training facilities; and improvements in training related hardware and software).

b. Implications to Operational Progress (including exchange/provision of training information among Members; use of exchanged training data/information; and improvement of training programs and material).

c. Interaction with users, other Members, and/or other components (including exchange of experts, fellowship programs, and roving seminars; exchange or attachment of typhoon forecasters; hosted or attended workshops, seminars, and training with/for other Members or outside of the region; improvement of training products and services to meet users' requirements and expectation; identifying training requirements; sharing of training materials among Members via internet or other methods; linkage with other components (meteorology, hydrology, and DPP); and use of integrated training products and services in capacity building and sustainability decisions).

d. Other Cooperative/RCPIP Progress.

2. **Progress in Member's Important, High-Priority Goals and Objectives** (towards the goals and objectives of the Typhoon Committee).

a. Hardware and Software Progress (including computer-based and internet-based training development activities; improved training facilities; and improvements in training related hardware and software).

b. Implications to Operational Progress (including exchange/provision of training information among Members; use of exchanged training data/information; and improvement of training programs and material).

c. Interaction with users, other Members, and/or other components (including exchange of experts, fellowship programs, and roving seminars; exchange or attachment of typhoon forecasters; hosted or attended workshops, seminars, and training with/for other Members or outside of the region; improvement of training products and services to meet users' requirements and expectation; identifying training requirements; sharing of training materials among Members via internet or other methods; linkage with other components (meteorology, hydrology, and DPP); and use of integrated training products and services in capacity building and sustainability decisions).

d. Other Cooperative Progress.

3. **Opportunities for Further Enhancement of Regional Cooperation.** Includes identification of other training-related topics and opportunities, possible further exchange of information and priority needs for assistance.

VI. Research

1. Progress in Member's Regional Cooperation Selected RCPIP Goals and Objectives:

a. Hardware and/or Software Progress (including improvement/new research hardware facilities and software).

b. Implications to Operational Progress (including use of data/information from International Observing Experiment; conducting research into use of in situ and remote sensing data, Dvorak technique, re-curvers, TC formation, and extra-tropical transition, rainfall distribution, storm surge; new uses of multi-model ensemble forecasting technique; new uses or development of statistical models; evaluation, validation, and verification of numerical models; evaluation of data assimilation of remotely sensed data; and understanding structure of tropical cyclone).

c. Interaction with users, other Members, and/or other components (including participation in International Observing Experiment; improvement of research to meet users' requirements and expectation; exchange of research experts through fellowship program; disseminate research results and case studies via internet and other sources; and Members' workshops on typhoon forecasting research. improvement of training products and services to meet users' requirements and expectation; identifying training requirements; sharing of training materials among Members via internet or other methods; linkage with other components (meteorology, hydrology, and DPP); and use of integrated research in capacity building and sustainability decisions).

d. Other Cooperative/RCPIP Progress.

2. **Progress in Member's Important, High-Priority Goals and Objectives** (towards the goals and objectives of the Typhoon Committee).

a. Hardware and Software Progress (including improvement/new research hardware facilities and software).

b. Implications to Operational Progress (including use of data/information from International Observing Experiment; conducting research into use of in situ and remote sensing data, Dvorak technique, re-curvers, TC formation, and extra-tropical transition, rainfall distribution, storm surge; new uses of multi-model ensemble forecasting technique; new uses or development of statistical models; evaluation, validation, and verification of numerical models; evaluation of data assimilation of remotely sensed data; and understanding structure of tropical cyclone).

c. Interaction with users, other Members, and/or other components (including participation in International Observing Experiment; improvement of research to meet users' requirements and expectation; exchange of research experts through fellowship program; disseminate research results and case studies via internet and other sources; and Members' workshops on typhoon forecasting research. improvement of training products and services to meet users' requirements and expectation; identifying training requirements; sharing of training materials among Members via internet or other methods; linkage with other components (meteorology, hydrology, and DPP); and use of integrated research in capacity building and sustainability decisions).

d. Other Cooperative/RCPIP Progress.

3. **Opportunities for Further Enhancement of Regional Cooperation.** Includes identification of other research-related topics and opportunities, possible further exchange of information and priority needs for assistance.

VII. Resource Mobilization Activities

Proposed Reporting Format for the Annual Country Reports - Three Components (Meteorology, Hydrology, and DPP). If This Format Is Adopted, Propose the RCPIP be Changed to Reflect Only These Three Components.

I. **Overview of Meteorological and Hydrological Conditions during the Year** (with focus on impacts of tropical cyclones (typhoons, tropical storms, and depressions) which occurred and affected Member).

1. Meteorological Assessment
2. Hydrological Assessment
3. Socio-economic Assessment

II. **Meteorology**

1. **Progress in Member's Regional Cooperation and Selected RCPIP Goals and Objectives:**

a. Hardware and/or Software Progress (including in-situ and remote meteorological observing, such as satellite, radar, and aircraft observations improvements; communications systems improvements; upgrading facilities to receive and process satellite data; expansion of observational area coverage; improvements of hardware for forecasts and data compilation and analysis; web site additions and improvements; improvements of software in data processing and analysis; and improvements in forecast models, both meteorological and storm surge).

b. Implications to Operational Progress (including exchange of in situ and remotely sensed data and uses; development of guidance and data requirements; improved use of consensus/ensemble model guidance; exchange of information with other Members via the internet; validation and verification activities; exchange/provision of information among Members; use of these exchanged data/information for improved forecasts; establishment of networks; expansion of the area coverage of forecasts and warnings; improvement of accuracy of forecasts/warnings; development of related tools and techniques; and improvement of timeliness of forecasts/warnings dissemination).

c. Interaction with users, other Members, and/or other components (including improvement of meteorological products to meet users' requirements and expectation; enhancement of community participation; linkage with other components (hydrology and DPP); use of integrated meteorological products and services in capacity building and sustainability decisions; and development of regional requirements; new dissemination methods).

d. Training Progress (including computer-based and internet-based training development activities; improved training facilities; improvements in training related hardware and software; exchange/provision of training information among Members; use of exchanged training data/information; improvement of training programs and material; exchange of experts, fellowship programs, and roving seminars; exchange of typhoon forecasters; attachment of forecasters to RSMC Tokyo; hosted or attended workshops, seminars, and training with/for other Members or outside of the region; improvement of training products and services to meet users' requirements and expectation; identifying training requirements; sharing of training materials among Members via internet or other methods; linkage with other components (hydrology and DPP); and use of integrated meteorological training products and services in capacity building and sustainability decisions).

e. Research Progress

f. Other Cooperative/RCPIP Progress.

2. **Progress in Member's Important, High-Priority Goals and Objectives** (towards the goals and objectives of the Typhoon Committee).

a. Hardware and/or Software Progress (including in-situ and remote meteorological observing, such as satellite, radar, and aircraft observations improvements; communications systems improvements; upgrading facilities to receive and process satellite data; expansion of observational area coverage; improvements of hardware for forecasts and data compilation and analysis; web site additions and improvements; improvements of software in data processing and analysis; and improvements in forecast models, both meteorological and storm surge).

b. Implications to Operational Progress (including exchange of in situ and remotely sensed data and uses; development of guidance and data requirements; improved use of consensus/ensemble model guidance; exchange of information with other Members via the internet; validation and verification activities; exchange/provision of information among Members; use of these exchanged data/information for improved forecasts; establishment of networks; expansion of the area coverage of forecasts and warnings; improvement of accuracy of forecasts/warnings; development of related tools and techniques; and improvement of timeliness of forecasts/warnings dissemination).

c. Interaction with users, other Members, and/or other components (including improvement of meteorological products to meet users' requirements and expectation; enhancement of community participation; linkage with other components (hydrology and DPP); use of integrated meteorological products and services in capacity building and sustainability decisions; and development of regional requirements; new dissemination methods).

d. Training Progress (including computer-based and internet-based training development activities; improved training facilities; improvements in training related hardware and software; exchange/provision of training information among Members; use of exchanged training data/information; improvement of training programs and material; exchange of experts, fellowship programs, and roving seminars; exchange of typhoon forecasters; attachment of forecasters to RSMC Tokyo; hosted or attended workshops, seminars, and training with/for other Members or outside of the region; improvement of training products and services to meet users' requirements and expectation; identifying training requirements; sharing of training materials among Members via internet or other methods; linkage with other components (hydrology and DPP); and use of integrated meteorological training products and services in capacity building and sustainability decisions).

e. Research Progress

f. Other Cooperative/RCPIP Progress.

3. **Opportunities for Further Enhancement of Regional Cooperation** (including identification of other meteorological-related topics and opportunities, possible further exchange of information and priority needs for assistance).

III. **Hydrology**

1. **Progress in Member's Regional Cooperation and Selected RCPIP Goals and Objectives:**

a. Hardware and Software Progress (including improvements in real-time in situ and remotely sensed data collection; expansion of observational area coverage; improvements of hardware for forecasts and data compilation/analysis; improvements of software in data processing and analysis; communications systems improvements; web site additions and improvements; improvements of software in data processing and analysis; improvements in hydrological forecast models; and evaluation and improvement of observing instruments).

b. Implications to Operational Progress (including expansion of the area coverage of forecasts and warnings; exchange of in situ and remotely sensed data and uses; development of guidance and data requirements; improved use of model guidance; exchange of information with other Members via the internet; validation and verification activities; exchange/provision

of information among Members; use of these exchanged data/information for improved forecasts; establishment of networks; improvement of accuracy of forecasts/warnings; development of related tools and techniques; and improvement of timeliness of forecasts/warnings dissemination).

c. Interaction with users, other Members, and/or other components (including improvement of hydrological products to meet users' requirements and expectation; enhancement of community participation; linkage with other components (meteorology and DPP); and use of integrated meteorological products and services in capacity building and sustainability decisions).

d. Training Progress (including computer-based and internet-based training development activities; improved training facilities; improvements in training related hardware and software; exchange/provision of training information among Members; use of exchanged training data/information; improvement of training programs and material; exchange of experts, fellowship programs, and roving seminars; exchange or attachment of typhoon forecasters; hosted or attended workshops, seminars, and training with/for other Members or outside of the region; improvement of training products and services to meet users' requirements and expectation; identifying training requirements; sharing of training materials among Members via internet or other methods; linkage with other components (meteorology and DPP); and use of integrated hydrological training products and services in capacity building and sustainability decisions).

e. Research Progress.

f. Other Cooperative/RCPIP Progress.

2. **Progress in Member's Important, High-Priority Goals and Objectives** (towards the goals and objectives of the Typhoon Committee).

a. Hardware and Software Progress (including improvements in real-time in situ and remotely sensed data collection; expansion of observational area coverage; improvements of hardware for forecasts and data compilation/analysis; improvements of software in data processing and analysis; communications systems improvements; web site additions and improvements; improvements of software in data processing and analysis; improvements in hydrological forecast models; and evaluation and improvement of observing instruments).

b. Implications to Operational Progress (including expansion of the area coverage of forecasts and warnings; exchange of in situ and remotely sensed data and uses; development of guidance and data requirements; improved use of model guidance; exchange of information with other Members via the internet; validation and verification activities; exchange/provision of information among Members; use of these exchanged data/information for improved forecasts; establishment of networks; improvement of accuracy of forecasts/warnings; development of related tools and techniques; and improvement of timeliness of forecasts/warnings dissemination).

c. Interaction with users, other Members, and/or other components (including improvement of hydrological products to meet users' requirements and expectation; enhancement of community participation; linkage with other components (meteorology and DPP); and use of integrated meteorological products and services in capacity building and sustainability decisions).

d. Training Progress (including computer-based and internet-based training development activities; improved training facilities; improvements in training related hardware and software; exchange/provision of training information among Members; use of exchanged training data/information; improvement of training programs and material; exchange of experts, fellowship programs, and roving seminars; exchange or attachment of typhoon forecasters; hosted or attended workshops, seminars, and training with/for other Members or outside of the region; improvement of training products and services to meet users'

requirements and expectation; identifying training requirements; sharing of training materials among Members via internet or other methods; linkage with other components (meteorology and DPP); and use of integrated hydrological training products and services in capacity building and sustainability decisions

e. Research Progress.

f. Other Cooperative/RCPIP Progress.

3. **Opportunities for Further Enhancement of Regional Cooperation** (including identification of other hydrological-related topics and opportunities, possible further exchange of information and priority needs for assistance).

IV. Disaster Prevention and Preparedness (DPP)

1. **Progress in Member's Regional Cooperation and Selected RCPIP Goals and Objectives:**

a. Hardware and/or Software Progress (including provision of equipment for local flood observing and notification system; additional communications systems to report weather and also used as backup; improvements of communications systems; safety shelters in risk village; effective operations and maintenance for flood shelters and facilities; flood proofing and mitigation activities; improvements of hardware and/or software for emergency management monitoring and decision making; and web site additions and improvements).

b. Implications to Operational Progress (including providing community based disaster training; training on local flood observation/notification system; exchange/provision of information among Members; dissemination of DPP information via internet; establishment of dissemination networks; and development of related tools and techniques).

c. Interaction with users, other Members, and/or other components (including maintaining effective working relationship and communications with Media, meteorological/hydrological services, other government agencies involved in emergency management, and related NGOs; enhanced list of DPP related web sites; changes in terminology to make forecasts/warnings understandable; exchange of DPP information among Members via internet and other methods; improvement of DPP products and services to meet users' requirements and expectation; use of integrated DPP products and services in capacity building and sustainability decisions; enhancement of community participation; and linkage with other components (meteorology and hydrology).

d. Training Progress (including computer-based and internet-based training development activities; improved training facilities; improvements in training related hardware and software; exchange/provision of training information among Members; use of exchanged training data/information; improvement of training programs and material; exchange of experts, fellowship programs, and roving seminars; exchange or attachment of typhoon forecasters; hosted or attended workshops, seminars, and training with/for other Members or outside of the region; improvement of training products and services to meet users' requirements and expectation; identifying training requirements; sharing of training materials among Members via internet or other methods; linkage with other components (meteorology and hydrology); and use of integrated DPP training products and services in capacity building and sustainability decisions.

e. Research Progress.

f. Other Cooperative/RCPIP Progress.

2. **Progress in Member's Important, High-Priority Goals and Objectives** (towards the goals and objectives of the Typhoon Committee).

a. Hardware and/or Software Progress (including provision of equipment for local flood observing and notification system; additional communications systems to report weather and also used as backup; improvements of communications systems; safety shelters in risk village; effective operations and maintenance for flood shelters and facilities; flood proofing and mitigation activities; improvements of hardware and/or software for emergency management monitoring and decision making; and web site additions and improvements).

b. Implications to Operational Progress (including providing community based disaster training; training on local flood observation/notification system; exchange/provision of information among Members; dissemination of DPP information via internet; establishment of dissemination networks; and development of related tools and techniques).

c. Interaction with users, other Members, and/or other components (including maintaining effective working relationship and communications with Media, meteorological/hydrological services, other government agencies involved in emergency management, and related NGOs; enhanced list of DPP related web sites; changes in terminology to make forecasts/warnings understandable; exchange of DPP information among Members via internet and other methods; improvement of DPP products and services to meet users' requirements and expectation; use of integrated DPP products and services in capacity building and sustainability decisions; enhancement of community participation; and linkage with other components (meteorology and hydrology).

d. Training Progress (including computer-based and internet-based training development activities; improved training facilities; improvements in training related hardware and software; exchange/provision of training information among Members; use of exchanged training data/information; improvement of training programs and material; exchange of experts, fellowship programs, and roving seminars; exchange or attachment of typhoon forecasters; hosted or attended workshops, seminars, and training with/for other Members or outside of the region; improvement of training products and services to meet users' requirements and expectation; identifying training requirements; sharing of training materials among Members via internet or other methods; linkage with other components (meteorology and hydrology); and use of integrated DPP training products and services in capacity building and sustainability decisions.

e. Research Progress.

f. Other Cooperative/RCPIP Progress.

3. **Opportunities for Further Enhancement of Regional Cooperation** (including identification of other DPP-related topics and opportunities, possible further exchange of information and priority needs for assistance).

V. Resource Mobilization Activities

Options for collaborative activities among the five components of the RCPIP.

a. Hold integrated, joint workshops/training sessions (meteorology, hydrology, and DPP) to promote integrated, joint projects/activities, research topics, and training areas.

b. Encourage and foster collaborative activities such as the Hydrology and DPP collaborative activities currently being conducted.

c. Expand the use of roving seminars, Typhoon Committee Research Fellowships Scheme, workshops, and multi-Member training sessions to involve the focus and interactions for the three components of meteorology, hydrology, and DPP.

d. Use the Typhoon Committee's five Component Focal Points/Chairpersons as a mechanism to seek and receive cross component feedback on issues and proposals.

e. Foster coordination and collaboration projects/activities with other tropical cyclone committees and other WMO and ESCAP programs including WWRP.

f. Proposed Scientific Lectures/Presentations on successful collaboration/ coordination activities and projects (lessons learned and best practices).

Appendix XIII Annex V

Options for Mobilizing Resources to Achieve the Goals and Objectives, as Determined by the Typhoon Committee at its Thirty-fifth Session

1. **Executive Summary (details provided below).** Options for consideration and discussion by Typhoon Committee:

   a. Conduct mobilization of resources activities/efforts led by the TC Chairperson, TC Vice-Chairperson, AWG, TC Secretary (Coordinator), and TCS. Recommend that WMO and ESCAP provide assistance and expertise, as required.
   b. Distribute questionnaire on Members' achievements, successes, and problems on mobilizing resources. Once data are collected, create data base on mobilization of resources which would be accessible to Members only.
   c. Facilitate and enhance the coordination and collaboration of tropical cyclone activities to ensure effective, integrated results with not only the Tropical Cyclone Programme (TCP), but also Education and Training Programme (ETP) and Regional Associations II and V of WMO
   d. At every TC Session, ensure a major agenda item addresses mobilization of resources; activities on mobilization of resources included in all Members' Country Reports; presentations/lectures given on resource mobilization activities, progress, procedures, schemes, or available data bases.
   e. Sponsor donor workshops to describe and elaborate on the vision, goals/objectives, and accomplishments of the TC especially in the area of the RCPIP.

2. **Current status of the resource mobilization activities in Typhoon Committee.**

Substantial efforts have been made by the Members and the Secretariat (TCS) of the Typhoon Committee to mobilize resources other than the Typhoon Committee Trust Fund (TCTF) for its activities on its five components: meteorology, hydrology, disaster prevention and preparedness, training, and research. The major resources include the multilateral assistance from the WMO Voluntary Cooperation Programme (VCP), WMO regular budget, ESCAP, and the bilateral assistance from the national governments and relevant agencies such as Japan International Cooperation Agency (JICA) and Korea International Cooperation Agency (KOICA). In the multilateral assistance area, VCP forms a majority of the achievements with 14 projects for 5 countries during 1998-2003. Technical Cooperation among Developing Countries (TCDC) also plays a significant role in the resource mobilization activities by Members. Recent examples of such cooperative assistance funded by resources outside the Typhoon Committee are:

(a) Provision of a VSAT system for linking NMC Vientiane to the GTS (WMO/VCP- ongoing).
(b) Improvement of data communication between NMC and local centers in Democratic People's Republic of Korea in 2001 (WMO/VCP).
(c) "Workshop on Integration of Risk Analysis and Management of Water-related Disasters into Development Process in the Typhoon Committee Area" held in Manila in July 2002 (PAGASA; Ministry of Land, Infrastructure and Transport of Japan; JICA; and TCS in cooperation with ESCAP/WMO).
(d) Regional Consultation Meeting on Flood Management held in Manila in October 2002 (ADB and JICA).
(e) "Annual Training Workshop on Weather Forecasting for Operational Meteorologists" held annually in Seoul since 1998 (KOICA).
(f) "International Training Course on Radar Meteorology" held at the WMO RMTC Nanjing in 2002 (China Meteorological Administration and WMO/VCP).
(g) Annual group training courses for "Meteorology", "River and Dam Engineering", "Volcanology and Erosion/Sediment Control Engineering", and "Risk Management Associated with Disaster to Infrastructure" being held in Tokyo (JICA).
(h) A series of "International Seminar on MTSAT/LRIT Data Utilization" held in Tokyo from 2000 to 2002 (Ministry of Land, Infrastructure and Transport of Japan)

3. **Exploitation of the potential resources**

   a. **Banks.** In view of the status quo of the resource mobilization in Typhoon Committee as described above, it is pointed out that partnerships are limited with major funding agencies, banks in particular, as compared with other WMO regions. We should note that WMO concluded a Memoranda of Understanding (MOU) with the World Bank and the Inter-American Development Bank (IDB) in 1999 and 2000, respectively, for cooperation in areas of mutual interest that included climate change, national disaster prevention and mitigation, El Niño phenomenon, and integrated water resources management. Attention is especially invited to the Ibero- American Climate Project which involves 13 countries in Latin America and has raised $3.2 million to date for a feasibility study from IDB with the coordination of WMO. The project is aimed at minimizing the adverse effect of climatic events on socio-economic activities in the region by strengthening the national meteorological/hydrological services (NMHSs) and the total estimated cost is $409 million.

   In this regard, the Typhoon Committee should recall that a similar project entitled "Integrated System for the Mitigation of Typhoon, Flood and Environmental Disasters in the Western North Pacific Area" was proposed in 1996 for its region by WMO. The overall objective of the project was to assist NMHSs of participating Members (12 of 14 TC Members) to develop the capacity to provide timely and accurate warnings for natural hazards including tropical cyclones. The regional project was to adopt comprehensive arrangements for fully modernizing the NMHSs and to improve coordination among domestic disaster-prevention authorities. It was also intended to develop close partnerships among the Members in the region so that they can better cope with natural disasters through regional cooperation. The project assumed World Bank, ADB and UNDP as principal contributors and also viewed bilateral assistance from interested countries such as Australia, Canada, Denmark, Finland, Sweden and Japan. The estimated total cost of the project was approximately US $200 million. Although the project has faded since 1999 when country plans were prepared, the concept of the project suggests an effective strategy to enhance the resource mobilization on a regional level through a concerted approach by the Members.

   b. **Other Resources**. Many TC Members have received substantial assistance under the various bilateral schemes, ranging from training and expert services to large-scale projects which may costs millions of dollars. However, donors (countries/agencies) have different characteristics, procedures, and applications for the implementation of projects which present problems for some Members applying for funding support. Given this situation, detailed information on the available schemes, focus areas, preferences, and relevant procedures would be of help to the Members in increasing the possibilities for receipt of the bilateral assistance.

   Consideration should also be given to funding agencies which have not yet contributed substantially to TC Members but have a keen interest in supporting the NMHSs. European Union (EU) is one of these agencies who in the past has work closely with WMO and NMHSs in other regions. An example of one of the EU projects currently in progress is the Caribbean Radar Network Project which is providing four new Doppler digital radars in Barbados, Belize, Guyana and Trinidad and Tobago for detecting and monitoring tropical cyclones in the Caribbean. EU has also undertaken joint initiatives with WMO in Africa through a series of projects related to water-resource management including the Southern African Development Community - Hydrological Cycle Observing Stations (SADC-HYCOS). However, for a successful approach to these agencies, WMO and/or TC Secretariat should assume a coordination role.

4. **Guidelines for the resource mobilization**

   a. **Short Term.** Considering the current severe fiscal situation of funding agencies, it is recommended to explore further resource possibilities from sources which have already provided funding support to the Members. Unfortunately, TC Members do not necessarily share their experiences in mobilizing resources. All of the funding mechanisms have their own polices, criteria, and procedures. Accordingly, it is proposed to facilitate the exchange

of information and experiences acquired by the Members as beneficiaries of specific financial resources, so Members can identify resources and sources which most suit their objectives. Establishment of a data base of financial resources is highly recommended. The data base would hold general information about available resources and be regularly updated by Members. Direct contact with relevant countries/agencies may be required to make the data base more useful and effective. In the second phase, the data base should include other resources which are still outside the scope of the Typhoon Committee. Finally, a consulting mechanism should be established to give appropriate advice to Members based upon the data base. The consultation may include partnerships with private sectors.

b. **Long Term.** From a long-term perspective, a more active and comprehensive approach is proposed. The TC Chairperson, TC Vice-Chairperson, AWG, TC Secretary (Coordinator), and TCS could present the common goal of the Members – mitigation of typhoon disasters – and make an appeal for the funding agencies to organize a project to enhance the Members' capabilities to cope with typhoons on a regional basis. The project "Integrated System for the Mitigation of Typhoon, Flood and Environmental Disasters in the Western North Pacific Area" is highly recommended for such a project. Assets of this cancelled project could be partly restored, although the scale of the project should be reduced by concentrating its focus on typhoons. Development banks should be identified as main funding agencies along with other potential donors. Also, due consideration should be given to budgetary conditions of the Members which have been seriously affected by the currency crisis during recent several years. Hence, the Typhoon Committee Secretariat with the support of the WMO should lead the mobilization of resources efforts for the Members with funding agencies. Linkages will also be needed with not only the Tropical Cyclone Programme (TCP), but also Education and Training Programme (ETR), Technical Cooperation Programme (TCO), and Regional Associations II and V of WMO.

5. **Options.** The IWG proposes the following options be considered:

a. The Typhoon Committee's mobilization of resources activities/efforts should be led by the TC Chairperson, TC Vice-Chairperson, AWG, TC Secretary (Coordinator), and TCS. WMO and ESCAP should provide assistance and expertise in these activities/efforts, as required.
b. Since there is currently little information available on TC Members mobilization of resources activities, the TCS should prepare and distribute a questionnaire on Members' achievements, successes, and problems on mobilizing resources. This questionnaire should also ask for schemes, procedures, and strategies that were successful with funding agencies.
c. Once the data from the questionnaire are collected, then the TCS with Members' support should create a data base of the mobilization of resources information which would be accessible to Members only.
d. WMO should continue to facilitate and enhance the coordination, harmonization, and collaboration of tropical cyclone activities between WMO RA II and the WMO/ESCAP Typhoon Committee to ensure effective, integrated results.
e. Since it is difficult for single Members to solicit and acquire funding support from EU, Development Banks, funding agencies, etc., it is recommended that the TC Chairperson, TC Vice-Chairperson, AWG, TC Secretary (Coordinator), and TCS with assistance from WMO and ESCAP lead the activities to get support for regional projects to enhance the Members' capabilities to cope with typhoons on a regional basis.
f. Consideration should also be given to funding agencies which have not yet contributed substantially to TC Members such as the European Union (EU) but have a keen interest in supporting the National Meteorological and Hydrological Services (NMHSs).
g. Resource mobilization activities should link with not only the Tropical Cyclone Programme (TCP), but also Education and Training Programme (ETP) and Regional Associations II and V of WMO.
h. At every TC Session, a major agenda item should address the mobilization of resources.
i. Activities on mobilization of resources should be included in all Members' Country Reports.
j. Presentations/lectures should be given at Typhoon Committee Sessions on resource mobilization activities, progress, procedures, schemes, or available data bases as appropriate.

k. The Typhoon Committee should sponsor donor workshops to describe and elaborate on the vision, goals/objectives, and accomplishments of the TC especially in the area of the RCPIP.

Appendix XIII Annex VI

Proposed Updates to the *STATUTE OF THE TYPHOON COMMITTEE* and *RULES OF PROCEDURE OF THE TYPHOON COMMITTEE.*

a. In developing methodologies to improve the efficiency of the Typhoon Committee (TC), TC Coordinator (Secretary), and TCS, the IWG reviewed the current ***Statute of the Typhoon Committee*** and the ***Rules of Procedure of the Typhoon Committee.*** The IWG found that these two documents were out of date, contained incorrect references, and did not reflect the current status of the Typhoon Committee operations. Therefore, the IWG proposes updates to these two documents as reflected in the attached. It is proposed the TC reviews, discusses, and acts on these two updated documents.

b. The IWG did not proposed updates to Article 8 of the ***Statute of the Typhoon Committee*** and did not propose updates to Rule 4 of the ***Rules of Procedure of the Typhoon Committee***. However the Typhoon Committee may want to review and revise as necessary the meaning/wording of Article 8 and Rule 4.

Current ***Statute of the Typhoon Committee*** and ***Rules of Procedure of the Typhoon Committee***

STATUTE OF THE TYPHOON COMMITTEE

ESTABLISHMENT

ARTICLE 1

The Typhoon Committee (hereinafter referred to as the **Committee)** is established by the Government of regional ECAFE members countries affected by typhoons (hereinafter referred to as the participating Governments) under the auspices of the United Nations Economic Commission for Asia and Far East (hereinafter referred to as the Commission) in cooperation with the World Meteorological Organization with a view to promoting and coordinating efforts to minimize typhoon damages in the ECAFE region.

MEMBERSHIP, COMPOSITION, AND ORGANIZATION

ARTICLE 2

The **Committee** shall be composed of a representative from each of the participating Governments desiring to participate in co-operative efforts to minimize typhoon damage in the ECAFE region. The Executive Secretary of ECAFE and the Secretary-General of WMO or their representatives shall be ex-officio members of the **Committee**.

ARTICLE 3

The **Committee** shall have a technical secretary and a secretariat which will serve as its executive body. The functions and duties of the Typhoon Committee Secretariat shall be determined by the **Committee.**

ARTICLE 4

The **Committee** shall be assisted, when necessary, by an Advisory Group consisting of qualified experts from within and outside the region.

CO-OPERATION WITH THE SECRETARIATS OF THE COMMISSION (ECAFE) AND THE WORLD METEOROLOGICAL ORGANIZATION (WMO)

ARTICLE 5

The Secretariat of the Commission and the Secretariat of the World Meteorological Organization shall co-operate with the **Committee** in the performance of the latter's functions.

FUNCTIONS

ARTICLE 6

The functions of the **Committee** are to promote and to co-ordinate the planning and implementation of measures required for minimizing typhoon damage in the ECAFE region. It shall, to this end:

a) Review regularly the progress made in the various fields of typhoon damage prevention;

b) Recommend to the participating Governments concerned plans and measures for the improvement of meteorological and hydrological facilities needed for typhoon damage prevention;

c) Recommend to the participating Governments concerned plans and measures for the improvement of community preparedness and disaster prevention;

d) Promote the establishment of programs and facilities for training personnel from countries of the region in typhoon forecasting and warning, flood hydrology and control within the region and arrange for training outside the region, as necessary;

e) Promote, prepare, and submit to participating Governments and other interested organizations plans for co-ordination of research programmes and activities concerning typhoons;

f) Consider, upon request, possible sources of financial and technical support for such plans and programmes;

g) Prepare and submit, at the request and on behalf of the participating Governments, request for technical, financial, and other assistance offered under the United Nations Development Programme and by other organizations and contributors.

In carrying out these functions, the **Committee** will ensure that the plans adopted by the appropriate bodies of the WMO including implementation programme established by WMO as part of the World Weather Watch Plan, are fully respected at all times.

GENERAL PROVISIONS

ARTICLE 7

The **Committee** shall adopt its own rules of procedure.

ARTICLE 8

The **Committee** shall take action in respect of any country without the agreement of the Government of that country.

ARTICLE 9

The **Committee** shall have authority, subject to established United Nations procedures and practice, to invite representatives of Governments, the United Nations specialized agencies, other United Nations bodies and recognized governmental and non-governmental organizations to attend specific meetings of the **Committee** in the capacity of observers or in a consultative capacity.

ARTICLE 10

The **Committee** shall submit annual reports to participating Governments, the Commission, and the World Meteorological Organization. Such reports, or summaries thereof, may be made available to other Governments, the United Nations specialized agencies, other United Nations bodies, and recognized governmental and non-governmental organizations on the recommendation of the **Committee.**

ARTICLE 11

Amendments to the present statute which may be proposed by any participating Government shall be examined by the **Committee** and shall take effect when approved by all participating Governments.

RULES OF PROCEDURE OF THE TYPHOON COMMITTEE

RULE 1

The **Committee** shall hold at least one session annually. The venues and dates of its sessions shall be decided by the **Committee**.

RULE 2

The Executive Secretary of ESCAP shall, in consultation with the Secretary-General of WMO, and the Chairman of the **Committee**, issue a notice convening each session of the **Committee**, together with copies of the provisional agenda, at least six weeks before the commencement of the session.

RULE 3

The Executive Secretary of ESCAP, in co-operation with the Secretary-General of WMO, shall provide the necessary servicing of the **Committee's** meeting.

RULE 4

All meetings shall be held in private unless the **Committee** shall decide otherwise.

RULE 5

English and French shall be the working languages of the **Committee.**

RULE 6

The **Committee** shall, at its first meeting of the year, elect from its representatives a chairman and vice-chairman, who shall hold office until their successors are elected. They shall be eligible for re-election.

RULE 7

A simple majority of the government members of the **Committee** shall constitute a quorum.

RULE 8

Decisions of the **Committee** shall be made by a majority of the government members present and voting.

RULE 9

In the event of any matter rising which has not been foreseen by the present Rules, the pertinent rules of the United Nations Economic and Social Commission for Asia and the Pacific shall be applied.

STATUTE OF THE TYPHOON COMMITTEE

ESTABLISHMENT

ARTICLE 1

The Typhoon Committee (hereinafter referred to as the **Committee)** is established by the Members (hereinafter referred to as the participating Members) of the regional United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) affected by typhoons under the auspices of the United Nations Economic and Social Commission for Asia and the Pacific (hereinafter referred to as the Commission) in cooperation with the World Meteorological Organization (WMO) with a view to promoting and coordinating efforts to minimize typhoon damages in the ESCAP region.

MEMBERSHIP, COMPOSITION, AND ORGANIZATION

ARTICLE 2

The **Committee** shall be composed of a representative with appropriate advisors and assistants from each of the participating Members desiring to participate in co-operative efforts to minimize typhoon damage in the ESCAP region. The Executive Secretary of ESCAP and the Secretary-General of WMO or their representatives shall be ex-officio members of the **Committee**.

ARTICLE 3

The **Committee** shall have a Typhoon Committee Secretariat directed by a Typhoon Committee Secretary which will serve as its secretariat. The functions and duties of the Typhoon Committee Secretary and Secretariat shall be determined by the **Committee.**

ARTICLE 4

The **Committee** shall be assisted, when necessary, by an Advisory Working Group whose members shall consist of qualified experts from within the region. A representative from ESCAP and a representative from WMO shall be ex-officio members of the Advisory Working Group.

CO-OPERATION WITH THE SECRETARIATS OF THE COMMISSION (ESCAP) AND THE WORLD METEOROLOGICAL ORGANIZATION (WMO)

ARTICLE 5

The Secretariat of the Commission and the Secretariat of the World Meteorological Organization (WMO) shall co-operate with the **Committee** in the performance of the latter's functions.

FUNCTIONS

ARTICLE 6

The functions of the **Committee** are to promote and to co-ordinate the planning and implementation of measures required for minimizing typhoon damage in the ESCAP region. It shall, to this end:

h. Review regularly the progress made in the various fields of typhoon damage prevention;
i. Recommend to the participating Members concerned plans and measures for the improvement of meteorological and hydrological facilities needed for typhoon damage prevention;
j. Recommend to the participating Members concerned plans and measures for the improvement of community preparedness and disaster prevention;

k. Promote the establishment of programs and facilities for training personnel from Members of the region in typhoon forecasting and warning, flood hydrology and control within the region and arrange for training outside the region, as necessary;
l. Promote, prepare, and submit to participating Members and interested organizations plans for co-ordination of research programmes and activities concerning typhoons;
m. Coordinate resource mobilization activities and technical support for its plans and programmes;
n. Prepare and submit, at the request and on behalf of the participating Members, request for technical, financial, and other assistance offered under the United Nations Development Programme and by other organizations and contributors.

In carrying out these functions, the **Committee** will ensure that the plans/projects adopted by the appropriate bodies of the WMO as part of the World Weather Watch Programme, are fully respected at all times.

GENERAL PROVISIONS

ARTICLE 7

The **Committee** shall adopt its own rules of procedure.

ARTICLE 8

The **Committee** shall take action in respect of any country without the agreement of the Government of that country. **(Not changed. The Typhoon Committee may want to review and revise as necessary the meaning and wording of Article 8.)**

ARTICLE 9

The **Committee** could, subject to established United Nations procedures and practice, invite additional experts or advisors of Members, the United Nations specialized agencies, other United Nations bodies and recognized governmental and non-governmental organizations to attend specific meetings of the **Committee** in the capacity of observers or in a consultative capacity.

ARTICLE 10

The **Committee** shall submit annual reports to participating Members, the Commission, and the World Meteorological Organization. Such reports, or summaries thereof, may be made available to Governments outside of the region, the United Nations specialized agencies, other United Nations bodies, and recognized governmental and non-governmental organizations on the recommendation of the **Committee.**

ARTICLE 11

Amendments to the present statute which may be proposed by any participating Member shall be examined by the **Committee** and shall take effect when approved by two thirds or more of all participating Members.

RULES OF PROCEDURE OF THE TYPHOON COMMITTEE

RULE 1

The **Committee** shall hold at least one session every two years. The venues and dates of its sessions shall be decided by the **Committee**.

RULE 2

The Typhoon Committee Secretary shall, in consultation with the Executive Secretary of ESCAP, Secretary-General of WMO, and the Chairman of the **Committee**, issue a notice convening each session of the **Committee**, together with copies of the provisional agenda, at least three months before the commencement of the session.

RULE 3

The Typhoon Committee Chairperson and Typhoon Committee Secretariat shall, in consultation with representatives of the Executive Secretary of ESCAP and Secretary-General of WMO, provide the necessary servicing of the **Committee's** meeting.

RULE 4

All meetings shall be held in private unless the **Committee** shall decide otherwise. **(Not Changed. The Typhoon Committee may want to review and revise as necessary the meaning and wording of Rule 4.)**

RULE 5

English shall be the working language of the **Committee.**

RULE 6

The **Committee** shall at each bi-annual Session elect from its representatives a Chairperson and Vice-Chairperson, who shall hold office until their successors are elected. They shall be eligible for re-election.

RULE 7

A simple majority of the Members of the **Committee** shall constitute a quorum.

RULE 8

Decisions of the **Committee** shall be made by a majority of the voting Members.

RULE 9

In the event of any matter which has not been foreseen by the present Rules, the pertinent rules of the United Nations Economic and Social Commission for Asia and the Pacific shall be applied.

APPENDIX XIV

TERMS OF REFERENCE OF THE WORKING GROUP ON THE REVIEW OF THE OPERATIONS AND STRUCTURE OF THE TYPHOON COMMITTEE

General

At the 36th Session of the Typhoon Committee held in Kuala Lumpur, 15-20 December 2003, the Chairperson of the Interim Working Group (IWG) on the Regional Cooperative Programme Implementation Plan (RCPIP) presented the IWG's report (Appendix XIII). After consideration of the report, the Committee requested further evaluation of the options and proposals in the IWG report regarding the operations and structure of the Typhoon Committee and the submission of detailed proposals for adoption, if appropriate, at the 37th Session.

To perform the further evaluation and submission of detailed proposals, the Committee decided to establish a Working Group on the Review of the Operations and Structure of the Typhoon Committee (WG ROSTY). Based upon the ***Guidance*** provided by the Typhoon Committee, the Working Group will present the deliverables listed below prior to the 37th Session of the Typhoon Committee based upon the roadmap provided.

Guidance

In accepting the establishment of the Working Group, the Typhoon Committee provided the following guidance to accomplish the items listed under ***Deliverables.*** The Working Group should:

- Consult and coordinate with Members of the Typhoon Committee to seek their inputs on the various proposals and options which will be submitted to the 37th Session.
- Evaluate the proposals (listed in Annexes I and II) from the IWG on the RCPIP's report presented at the 36th Session.
- Consider pros and cons of the proposals and options, negative and positive impacts, improvements to the proposals and options, and inputs of Typhoon Committee Members in evaluating the proposals in Annexes I and II.
- Consider related proposals and options in addition to those given in Annexes I and II.

Membership

The Committee appointed Mr. James Weyman, USA, to be the Chairperson of the Working Group on the ROSTY. In addition, the Committee invited the following Typhoon Committee Members to nominate a core member each to serve on the WG ROSTY:

- China
- Hong Kong, China
- Japan
- Malaysia
- Philippines
- Republic of Korea
- Thailand

Other Typhoon Committee Members are each invited to nominate a non-core member

to serve on the WG ROSTY. Members may send experts to attend meetings of the WG. If necessary, resource persons may be invited by the Chairperson of the WG on the ROSTY in consultation with members of the WG.

Operation Modalities

The Working Group will conduct its work, coordination, and communications through email to the maximum extent possible. The Working Group will hold a 3-day meeting to complete its work. A representative from ESCAP and WMO will be invited to the meeting to serve as resource persons to the WG on the ROSTY. The Chairperson in consultation with ESCAP, WMO, and core members, based upon the potential costs and effectiveness/efficiency of the meeting, will determine the location of the meeting.

Deliverables

The following items will be delivered to the TCS for circulation to all of the Typhoon Committee Members prior to the 37th Session of the Typhoon Committee based upon the roadmap provided below:

1. Detailed proposals and options of the IWG's proposals presented at the 36th Session and other proposals and options regarding strengthening of the effectiveness and efficiency of the:

   a. TCS,
   b. structure of the Committee, and
   c. operations of the Typhoon Committee, including the budgetary process

2. Proposals to modify the ***RULES OF PROCEDURE OF THE TYPHOON COMMITTEE*** based on removing outdated information, required clarification, and required related changes if the Committee adopts the proposals and options listed in paragraph 1 above, and if necessary, the ***STATUTE OF THE TYPHOON COMMITTEE.***

3. Strategies and one or two detailed project proposals to be used for resource mobilization.

Roadmap

The Roadmap for the work of the WG on the ROSTY:

- TCS will issue letters to request Members to nominate core and non-core members to the WG. **Action by January 1, 2004**.
- Members will provide the name of their respective members for the WG to the TCS. **Action by January 21, 2004.**
- Working Group Chairperson will send out the WG's work plan with duty assignment. **Action by February 10, 2004.**
- WG Chairperson will consult and coordinate with all Typhoon Committee Members on proposals regarding the TCS and the possibilities of hosting the TCS and conditions of any offer to host. **Action by April 1, 2004.**
- WG members will submit the first draft of their assigned documents to the Chairperson. **Action by April 1, 2004.**
- Chairperson will coordinate and integrate the draft documents and send out to WG members. **Action by April 15, 2004.**
- Meeting of the WG on the ROSTY. **Action by April 30, 2004.**

- Chairperson incorporates changes/modifications needed from the meeting and send out for second review to WG members. **Action by May 30, 2004.**
- WG members forward their comments on documents. **Action by July 15, 2004.**
- Chairperson incorporates changes/modifications needed from the meeting and send out for final review to WG members. **Action by August 5, 2004.**
- WG members forward their final comments on documents. **Action by August 30, 2004.**
- Chairperson incorporates final comments and sends finalized documents to TCS. **Action by September 10, 2004.**
- TCS distributes WG's documents to Typhoon Committee Members for review and preparation of discussion at 37th Session of the Typhoon Committee. **Action by September 15, 2004.**

ANNEX I

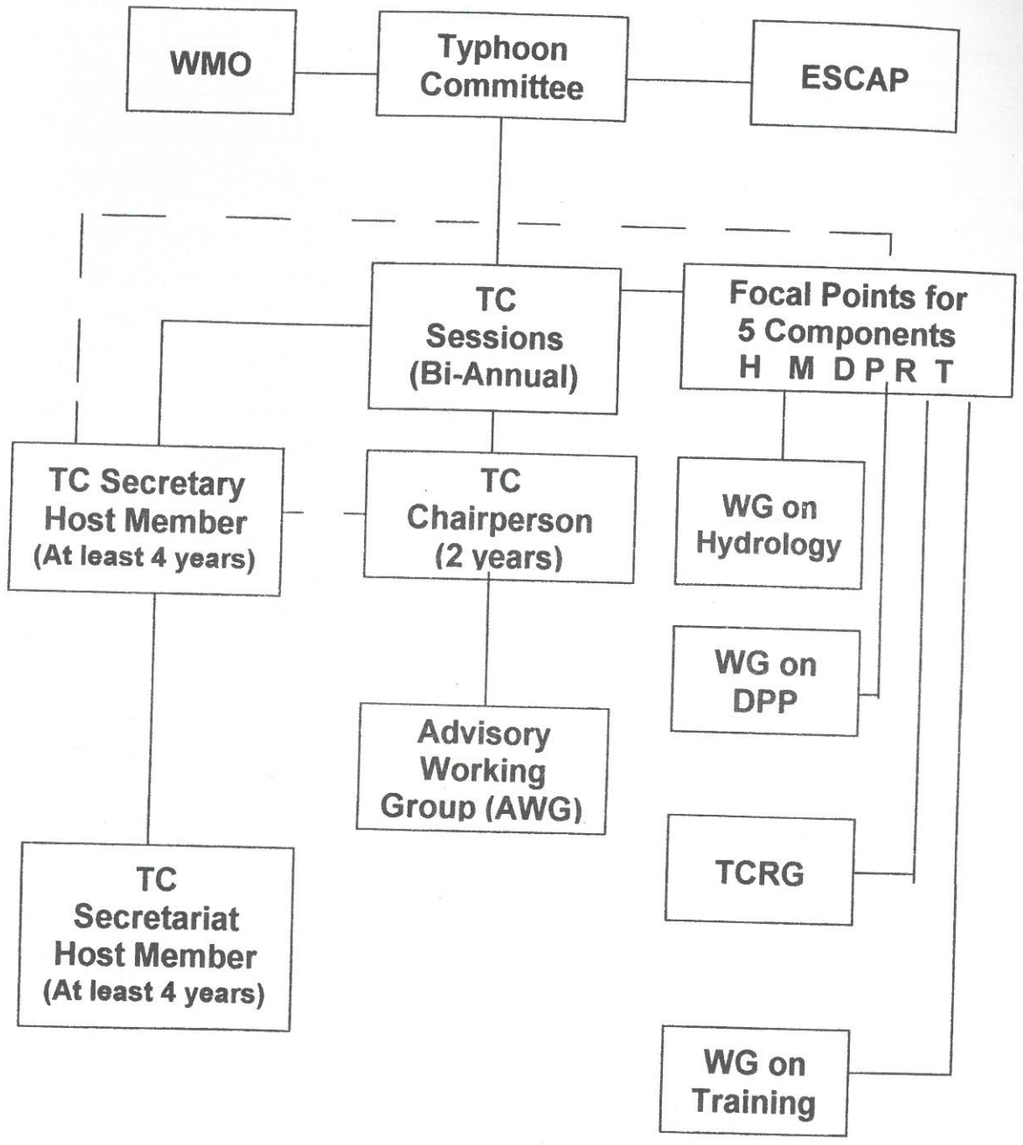
IWG of the RCPIP's Proposals and Options Presented to the 36th Session of the Typhoon Committee

- Stronger, more involved role for the TC Chairperson, the TC Vice-Chairperson, and the five Component Focal Points/Chairpersons
- Establishment of Advisory Working Group (AWG) to assist the Chairperson of the Typhoon Committee and the TC Secretary (currently the Coordinator Position).
- New Terms of Reference for Typhoon Committee (TC), TC Chairperson, TC Vice-Chairperson, Advisory Working Group, TC Secretary (formerly Coordinator), and TC Secretariat
- TC Sessions held every two years with the AWG meeting the alternate years
- Members volunteering to host the TCS (providing TC Secretary and TC Secretariat members) and/or providing seconding experts, as Members' resources and facilities permit.
- Proposed Updates to the *STATUTE OF THE TYPHOON COMMITTEE* and *RULES OF PROCEDURE OF THE TYPHOON COMMITTEE*
- Formation of a WG on Training and WG on DPP
- A more effective method be adopted to seek and obtain feedback/input from the TC Members.
- TCS and Advisory Working Group (AWG) jointly develop a bi-annual operating/work plan and a 4 year strategic plan on their goals/objectives and performance measures for assisting Members in accomplishing the goals and objectives of the RCPIP
- Mobilization of resources activities should be led by the TC Chairperson, TC Vice-Chairperson, AWG, TC Secretary (Coordinator), and TCS. WMO and ESCAP should provide assistance and expertise.
- Difficult for single Members to solicit/acquire funding support from EU, Development Banks, funding agencies, etc., recommended the TC Chairperson, TC Vice-Chairperson, AWG, TC Secretary (Coordinator), and TCS with assistance from WMO and ESCAP lead the activities to get support for regional projects
- Consideration given to funding agencies which have not yet contributed substantially to TC Members such as the European Union (EU)
- The Typhoon Committee should sponsor donor workshops to describe and elaborate on the vision, goals/objectives, and accomplishments of the TC especially in the area of the RCPIP.
- Effective, efficient budgetary process.

STRUCTURE
TC

STRUCTURE
TC

Proposed Structure of the Typhoon Committee



APPENDIX XV

REPORT OF THE WORKING GROUP ON A UNIFIED NORTH WEST PACIFIC BEST TRACK DATA SET

A scheme for the development of an Expanded Best Track Data Set for the Western North Pacific and the South China Sea

Introduction

At the Workshop on Potential Development of a Unified N.W. Pacific Tropical Cyclone (TC) Best-Track Data Set (BT) held in Honolulu on 26-27 November 2001, a wide variety of arguments were presented. However, they did not converge to the extent that consensus was reached about the feasibility and effectiveness of a new data set. Especially creating a new data set which requires re-analysis and/or unification procedure is controversial.

After exchanging views and comments on Chairman's draft proposals among its Members, a Chairman of the Working Group on a Unified North-West Pacific Tropical Cyclone Best Track Data Set proposed a two-tiered strategy for the development of a unified Best Track data set at the Thirty-fifth session of the Typhoon Committee held in Chiang Mai, Thailand from 19 to 25 November 2002;

(1) The first stage: Data which are useful for disaster mitigation activities, particularly during the land-falling period, should be appended to the RSMC Tokyo Best Track data set.
(2) The second stage: A feasibility study should be conducted to examine if re-analysis and unification of Best Track data sets of various centers are feasible and effective from the cost-benefit (cost-effective) point of view before their implementation.

After discussions, the Committee decided to approve the implementation of the first stage of the proposal and not to implement the second stage of the proposal. It was decided that the second stage would not be feasible or effective for the Committee Members. Some comments were made on the implementation of the first stage: i) Attention should be paid to the time needed for completing post-analysis and compiling data relevant to a particular storm. ii) Information on not only basic tropical cyclone parameters but also data related to disaster is very useful especially if it is available on a web site. iii) Precipitation-related data would be very useful to operational forecasters if they are linked to the Best Track data set in some form. The Committee requested the RSMC Tokyo - Typhoon Center to prepare details of the implementation plan of the first stage.

The Working Group examined draft proposals prepared by its Chairman and finalized a report on a proposal of establishing an Expanded Best Track Data Set for the Western North Pacific and the South China Sea for consideration by the Typhoon Committee at the 36th session.

Description of the Expanded Best Track Data Set for the Western North Pacific and the South China Sea

1. **Purpose**

A new data set is created for aiming at contributing to enhancement of the quality of tropical cyclone (TC) forecasts and disaster mitigation activities performed by the Members.

For this purpose, the data set contains combined meteorological and hydrological data and information on disaster damage besides a basic set of TC parameters supplemented with historical track data.

2. Name

The new data set is named "Expanded Best Track Data Set for the Western North Pacific and the South China Sea" (hereafter Expanded BT or EBT).

3. Scope of EBT

The new data set consists of the RSMC Tokyo-Typhoon Center Best Track Data (from 1951 to the present) (hereafter RSMC BT or simply BT) and additional data to be provided by the Members. The additional data are merged into RSMC BT. Neither reanalysis of BT nor unification of BT with other best track data sets will be done.

4. Procedures to compile EBT

(1) Attach data of precipitation, maximum sustained wind speed, peak gust and minimum sea level pressure at surface stations, maximum storm surge, and total damages in affected Members, if available, to each tropical cyclone data in BT.

<Specification of data>

To ensure a standardized data base, the threshold of data to report is proposed.

- Precipitation: Total amount of precipitation (more than 500 mm) and maximum one-hour and 24-hour precipitations (more than 50 mm and 200mm, respectively) associated with the tropical cyclone at individual surface stations. The definition of total amount of precipitation by each Member has to be clearly described.
- Wind: Maximum sustained wind speed and peak gust (more than 20 m/s and 30 m/s, respectively) associated with the tropical cyclone at individual surface stations.
- Pressure: Minimum sea level pressure (less than 980 hPa) associated with the tropical cyclone at individual surface stations.
- Storm surge: Maximum difference (more than 50 cm) between the observed tide level and the one that would have occurred without the storm (astronomical tide). Wave run-up is to be discriminated from still water level.
- Toll: Total number of the dead and missing.
- Damages: Total countable damage in terms of US dollars at that time.

(2) Add analysis data (center position and intensity) at the landfall, if available from Members, to each tropical cyclone in BT.

- The data should include position (latitude, longitude), central pressure and/or maximum sustained wind speed. The definition of landfall by each Member has to be clearly described.

(3) Estimate maximum sustained wind speed data from central pressure data for each tropical cyclone before 1977 based on regression relations to be developed.

(4) Merge historical track data before 1951, if available from RSMC Tokyo-Typhoon Center and other Members, to BT, avoiding duplication.

5. Implementation schedule

2004

+ RSMC Tokyo-Typhoon Center requests that Members provide the data from 1996 to 2003 described in the section 4(1) and 4(2) not later than June 30. RSMC Tokyo-Typhoon Center puts the data into EBT after basic screening.

+ RSMC Tokyo-Typhoon Center derives regression relations between maximum sustained wind speed and central pressure of tropical cyclones using the data during 1977-87, when both satellite observation and aircraft reconnaissance were available.

2005

+ RSMC Tokyo-Typhoon Center requests that Members provide the data from 1978 to 1995 described in the section 4(1) and 4(2) not later than January 31. RSMC Tokyo-Typhoon Center puts the data into EBT after basic screening.

+ RSMC Tokyo-Typhoon Center will derive maximum sustained wind speed from the central pressure data of RSMC BT from 1951 to 1977 using regression relations for latitudinal belts derived in 2004.

2006

+ RSMC Tokyo-Typhoon Center requests that Members provide the data from 1951 to 1977 described in the section 4(1) and 4(2) not later than January 31. RSMC Tokyo-Typhoon Center puts the data into EBT after basic screening.

+ RSMC Tokyo-Typhoon Center requests Members to provide historical track data for the years prior to 1951 from such sources as the U.S.'s JTWC and NCDC and other Members' data collection and archive centers. RSMC Tokyo-Typhoon Center starts to merge the track data to BT, avoiding duplication.

6. Regular update

Members are invited to provide RSMC Tokyo-Typhoon Center with the data described in section 4 (1) and 4 (2) annually not later than March 31 for each tropical cyclone that affected Members in the previous year.

7. Accessibility to EBT by Members

Members can access to the Expanded BT on a web site at RSMC Tokyo-Typhoon Center via Internet. The Expanded BT is regarded to be "essential data" under the WMO Resolution 40.

8. Example of data format

Attached below is a draft data format. More detailed description will be prepared before its implementation.

Best Track data (6hourly) prepared by RSMC Tokyo - Typhoon Center

```
---------------------------------------------------------------------66666 7701  17     7701 0 6
PATSY                19921021
1977032718 2  48 1593  998    000
1977032800 4  56 1588  990    050    -1 0000 0000 0 0000 0000 9 0125 0125
1977032806 4  61 1582  996    050    -1 0000 0000 0 0000 0000 9 0125 0125
1977032812 4  66 1575 1000    050    -1 0000 0000 0 0000 0000 9 0125 0125
```

1977032818 3 70 1568 1002   045   -1 0000 0000 0 0000 0000 9 0100 0100
1977033018 2 99 1502 1008   000
1977033100 2 100 1496 1008   000

This is the format for the basic set of TC analysis parameters in the Best Track data. The first line carries the header information for the basic set and is followed by analysis data lines. The first 10-digit column in the data line shows year (YYYY), month (MM), day (DD), and time (hh, UTC). The next one digit column shows class of tropical cyclone, 2: tropical depression, 3: tropical storm, 4: severe tropical storm, 5: typhoon, 6: extra-tropical cyclone. The next four columns show latitude and longitude of center position, central pressure (hPa), and 10-min. maximum sustained surface wind speed (kt). Finally the last nine columns show direction of the longest axis and the longest and the shortest radii (nm) of the hurricane-force (64kt), storm-force (50kt), near gale-force (30kt) wind areas. The codes for the direction of the longest axis are, 1: NE, 2: E, - - - , 8: N, 9: circular, 0: zero radius, -1: no data.

The format for the basic set of TC analysis parameters is based upon the current format of the RSMC Tokyo - Typhoon Center Best Track data.

(Analyses at landfall by Members)

----------55555 7701 landfall analysis
CH 1977032817 3 70 1570 1002   050   -1 0000 0000 0 0000 0000 9 0100 0100

This is the format for the landfall analyses by Members. The first line is the header for additional data and is followed by data line(s). The data line consists of country code, date and time, class, latitude and longitude of center position, central pressure, and 10-min. maximum sustained surface wind speed and wind radii information in order.

Even if landfall is not reported by any Member, the header line is attached and followed by a line indicating no report as shown below:

55555 7702 landfall analysis
NONE

(Reports by Members)

----------44444 7701 maximum one-hour
precipitation (mm)
HK 85 47662 357 1397 197703280800

This is the format for a maximum one-hour precipitation. The first line is the header for additional data and is followed by data line(s). The data line consists of country code, maximum one-hour precipitation amount (mm), station code, latitude and longitude of the station, date and time of ending (YYYYMMDDhhmm, UTC) in order.

----------44444 7701 maximum 24-hour
precipitation (mm)
HK 293 47662 357 1397 197703281300

This is the format for a maximum 24-hour precipitation. The first line is the header for additional data and is followed by data line(s). The data line consists of country code, maximum 24-hour precipitation amount (mm), station code, latitude and longitude of the station, date and time of ending (YYYYMMDDhhmm, UTC) in order.

----------44444 7701 total amount of
precipitation
HK 417 47662 357 1397 197703260700 197703282100

This is the format for a total precipitation. The first line is the header for additional data and is followed by data line(s). The data line consists of country code, total precipitation amount (mm), station code, latitude and longitude of the station, date and times of beginning (YYYYMMDDhhmm, UTC) and ending (YYYYMMDDhhmm, UTC) in order.

----------44444 7701 10-minute
maximum sustained surface wind speed (kt)
HK 57 160 47662 357 1397 197703280940

This is the format for a 10-minute maximum sustained surface wind speed (kt). The first line is the header for additional data and is followed by data line(s). The data line consists of country code, 10-minute maximum sustained surface wind speed (kt), its direction (deg), station code, latitude and longitude of the station, date and time (YYYYMMDDhhmm, UTC) in order.

----------44444 7701 peak gust (kt)
HK 83 170 47662 357 1397 197703280932

This is the format for a peak gust (kt). The first line is the header for additional data and is followed by data line(s). The data line consists of country code, peak gust (kt), its direction (deg), station code, latitude and longitude of the station, date and time (YYYYMMDDhhmm, UTC) in order.

----------44444 7701 minimum sea level
pressure (hPa)
HK 955 47662 357 1397 197703280956

This is the format for a minimum sea level pressure (hPa). The first line is the header for additional data and is followed by data line(s). The data line consists of country code, central pressure (hPa), station code, latitude and longitude of the station, date and time (YYYYMMDDhhmm, UTC) in order.

----------44444 7701 storm surge (cm)
HK 172 1 47662 357 1397 197703281003

This is the format for a storm surge (cm). The first line is the header for additional data and is followed by data line(s). The data line consists of country code, storm surge (cm), code discriminating 1: still water level or 2: wave run-up, station code, latitude and longitude of the station, date and time (YYYYMMDDhhmm, UTC) in order.

----------44444 7701 total death and
missing (persons)
HK 13

This is the format for total death and missing (persons). The first line is the header for additional data and is followed by data line(s). The data line consists of country code, number of total death and missing (persons) in order.

----------44444 7701 damages (US
dollars at that time)
HK 4.2 M

This is the format for damages (US dollars at that time). The first line is the header for additional data and is followed by data line(s). The data line consists of country code, damages (US dollars at that time) in order. Amount of damages should be shown with T: thousand or M: million whenever appropriate.

APPENDIX XVI

REPORT OF THE TYPHOON RESEARCH COORDINATION GROUP (TRCG)
Visiting Lecturer Program

The Committee took note of the report made by the Chairman of TRCG including the status and plan for the visiting lecturer program and for the Typhoon Committee Research Fellowship scheme. The TRCG meeting was held in the 36th session to discuss on the activities of TRCG in 2004 and 2005. The summary of the meeting is attached in Annex I, including the action plan in 2004.

The TRCG recommended the following topics to promote research activities in conjunction with the refined priorities of RCPIP.

(1) To implement the roving seminars in 2004 under the visiting lecturer programme (Annex III of Appendix XIX of final report 34th session) to promote research and development, and to strengthen capacity building on the tropical cyclone forecasting and other two components hydrology and DPP. The roving seminars in 2003 are summarized in Annex II.

(2) To continue with the Typhoon Committee research fellowship scheme. The Committee invited TCS to issue a letter to all Members to request for the application of fellowship and hosting organization. The current status of the scheme is summarized in Annex III.

(3) To hold a regional workshop in 2005 focusing on the meteorological component and yet to stimulate joint collaboration among the three components: meteorology, hydrology, and disaster prevention and preparedness.

(4) To update the list of resource persons or contact points (Annex IV) in the region for better interaction, encouraging members to take part in the development work, to share research results, and to assist other members in adopting the use of information through internet.

The Committee urged its Members to implement the above recommendations as far as possible and requested TCS to provide necessary support to the Working Group.

The Committee decided to re-establish TRCG to be chaired by Dr. Woo-Jin Lee (Republic of Korea) and invited all Members to nominate representatives to take active part in the work of the Group.

Annex I

Report of the TRCG meeting

Laksamana Ballroom, Armada Hotel, Petaling Jaya, 16 December 2003

1. A total of 14 participants, respectively from China, Japan, Republic of Korea, Thailand, USA, Malaysia, Vietnam, Hong Kong China and WMO CAS, attended the Meeting.

Roving seminars in 2004

2. The Meeting discussed the potential hosts and topics of the roving seminars in 2004.

3. Members were invited to consider hosting the seminar. The Thailand Member showed positive response. They would be particularly interested in the topic of forecasting tropical cyclone formation in the South China Sea. They also indicated that no budgets have been set aside for the participants and lecturers to attend the seminar and funding assistance would be required.

4. The China Member also indicated interests in hosting the seminar. The China Member agreed in principle that they could support local participants and partially overseas participants to attend the seminar.

5. The Vietnam Member expressed interests in hosting a roving seminar in 2005.

6. Considering that there are many NWP products on the Internet including those available in the RSMC Tokyo web site, it would be beneficial to Members to attend lectures on the use and interpretation of model products for tropical cyclone forecasting. Some participants in the Meeting commented that the topic of "quantitative precipitation forecasting" might not be very suitable for the seminar in 2004 since the subject is still under active research.

7. In view of the availability of multi-model ensemble TC track forecasts in 2004, it would be beneficial for the Members to equip themselves with knowledge on the application of ensemble TC forecasting. It is thus desirable to include the topic of "Operational application of multi-model ensemble technique" in the 2004 Roving Seminar.

8. The Meeting suggested that the feasibility of using video conferencing facility in roving seminars could be explored to save traveling cost of the overseas participants. The Japan Member would help explore the possibility of using JICA (Japan International Cooperation Agency) facilities in Japan for the purpose.

Regional Workshop in 2005

9. It was proposed in the Meeting that a regional workshop with joint collaboration among the three components, namely meteorology, hydrology and disaster prevention and preparedness (DPP), be held in 2005. The provisional title of the workshop could be "Effective tropical cyclone warnings". The China Member expressed interests in hosting the workshop.

10. The Meeting noted that a WMO supported Workshop on TC landfall would be held in Shanghai, China in October 2004. The Meeting suggested that the Workshop be combined with the Typhoon Committee Regional Workshop in early 2005. The China Member would see if it could be arranged.

11. The Meeting agreed to the proposal of organizing an Interim Working Group (IWG) to plan for a regional workshop in 2005. The IWG would comprise of 2-3 members respectively from each component of meteorology, hydrology and DPP in Typhoon Committee, and some maybe outside the Committee. The IWG would communicate via emails to work on a plan for the regional workshop.

Action plan

12. The Chairman would submit an implementation plan for the 2004 Roving Seminars, based on the visiting lecturer program approved by the 35th Session of Typhoon Committee, to TCS/TC.

13. The TRCG Chairman would submit a plan for the 2005 Regional Workshop to the 37th Session of Typhoon Committee for consideration.

List of participants in the TRCG meeting on 16 December 2003

Mr. Duan Yihung, China
Ms. Tian Cuiying, China
Ms. Lam CHing-chi, Hong Kong, China (Rapporteur of the meeting)
Mr. Nobutaka Mannoji, Japan
Mr. Tokuo Kishii, Japan
Mr. Subramaniam Moten, Malaysia
Mr. Ooi See Hai, Malaysia
Mr. Woo-Jin Lee, Rep. of Korea

Mr. Sampan Thaikruawan, Thailand
Mr. Dusadee Sarigabutr, Thailand
Mr. Somsri Huntrarul, Thailand
Mr. Russ Elsberry, USA (WMO CAS)
Mr. Frank Wells, USA
Ms. Duong Lien Chau, Vietnam

ANNEX II. **Summary of major elements for the roving seminars under the visiting lecturer program in 2003**

Venue/ Period	Topic	Invited Lecturer		Participants with financial support	
		Invited Lecturers	Fund source	Invited participants	Fund source
Seoul 20-21 Oct.	1. Interpretation of typhoon forecasts provided by RSMC Tokyo; 2.Typhoon analysis and bogus vortex surgery in NWP models 3.Typhoon forecasting from short to seasonal range	Dr. Nobutaka Mannoji (Japan) Dr. H-J Kwon (Korea, Rep.)	TCTF Korea (Rep.)	A participant from Hong Kong A participant from China A participant from Malaysia	Hong Kong China Korea (Rep.) Malaysia & Korea (Rep.)
Hong Kong 22-24 Oct.	1. Interpretation of satellite data including microwave imagery for tropical cyclone intensity and rainfall forecasts 2.Interpretation of Doppler weather radar products; radar applications in tropical cyclone forecasting particularly for landfall cases 3.Water vapor and rain retrievals from infrared and microwave measurements; potential applications of satellite retrievals of water vapor and rain to tropical cyclone forecasting.	Dr. Mark A. Lander (USA) Dr. P.W. Li (Hong Kong China) Dr. B.-J. Sohn (Korea, Rep.)	Hong Kong China Hong Kong China Hong Kong China	Four participants from Lao PDR. Macao China, Philippines, and Vietnam. A participant from Korea(Rep.) A participant from China. A participant from Malaysia	TCTF Korea(Rep.) China Malaysia
Shanghai 27-29 Oct.	Same as above	Dr. Mark Lander Dr. P.W. Li	TCTF TCTF	Two participants from Korea(Rep.)	Korea(Rep.)

ANNEX III. Typhoon Committee Research Fellowship Scheme (as of 10 November 2003)

– Offers from Members

Member	*Host Organization*	*Research Topics*	*Resources & Facilities*	*Visiting Fellow*	*Financial Support*	*Remark*
China	Central Meteorological Observatory, NMC/CMA	To estimate typhoon intensity with several micro-wave data	Provide the latest Quikscat data, TRMM & TBB data	1-2 months	Accommodation and per diem expenses	Dr. Bing Zhou Bingz@cma.gov.cn
Hong Kong, China	Hong Kong Observatory	Effect of tropical cyclone bogusing on model analysis and forecasts	Hardware and software facilities in the Open Laboratory	2 months in Spring 2004	Lump sum per diem of HK$20,000 (approx. US$2,500) per month	Ms. Queenie C.C. Lam Hong Kong Observatory, 134 A Nathan Road, Kowloon, Hong Kong. Tel : (852) 2926 8452 Fax: (852) 2375 2645 Email: cclam@hko.gov.hk
Japan	Meteorological Research Institute	(a) TC vortex initialization (b) Improved cumulus parameterization in TC numerical models (c) TC ensemble forecasting (d) TC analysis using satellite data of sea surface wind and precipitation (e) TC analysis using Doppler radar data	PCs, UNIX Workstations and Supercomputer	Up to 2 years for max. 2 persons	Not provided	Mr. Nobutaka MANNOJI RSMC Tokyo Typhoon Center, Japan Meteorological Agency, 1-3-4 Ote-machi, Chiyoda-ku, Tokyo 100-8122, Japan. E-mail: mannoji@met.kishou.go.jp

		(f) Data analysis related to extratropical transition				
Korea (Rep. of)	Forecast Bureau/ KMA	Validation of intensity forecasting including wind structure change	PC or W/S, Supercomputer	About 3 months in early 2004	Accommodation and per diem expenses, others negotiable	Dr. Nathaniel T. Servando (PAGASA) has been awarded for the fellowship

– **Request from Members**

Member	*Host Organization*	*Research Topics*	*Resources & Facilities*	*Visiting Fellow*	*Financial Support*	*Contact Person*
China		Consensus forecasting for track and intensity of typhoon	1. Computer condition, 2. Data of numerical model guidance	3-6 months	Accommodation and per diem expenses	Mr. Gao Shuanzhu Email: gaosz1129@sina.com
Thailand		Dynamic aspect of tropical cyclones evolution and movement in the South China Sea and the Gulf of Thailand a. moisture adjustment impact on typhoon behavior both in track and intensity b. Beta effect on TC movement	24 hr internet service PC GTS data access Supercomputer with w/s Radar/ satellite data	3-4 months		Mr. Sampan Thaikruawan (E-mail: thhsamp@yahoo.com) Mr. Tanya Tongnunui (E-mail: krootan@yahoo.com)

ANNEX IV. **List of Resource Persons or Contact Points (as of 10 November 2003)**

Field	Specialties	Name	E-mail	Affiliation	Members
Data Assimilation	TC vortex initialization	Xuedong Liang	Liangxd@mail.typhoon.gov.cn	Shanghai Typhoon Institute/CMA	China
	TC intensity estimation by rarad,satellite,SSMI and Quikscat	Gao Shuanzhu Zhou Bing	gaosz1129@sina.com bingz@cma.gov.cn	National Meteorological Center/CMA National Meteorological Center/CMA	China China
	Radar data quality control and assimilation scheme	Gong Jiandong	gongjd@cma.gov.cn	National Meteorological Center/CMA	China
	Radar-based analysis and other tropical cyclone related data analyses	P.W. Li	pwli@hko.gov.hk	Hong Kong Observatory	Hong Kong China
	TC vortex initialization	Mitsuru Ueno Masaru Kunii	mueno@mri-jma.go.jp mkunii@mri-jma.go.jp	MRI/TRD	Japan
	satellite data analysis	Tetsuo Nakazawa	nakazawa@mri-jma.go.jp	MRI/TRD	
	TC intensity estimation	Tetsuo Nakazawa	nakazawa@mri-jma.go.jp	MRI/TRD	
	Data analysis related to extratropical transition	Naoko Kitabatake	nkitabat@mri-jma.go.jp	MRI/TRD	
	typhoon bogusing	Rha, Deuk-Kyun	dkrha@kma.go.kr limjh@kma.go.kr	Numerical Weather Prediction Div. /KMA	Korea (Rep.)

Field	Specialties	Name	E-mail	Affiliation	Members
		Lim, Jang-Ho			
	Typhoon bogusing	Kwon, H. Joe	hjkwon@kongju.ac.kr	Prof. Kongju National University	
	satellite data analysis	Kim, Kum-Lan	kkl@kma.go.kr	Remote sensing Div./KMA	
	radar data analysis	Lee, Jong-Ho	jhlee@kma.go.kr	Observation Div./KMA	
Modelling	Numerical schemes of TC model	Yihong Duan	duanyh@mail.typhoon.gov.cn	Shanghai Typhoon Institute/CMA	China
	TC model physics and bogussing schemes	Ma Suhong	mash@cma.gov.cn	National Meteorological Center/CMA	China
	Ensemble track forecasting	Xiaqiong Zhou	zhouxq@mail.typhoon.gov.cn	Shanghai Typhoon Institute/CMA	China
	Typhoon modelling	Xudong Liang	Liangxd@mail.typhoon.gov.cn	Shanghai Typhoon Institute/CMA	China
Modelling	Tropical cyclone modelling and bogussing schemes	Queenie C.C. Lam	cclam@hko.gov.hk	Hong Kong Observatory	Hong Kong China
	numerical schemes of TC model	Wataru Mashiko	wmashiko@mri-jma.go.jp	ditto	
	physical processes of TC model	Mitsuru Ueno Akihiko Murata	mueno@mri-jma.go.jp amurata@mri-jma.go.jp	ditto	

Field	Specialties	Name	E-mail	Affiliation	Members
	TC-ocean interaction (incl. mixed-layer ocean modeling and ocean surface wave modeling)	Nadao Kohno Akiyoshi Wada	nkohno@mri-jma.go.jp awada@mri-jma.go.jp	ditto	
	typhoon modelling	Rha, Deuk-Kyun Lim, Jang-Ho	dkrha@kma.go.kr limjh@kma.go.kr	Numerical Weather Prediction Div.	Korea (Rep.)
	ensemble track forecasting	Rha, Deuk-Kyun	dkrha@kma.go.kr	ditto	
	global NWP model tracks	Park, Hoon	hoon@kma.go.kr	ditto	
	Typhoon modelling	Kwon, H. Joe Baik, Jong-Jin	hjkwon@kongju.ac.kr jjbaik@snu.ac.kr	Prof. Kongju National University Dept. Atmos., Seoul National University	
Forecasting	Track and intensity forecasting	Xiaotu Lei	Leixt@mail.typhoon.gov.cn	Shanghai Typhoon Institute/CMA	China
	Long-range prediction of typhoon	Ming Xu	Xum@mail.typhoon.gov.cn	Shanghai Typhoon Institute/CMA	China
Forecasting	Tropical cyclone track and related weather forecasting	T.C. Lee	tszclee@hko.gov.hk	Hong Kong Observatory	Hong Kong China

Field	Specialties	Name	E-mail	Affiliation	Members
	Tropical cyclone intensity, structure and landfall impact	Edwin S.T. Lai	stlai@hko.gov.hk	Hong Kong Observatory	
	Long-range forecasting of tropical cyclones	Edwin W.L. Ginn	eginn@hko.gov.hk	Hong Kong Observatory	
	Tropical cyclone motion, intensity, size, modelling and seasonal prediction	Johnny C.L. Chan	Johnny.Chan@cityu.edu.hk	Department of Physics & Material Sciences, City University of Hong Kong.	
	track and intensity forecasting	Chung, Kwan-Young	kychung@kma.go.kr	Forecast Management Div./ KMA	Korea(Rep.)
	long-range prediction of typhoon	Yook, Myung-Ryul	mryook@kma.go.kr	Forecaster/ KMA	
	track and intensity forecasting	Kwon, H: Joe Baik, Jong-Jin Sohn, Keon-Tae	hjkwon@kongju.ac.kr jjbaik@snu.ac.kr ktsohn@pusan.ac.kr	Dept. Atmos., Kongju National University Dept. Atmos., Seoul National University Dept. of Statistitcs, Pusan National University	
	long-range prediction of typhoon	Sohn, Keon-Tae	ktsohn@pusan.ac.kr	Dept. of Statistitcs, Pusan National University	
	seasonal prediction of typhoon	Lim Tian Kuay	LIM_Tian_Kuay@nea.gov.sg	Meteorological Services Division, National Environment Agency	Singapore
Application	Tropical cyclone warning system	Edwin S.T. Lai	stlai@hko.gov.hk	Hong Kong Observatory	Hong Kong China

Field	Specialties	Name	E-mail	Affiliation	Members
	Tropical cyclone warning system	Sandy M.K. Song	mksong@hko.gov.hk	Hong Kong Observatory	
	Tropical cyclone information visualization and display systems	K.K. Yeung	kkyeung@hko.gov.hk	Hong Kong Observatory	
	Tropical cyclone warning operations	C.Y. Lam	chiuylam@hko.gov.hk	Hong Kong Observatory	
	web manager	Chang, Ki-Dong	gdjang@kma.go.kr	Forecast Research Lab./ METRI/KMA	Korea(Rep.)
	typhoon data on GTS	Wu, Chong-Gyu	woojk@kma.go.kr	Information and Telecommunication Div./KMA	
	To be extended to cover hydrology & disaster prevention and preparedness				

KMA: Korea Meteorological Administration

METRI: Meteorological Research Institute

MRI : Meteorological Research Institute

TRD : Typhoon Research Division

APPENDIX XVIII

TERMS OF REFERENCE OF THE WORKING GROUP ON HYDROLOGY

In order to coordinate efforts on the implementation of various activities under the Hydrological Component to better support the socio-economic development process in the Typhoon Committee Area, the Typhoon Committee has established the Working Group on Hydrology (WGH) with the following Terms of Reference and operational modalities.

Terms of Reference

The WGH will promote cooperation among the Members in the implementation of activities under the Hydrological Component of the Committee's RCPIP with the aim to support the socio-economic development process and enhance cooperation among the Members in all the five components. Towards this end, the WGH is expected to advise and assist the Committee in:

- Identifying priority issues and areas of cooperation in the Hydrological Component;
- Facilitating the exchange of experiences and knowledge on latest developments and techniques related to the above issues and areas;
- Undertaking priority activities and programmes of the Committee aiming at strengthening capacity of the Members in hydrology and water resources;
- Mobilizing resources to carry out priority activities of the Committee related to the Hydrological Component;
- Reporting overall progress in the implementation of the hydrological component of the RCPIP; and
- Recommending to the Committee priority areas, programmes and activities for cooperation in research by related experts of the Members.

Membership

The WGH will consist of the following members:

- Mr Kenzo Hiroki, Japan as Chairman
- Mr Liu Jinping, China as Vice Chairman
- Mr Low Koon Sing, Malaysia
- Dr Hong Ilpyo, Republic of Korea
- Mr Ryosuke Kikuchi, Japan

The Committee also requested other interested Members to take part in the Working Group and invited ESCAP, WMO and TCS Hydrologist to involve in this Working Group. The term in service of the WGH is one year subject to extension authorized by the Committee.

Operation modalities

In view of the limited financial resources of the TC Trust Fund, the WGH is expected to communicate through email and other means which require no financial resources from the Trust Fund.

Reporting requirements

The Chairman of the WGH is required to submit an annual report to the Committee session for its consideration through the TCS on activities in all the three technical areas of the Committee work and recommendations related to priority research activities to be undertaken in the coming years.

APPENDIX XIX

ESCAP/WMO TYPHOON COMMITTEE TRUST FUND
INTERIM STATEMENT OF ACCOUNT
as at 31 October 2003

			$	$
Balance of fund at 1 January 2002			533,976	
Contributions Received			213,071	
Interest Income			12,936	
Total revenue				759,983
Less: Expenditure	Liquidated	Unliquidated	Total	
2002 Expenditures				
Mission travel -TCS/participants Manila -2002	30,600		30,600	
Mission travel -TCS/participants Cairns -2002	13,101		13,101	
Mission travel - Kang/Kim Shanghai Oct-Dec 2002	1,216		1,216	
Mission travel - Ciang Mai 2002	2,711		2,711	
General Office expenses - TCS 2002	26,284		26,284	
Printing cost of documents Oct 2002	2,000		2,000	
Bank charges-2002	40		40	
Publication of reports	-		-	
Contribution to MF22381/Tokyo, Japan, July 2002	4,000		4,000	
Miscellaneous -2002	129		129	
			-	
2003 Expenditures			-	
Lumpsum for 5 participants Hong Kong China		6,000	6,000	
Bank charges 2003	8		8	
Typhoon Committee Newsletter/Annual Review	7,528		7,528	
Reproductions costs 35th session Typhoon Ctte	455		455	
Pouch charges	17		17	
General Office expenses - TCS 2003	20,226	5,994	26,220	
Computer for TCS	2,000		2,000	
Participation - Third World Water Forum			-	
(Dr Kintanar and Mr Jin-Ping)	4,500		4,500	
Support for RCPIP Working Group Meeting -Japan	6,513		6,513	
Support for Visiting Lecturer Services	2,828		2,828	
Support for forecasters to RSMC Tokyo 23/07-01/08/03	4,006		4,006	
Mission Travel non- WMO staff MF 27048	10,025		10,025	
Support for printing & local support MF 27048	3,013		3,013	
Support for participation/financial assistance Kuantan July 2003		14,000	14,000	
Mission Travel participant Choi Man Cheng	500		500	
Printing of Newsletter		500	500	
Miscellaneous -2003	49		49	
Support Costs	18,427	3,444	21,871	
Exchange gain/loss	(40)		(40)	
	160,136	29,938	190,074	
Total expenditure				190,074
Balance at 31 October 2003			$	569,909
Represented by:				
Cash in Bank				619,608
Less: Unliquidated Obligations - Prior year			534	
Unliquidated Obligations - Current year			29,938	
Unpaid invoices			19,227	
			$	569,909