



**UNITED NATIONS ECONOMIC AND SOCIAL COMMISSION**

**FOR ASIA AND THE PACIFIC**

**AND**

**WORLD METEOROLOGICAL ORGANIZATION**

**REPORT OF THE TYPHOON COMMITTEE  
ON ITS THIRTY-FOURTH SESSION**

**Honolulu, Hawaii  
28 November – 4 December 2001**



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## I. ORGANIZATION OF THE SESSION

1. The thirty-fourth session of the ESCAP/WMO Typhoon Committee was held in Honolulu, Hawaii, USA, from 28 November to 4 December 2001.

### Attendance

2. The session was attended by 60 participants representing eleven (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 an observer from WMO Commission of Atmospheric Sciences. Five representatives from Economic and Social Commission for Asia and the Pacific (ESCAP), World Meteorological Organization (WMO) and Typhoon Committee Secretariat (TCS) 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 the Honorable Mazie Hirono, Lieutenant Governor of the State of Hawaii and commenced at 0910 hrs on Wednesday, 28 November 2001 in the Waikiki Ballroom of the Waikiki Beach Marriott Resort.

5. Mr James Weyman, Acting Director of the Pacific Region of the National Weather Service, extended a warm welcome to all the participants and delegates and expressed his pleasure at the large attendance to the 34<sup>th</sup> Session of the Typhoon Committee, which was an indication of the strength of the regional collaboration to mitigate losses of lives and properties by typhoons. He wished that the Session would be a successful one and hoped that the delegates would have an opportunity to see the beauty of Hawaii.

6. Mr Weyman then mentioned that the recent death of Mr Richard H. Hagemeyer, the former Director of the Pacific Region of the National Weather Service and Vice Chairman of the 33<sup>rd</sup> Typhoon Committee, was a great loss to the U.S. National Weather Service, and to the international meteorology and tsunami communities. The delegates then observed for a minute of silence in tribute to Mr Hagemeyer, for his dedication and contribution to the work of the Typhoon Committee and the National Weather Service in the region.

7. 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 the United States of America for hosting the session and for its active role since joining the Typhoon Committee in 1997 in the common efforts to achieve the objectives of the Committee. He informed the Committee that the ESCAP Commission at its fifty-seventh session in April 2001 had noted with appreciation the progress and achievements made by the Committee and its Members in 2001 on meteorological observations, forecasts and warnings, hydrological components and on natural disaster reduction and the increase in the number of subregional cooperation activities of the Committee in these fields. He also informed the Committee that the ESCAP secretariat had provided technical support to the Committee's Working Group to complete the comprehensive review for the hydrological component and disaster prevention and preparedness, including the conduct of a regional survey, mobilization of financial support to undertake review expert mission, and preparation of the review report, as requested by the Committee at the last session held in Macao, China in 2000. In addition, ESCAP in cooperation with Thailand and the Typhoon Committee Secretariat organized the 4-day Expert Workshop for TC Hydrologists on "Evaluation and Improvement of Operational Flood Forecasting Models in the Typhoon Committee Area" and "Review Mission Findings" in Bangkok, Thailand from 21 to 24 August 2001. The Executive Secretary also noted that the Committee's achievements had been realized through the excellent spirit of cooperation that prevails among the Members and the spirit of and self-reliance evident from the contributions of many members to the Typhoon Committee Trust Fund. He thanked



those members who have been supporting the activities of the Committee, as well as the World Meteorological Organization and other international organizations for the continuing support. He also paid tribute to Mr Richard H. Hagemeyer, the late Director of the Pacific Region of the National Weather Service for his devotion and leadership provided to the work of the Committee. The Executive Secretary assured the Committee that ESCAP would continue to provide technical support to the activities of the Typhoon Committee within the framework of its own programme of work and available resources, as shown in the active contribution of ESCAP during the past year.

8. 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 the World Meteorological Organization. He expressed deep appreciation to the Government of the USA for hosting the session. He also thanked the Government of the Philippines for hosting the TCS. He mentioned that the session would develop strategies for coordinated actions to upgrade tropical cyclone forecasts and warning services, including Regional Specialized Meteorological Centres (RSMCs) operations and improved public awareness. In this connection, he added that the Central Pacific Hurricane Centre, Honolulu, had become WMO RSMC for tropical cyclone in accordance with the decision of the Executive Council on 1 July 2001. Mr Al-Majed informed the session that WMO Sixth long-term plans would include a new programme which will be on disaster prevention and mitigation activities. He concluded by assuring that the WMO would continue to make every effort to support the Typhoon Committee's work.

9. The Honorable Mazie Hirono, Lieutenant Governor, State of Hawaii welcomed the delegates to Hawaii, and stressed how important it is for National Meteorological and Hydrological Services to work together to improve forecast and warning systems for natural disasters, as well as the benefits gained from the strengthened cooperation among members in the areas of disaster mitigation, research, and water resource management. As tourism plays a major role in the economy of Hawaii, similar to many members of the Typhoon Committee, she underscored the critical role that NMHSs play in saving lives and property. She wished the delegates a successful meeting and declared the 34<sup>th</sup> session officially opened.

10. A short ceremony was held in the presence of Honorable Mazie Hirono, Lieutenant Governor of the State of Hawaii, where the ESCAP/WMO Typhoon Committee Natural Disaster Prevention Award 2001 was presented to the Hong Kong China Observatory, Hong Kong, China in recognition of the significant contributions made by the Staff of the Hong Kong Observatory to the Tropical Cyclone Programme in the Committee's area of responsibility that have been of special benefit to the emergency management community, the media and the general public. Especially noteworthy contributions include: Distinguished service as the Chair of the Typhoon Committee; extended and extremely effective chairmanship of the Typhoon Research Coordination Group (TRCG), notably during the period when TRCG was developing the name list and the procedures for naming tropical cyclones in the Western North Pacific and the South China Sea; for making the Observatory's web page available to host not only the listing of the tropical cyclone names and their definitions but also their pronunciation by native speakers; and finally for taking the initiative and providing the resources to develop a web page for the World Meteorological Organization that provides a single location containing information on all active tropical cyclones anywhere in the world. Dr H.K. Lam, Director of the Hong Kong Observatory, Hong Kong, China accepted the award on behalf of the Observatory.

#### **Special address by Director of the National Weather Services of the United States of America**

11. Brigadier General (Rtd.) John J. Kelly, Jr., Director of the National Weather Service of the United States of America and Permanent Representative of USA with WMO welcomed all the participants in his address. He paid tribute to Mr Richard H. Hagemeyer, the former Regional Director of the Pacific Region of the National Weather Service, who passed away in last October for his contribution in servicing the countries of this region. He highlighted the importance of bringing together multi-disciplinary experts for better coordination and putting together regional cooperation development plans. He applauded the contributions of Hong Kong, China, for initiating a tropical cyclone names list and providing a web site for tropical cyclone names. He also highlighted the importance of weather services for the benefit of the citizens of this region and

of the world. He extended invitation to the participants to visit the Pacific Tsunami Warning Center, Joint Typhoon Warning Center, and the Regional Specialized Meteorological Center to see together the weather services and the systems in operation, in particular the system to improve tropical cyclone forecasts and the Emergency Meteorological Weather Information Network (EMWIN), a satellite communication system. He hoped that this system would be available around the world in the future. He mentioned that the NWS now has the capability to provide six-month climate forecast and encouraged the members to improve their quality of services and increase the interaction with decision-makers, and the private sector, including improvement in the formats of weather forecasts. Furthermore, he encouraged the introduction of performance-based results and wished that the three disciplines: meteorology, hydrology and disaster prevention and preparedness would work together for better servicing their communities. He wished the participants a pleasant stay.

## **II. ELECTION OF OFFICERS (agenda item 2)**

12. Mr James Weyman (USA) and Mr Chow Kok Kee (Malaysia) were elected as the Chairman and Vice Chairman of the Typhoon Committee, respectively. Dr H.K. Lam (Hong Kong, China) was elected Chairman of the Drafting Committee.

## **III. ADOPTION OF THE AGENDA (agenda item 3)**

13. The Committee adopted the Agenda shown in Appendix II.

## **IV. THE COMMITTEE'S ACTIVITIES DURING 2001 (agenda item 4)**

14. The ESCAP Representative reported that the Economic and Social Commission for Asia and the Pacific, at its fifty-seventh session held in Bangkok from 19 to 25 April 2001, noted with appreciation the important achievements and progress of work by the Typhoon Committee and its members in 2000 on meteorological components, including observations, forecasts and warnings of typhoons; on hydrological components, including flood forecasts and warning, as well as storm surge forecasts; and on natural disaster reduction. The Commission noted the increase in the number of subregional cooperation activities of the Committee in the fields of meteorology, hydrology, training and research, and the increased importance it attached to addressing the impacts of water-related disasters, including an increase in research on, and the improvement of, forecasting. It also noted the decision by the Committee to undertake a comprehensive review of the hydrological, disaster prevention and preparedness components in cooperation with ESCAP, WMO, the Typhoon Committee Secretariat and interested members. The ESCAP Commission took special note of the increase importance attached by the Committee to training activities, and of the initial results of the Typhoon Committee Research Fellowship Scheme, which put emphasis on the exchange programme among the Committee members. It also noted with interest the decision of the Committee to re-establish the Typhoon Research Coordination Group so as to increase the effectiveness of typhoon-related research activities in accordance with the needs of the members. The Commission further noted the continued support given by ESCAP to various activities of the Committee members, and the valuable contribution of WMO to the work of the Typhoon Committee since its establishment. In this connection, he also reported that since the beginning of 2000, ESCAP has increased its technical support to the Typhoon Committee's activities, apart from its regular activities on water resources management. The increase of technical support was in response to the request of the Typhoon Committee at its 33<sup>rd</sup> session held in Macao, China in 2000 to assist the Committee's Working Group on the comprehensive review for the hydrology component and disaster prevention and preparedness, including the conduct of a regional survey, mobilization of financial support to undertake review expert mission, and preparation of the review report and in the organization of the 4-day Expert Workshop for TC Hydrologists on "Evaluation and improvement of Operational Flood Forecasting Models in the Typhoon Committee Area" and "Review Mission Findings" in Bangkok, Thailand from 21 to 24 August 2001. In conjunction with this workshop, ESCAP in cooperation with the United Nations



Department of Economic and Social Affairs (DESA), the United States National Weather Service, National Oceanic and Atmospheric Administration (NOAA), and the Secretariat for the International Strategy for Disaster Reduction (ISDR) organized an Interregional Symposium on Water-Related Disaster Reduction and Response also in Bangkok from 27 to 31 August 2001 to promote interregional cooperation and exchange of experiences.

15. The Typhoon Committee Secretariat (TCS), on behalf of the Typhoon Committee, expressed its gratitude to Dr Songkran Agsorn of the Thai Meteorological Department for representing the Committee at the Fifty-seventh Session of ESCAP held in Bangkok in April 2001 and Mr Samphand Thaikruawan for representing the Committee at the Third Session of the Committee on Environment and Natural Resources Development of ESCAP, in Bangkok in October 2001. TCS also informed the session that:

- The TCS Coordinator assisted in the interview and selection of the next Assistant Secretary-General of WMO in view of the retirement of the incumbent.
- The TCS continued the management of the Typhoon Committee Foundation, Inc. (TCFI). The TCFI awarded the Typhoon Committee Natural Disaster Award 2001.
- The TCS published the thirteenth issue of the Typhoon Committee Newsletter in July 2001.
- The TCS published the sixteenth issue of the Typhoon Committee Annual Review (TCAR) 2000 in November 2001.
- The TCS organized the Workshop on Typhoon Forecasting Research held in Jeju, Korea on 25-28 September 2001. The TCS meteorologist participated in the workshop.
- The TCS organized and coordinated the activities of the expert mission from 7-9 September in the Philippines.
- The TCS was represented by a PAGASA representative in the Workshop on Evaluation and Improvement of Operational Flood Forecasting Models held in Thailand on 21-24 August.

**(a) Meteorological Component (agenda item 4.1)**

16. The session reviewed the activities under the component of the Members of the Committee during the past year, details of which are presented in Appendix III.

17. The delegate from China informed the Committee that the real time high resolution picture transmission data of the polar orbiting meteorological satellite FY-1C, which had been launched in May 1999, would be open to all users including international users and that efforts were being undertaken to make FY-1C products available through Internet.

18. The Committee noted with appreciation the Korea Meteorological Administration (KMA) which has been conducting an annual training workshop since 1998 under the sponsorship of the Korea International Cooperation Agency (KOICA) on weather forecasting for operational meteorologists. Thirteen participants from 14 TC Members attended in 2001. It hoped that such a training workshop be continued in the future.

19. The Committee reviewed and approved the proposed amendments to the Typhoon Operational Manual Meteorological Component (TOM) submitted by the Rapporteur, Mr Tatsu Ueno (Japan), which is given in Appendix IV. The Committee also approved the proposal of Mr Ueno that TOM be given in electronic form for the 2002 version onward.

20. The Members of the Typhoon Committee expressed their gratitude for the services of the rapporteur in the past and accepted the offer of JMA to continue to provide the services of a rapporteur on TOM for the coming year. The WMO representative informed the Committee that a new edition of the Manual would be made available in early 2002.

21. 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 2001 and implementation plan for the period from 2001 to 2005 are contained in Appendix V.

22. The Committee took note of the Report of the Workshop on Typhoon Forecasting Research, Jeju Island, Republic of Korea, 25 to 28 September 2001 as presented by the Chairman of the Typhoon Research Coordinating Group (TRCG). It noted that the Workshop had covered the following areas of typhoon forecasting research: (1) Requirements, Issues and Problems including problems and requirements in operational tropical cyclone forecasting application of objective technique, difficulty in interpretation of objective information, and linkage between theory and practice; (b) Status and Prospects in Tropical Cyclone Research, including progress in NWP for tropical cyclone forecasting, in conceptual models, in statistical model, in remote sensing and data-assimilation technique, and in seasonal prediction for tropical cyclones; (c) Status and Prospects of Research Activities in the region, including research through TRCG fellowship scheme, and on tropical cyclone research and forecasting; and Strategy for Promotion of Typhoon Forecasting Research in Region through identification of key research topic (2002-2006) in the region, strengthening of cooperative research, exploration of cooperation opportunities, and regional view on tropical cyclone issues as an input to the IWTC-V (Cairns, Australia, 03 to 12 December 2002). The Workshop's recommendations, shown in Appendix VI, were adopted as the basis for the report of TRCG to the Committee.

23. The Committee took note of the Resolution submitted by the Workshop on the Potential Development of a Unified N.W. Pacific Tropical Cyclone Best-Track Data Set, Honolulu, 26-27 November 2001 as summarized in Appendix VII. It agreed to set up a Working Group, with the understanding that no financial resources would be required in the operation, to further examine the feasibility, resources and implementation plan of the recommendation of the Workshop to set up a comprehensive tropical cyclone best-track data set covering the North West Pacific, in accordance with WMO Resolution 40 (Congress XII) taking into account issues related to cost recovery. The Committee requested the Working Group to submit a report for consideration by the Committee at its 35<sup>th</sup> session. The Committee expressed its appreciation to the following Members for their willingness to serve in the Working Group:

- (1) Japan : (Chair)
- (2) China
- (3) Hong Kong, China
- (4) Philippines, and
- (5) United States of America

**(b) Hydrological Component (agenda item 4.2)**

24. The Committee reviewed its activities under this component in two states: (i) during the meeting of TC hydrologists at the pre-session held on Tuesday, 27 November 2001 and (ii) under agenda item 4.2.

**(i) Meeting of TC Hydrologists**

25. The Chairman of the annual pre-session meeting of the hydrologists presented the report of the meeting which had been convened at the Waikiki Ballroom of the Waikiki Beach Marriott Resort on 27 November 2001, with participation of 16 representatives from seven Members, ESCAP, WMO and TCS. The report of the Meeting included the review and discussion of findings and recommendations of the "Report of the Regional Survey on Strengthening Cooperation in the Hydrological and Disaster Prevention and



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Preparedness Components of the Typhoon Committee" the "Report of the Workshop on Evaluation and Improvement of Operational Flood Forecasting Models in the Typhoon Committee Area" and the "Expert Review Mission Report on Strengthening Cooperation in the Hydrological and Disaster Prevention and Preparedness Components of the Typhoon Committee". On the basis of the findings of the above-mentioned three reports and discussion shown in Appendix VIII, the pre-session meeting made the following recommendations: (1) to re-establish the Working Group on Hydrological Component to work out detailed method and format of hydrological reporting in order to enhance regional interaction for subsequent consideration by the Members; and to prepare a detailed programme of activities and projects for implementation and subsequent fund mobilization from interested Members and international organizations; (2) to hold a workshop for TC hydrologists on "Integration of Risk Analysis and Management of Water-related Disasters into Development Process" in July 2002 in Manila, and (3) to establish a TC Web-site to enhance its visibility on its activities of the five components and to send a delegation of the Committee to the Third World Water Forum to be held in Kyoto, Japan in March 2001.  
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26. The Committee expressed its appreciation to the Working Group, the Expert Review Mission and ESCAP for the findings and recommendations related to the comprehensive review of the Committee's activities in the hydrological and DPP components carried out in 2001. It also expressed its gratitude to the Ministry of Land, Infrastructure and Transport in Japan for the financial support provided to the conduct of the expert review mission and looked forwards to its continued support in the Committee's future activities. The Committee took note of the recommendations of the pre-session meeting and approved the re-establishment of the Working Group for the purpose mentioned in recommendation No. 1 of the Chairman of the pre-session in view of the fact that the related activities would have no financial requirement from the Committee's Trust Fund. It also decided to consider the other two remaining recommendations under agenda item 7 on Programme for 2002 and Beyond and agenda item 8 on Support Required for the Committee's Programme. The Committee requested the Working Group to submit a report through the TCS to the 35<sup>th</sup> session.

(ii) **Regional Cooperation Programme and Related National Activities**

27. The Committee reviewed activities related to the hydrological component, including flood forecasting and warning, and comprehensive flood loss prevention and management. Activities on the hydrological component reported by the eleven TC Members, namely China; Hong Kong, China; Japan; Macao, China; Malaysia; Philippines; Republic of Korea; Singapore; Thailand; United States of America; and Viet Nam, as summarized in Appendix IX which includes also the summary of activities of ESCAP and WMO related to the hydrological component. The Committee was pleased to note the increase in the exchange of hydrological data among several Members for better flood forecasting and warnings in the past year.

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

28. The ESCAP representative informed the Committee that at the fifty-seventh session, the ESCAP Commission had noted the importance of natural disaster reduction for economic and social development in the twenty-first century and recognized the importance and benefits of regional and subregional cooperation in disaster management and mitigation.

29. The Committee took a special note of efforts made by various Members to facilitate sharing of information, such as a "Server for International Exchange" developed by the Hong Kong Observatory (HKO), which was launched in October 2001 on a trial basis to initially provide products of HKO's Operational Regional Spectral Model and is accessible by interested Typhoon Committee Members via the Internet. HKO also hosted a website, known as Severe Weather Information Centre (SWIC), for WMO, which collects and displays warning messages issued by RSMC Tokyo-Typhoon Centre and National Meteorological and Hydrological Services (NMHS) for access by the public international and regional media. The website went into operational trial on 10 September 2001 with 12 Typhoon Committee Members participating in the project. Currently, it contains warnings on tropical cyclones in the western North Pacific and South China

Sea region. On behalf of WMO, HKO took the lead to develop another website, known as World Weather Information Service (WWIS), to display climatological information and weather forecasts for the next few days supplied by participating NMHSs with a view to generating an integrated forecasting service for major cities around the world.

30. The Committee reviewed activities on disaster prevention and preparedness (DPP). Various developments on DPP covering two categories: public awareness and disaster management are summarized in Appendix X, which also includes brief summary of activities presented by the representatives of ESCAP, WMO, ISDR Secretariat and the Asian Disaster Reduction Centre (ADRC) in Kobe related to disaster prevention and preparedness. The Committee noted the increased interaction on DPP activities among the Members generated by the visit of the expert review missions to several Members in connection with the comprehensive review of the Committee's activities in the hydrological and DPP components. It also noted the urgent needs of several Members on the preparation and improvement of hazard maps and strengthening the related warning systems. Several Members expressed interest in learning from the Japanese experiences in flood map preparation.

(d) **Training Component (agenda item 4.4)**

31. 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 mainly by Members themselves and WMO. The details are given in Appendix XI.

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

33. The Committee took note of the important contribution to the training component of the Committee by the Workshop on Typhoon Forecasting Research, Jeju Island, Republic of Korea, 25 to 28 September 2001, the Workshop on the Potential Development of a Unified N.W. Pacific Tropical Cyclone Best-Track Data Set, Honolulu, 26-27 November 2001, and the Workshop on Evaluation and Improvement of Operational Flood Forecasting Models in the Typhoon Committee Area, Bangkok, 21-24 August 2001. It also noted with appreciation of the opportunities provided to the hydrologists of several TC Members to take part in the International Symposium on Water-Related Disaster Reduction and Response jointly organized in Bangkok from 27 to 31 August 2001 by the United Nations Department of Economic and Social Affairs (DESA), ESCAP, the United States National Weather Service, National Oceanic and Atmospheric Administration (NOAA), and the Secretariat for the International Strategy for Disaster Reduction (ISDR).

(e) **Research Component (agenda item 4.5)**

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

35. The representative of CAS highlighted major activities of CAS, a summary of which is given in Appendix XIII. He informed the Committee that the fifth International Workshop on Tropical Cyclones (IWTC-V), which would take place once every four years, would be held in Cairns, Australia from 03 to 12 December 2002.



## V. REVIEW OF THE 2001 TYPHOON SEASON/PUBLICATIONS (agenda item 5)

### Review of the 2001 typhoon season

36. The Members noted that 22 typhoons developed in 2001 (up to 31 October 2001). A review of the tropical cyclones affecting the Members are given in Appendix XIV.

37. As in previous year, RSMC Tokyo-Typhoon Center provided the session with a review of the 2001 typhoon season contained in Appendix XV.

38. In response to the objection of the India Meteorological Department to the name "Hanuman" because of possible religious sentiments, the TCS informed the Committee, as requested at its 33rd session held in Macao, China in 2000, that the following names have been adopted:

- (i) Hanuman was replaced by Morakot; and
- (ii) Kodo was replaced by Aere.

### Publications

39. The TCS reported to the Committee that it had published the 13th issue of the Typhoon Committee Newsletter in July 2001 and the publication of the 2000 Typhoon Committee Annual Review (TCAR) in October 2001 and had disseminated to all the Members, ESCAP and WMO.

40. 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.

41. The RSMC Tokyo - Typhoon Center published the "Annual Report on Activities of the RSMC Tokyo - Typhoon Center in 2001" in the form of CD ROM with printed matters in July 2001. The RSMC Tokyo also published Technical Review No. 4 that contains three papers on new numerical typhoon forecasting model of JMA in March 2001.

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

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

43. The Committee was informed that JCOMM and WMO would organize a series of annual Workshops on the South China Sea Storm Surge, Wave and Circulation Forecasting. The first workshop will be held in Hanoi, Viet Nam from 21 to 24 January 2002 for Cambodia, China, DPR of Korea, Malaysia, Philippines, Republic of Korea, Singapore, Thailand and Viet Nam.

44. The Committee noted with appreciation that two typhoon forecasters from Cambodia and Viet Nam had undertaken on-the-job training in typhoon operations at the RSMC Tokyo-Typhoon Centre from 2 to 13 July 2001. It also noted with appreciation that JMA would offer the attachment of two woman forecasters to the RSMC Tokyo for two weeks in July 2002. The Committee was informed that the outcome of the above training of typhoon operational forecasters would be submitted to the "Second International Technical

Conference on the Participation of Women in Meteorology and Hydrology", tentatively scheduled to be held in Geneva in November 2002.

45. The Committee was informed that NOAA, in cooperation with WMO, would organize the RA IV Workshop on Hurricane Forecasting and Warning, and Public Weather Services, at the RSMC Miami-Hurricane Center, from 15 to 27 April 2002. The Committee was invited to send six typhoon forecasters with financial assistance from the Typhoon Committee Trust Fund to take part in the workshop. The workshop aims to assist participants in their efforts to improve tropical cyclone warning systems and related public weather services, through the provision of refresher training for operational forecasters.

46. The Committee was informed that the Fourth Tropical Cyclone RSMCs Technical Coordination Meeting would be held, tentatively in Nadi, Fiji, 26-29 November 2002. The outcome of the Meeting was planned to be submitted to the Fifth International Workshop on Tropical (IWTC-V) to be held in Cairns, Australia, 03-12 December 2002.

## VII. PROGRAMME FOR 2002 AND BEYOND (agenda item 7)

### Regional Cooperation Programme Implementation Plan (RCPIP)

47. In reviewing the Report of the working Group on the structure of RCPIP (WRD/TC33/4 Add. 1) as presented by its Chairman, the Committee noted with appreciation the new approach adopted by the Working Group and its efforts to translate the spirit of cooperation of the TC Members into a new logical framework consisting of Vision, Broad Goals, Priority Objectives and Supporting Actions.

48. The Committee discussed intensively the key principles and concept underlying the proposed logical framework and approved the proposed vision statements, the broad goals and priority objectives as reflected in Appendix XVI. It also considered the detailed supporting actions including success indicators and financial resources required and decided to include several actions to ensure effective achievement of priority objectives of the Committee as shown in the above-mentioned Appendix.

49. The Committee urged all the Members to actively participate in the implementation of the newly adopted RCPIP and requested the TCS, in coordination with the Chairman of the RCPIP Working Group, to issue a letter, by January 2002, to invite the Members to provide the TCS with information on which priority objectives and related actions and respective identified goals they would intend to participate. The Members were urged to provide the above information to the TCS before the end of March 2002 in order to ensure an effective beginning of the implementation of the new RCPIP and a much more fruitful cooperation framework for the coming year to prepare for the 35th session of the Committee. The TCS was requested to liaise the above activities with the Chairman of the RCPIP Working Group.

50. In discussing the implementation of the new RCPIP, the Committee noted the importance of coordination of efforts among the members and cooperation with other international organizations as well as the need to mobilize additional resources. It therefore decided to reestablish the Working Group on RCPIP with a new Terms of Reference as shown in Appendix XVII. The Committee expressed its appreciation to Mr. James Weyman for his willingness to continue to serve as the Chair of the Working Group and invited the other Members to take part in the Working Group. The Committee also noted that interaction among the members of the Working Group could be effectively carried out through e-mail or other means and that no financial resources would be required from the Committee's Trust Fund.

51. TCS is invited to keep the Members informed of the progress made in the implementation of RCPIP and distribute a document on the outcome of the Working Group to the Members for consideration at the thirty-fifth session of the Committee.



### *Typhoon Research Coordination Group (TRCG)*

52. The Committee took note of the report made by the chairman of TRCG including the outcome of the Workshop on Typhoon forecasting Research held in Jeju from 25 to 28 September 2001 which had provided the opportunity for TC typhoon forecasters to understand and exchange latest developments on science and technology, to discuss regional requirements identified through a set of questionnaires circulated prior to the workshop. The TRCG recommended the following short-term topics related to research activities for the Committee to consider:

- (1) To continue TRCG fellowship scheme and extend further to include a visiting lecturer program based on electronic channel. The committee invited TCS to request on the application of fellowship and hosting organization. Typhoon Committee Annual Review should be used to publish tropical cyclone forecasting research results. This is particularly useful for young scientists to enter the international research communities
- (2) To encourage 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. It is recommended to compile a list of resource persons in the region for better interaction
- (3) To encourage members to adopt cooperative activities to engage the interest of academic researchers and to secure their participation in cooperation research with TC forecasting application including track forecasting with multi-model ensembles, heavy rain and local wind forecasting, and utilization of satellite microwave data and radar data
- (4) To bring to the attention of IWTC-V the regional views, key research topics identified, and recommendations in the workshop on typhoon forecasting research (Jeju, 25-28 September 2001)
- (5) To hold a regional workshop every two or three years

TRCG further also recommended following research topics for the medium or long term in cooperation with the scientific community such as IWTC, under the framework of RCPIP:

- (1) Model intercomparison project on tropical cyclone, utilizing international intensive observation experimental data set, to better understand physical processes
- (2) Demonstration project including interactive display system to facilitate transfer of technology and exchange of information among others
- (3) Cooperative development of mesoscale models including data assimilation, quantitative precipitation, and air-sea interactions

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.

53. The Committee expressed its appreciation to the Chairman and members of the Typhoon Research Coordination Group (TRCG) for its report (see Appendix VI) and their excellent work. 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. In this connection, the Committee reiterated its view that the TRCG should provide an overall framework for research collaboration among the Members in all the components of the Committee as reflected in the Terms of Reference of TRCG shown in Appendix XVIII.

54. Under the Typhoon Committee Research Fellowship Scheme, established by TRCG during the 32<sup>nd</sup> session, two research fellowships were awarded in 2001.

55. Since the success of the scheme depended on the centres' willingness to play host, researchers to work with partners from other Members, and funding to support Research Fellows, the Committee urged Members to indicate through its member in the TRCG their intentions in these aspects. The TCS was requested to liaise closely with Members on their intention in these aspects.

### *Meteorological Component*

56. The Committee was pleased to note that JMA would offer an attachment of one or two typhoon forecasters to the RSMC Tokyo for 2 weeks in July 2002 for the on-the-job training in typhoon operation. The Committee also noted with appreciation the offer of JMA to set up a Web site with information for numerical predictions of tropical cyclone tracks in cooperation with relevant major centers.

57. The Committee was informed by the CAS representative that the IWTC-V would be held in Cairns, Australia, in December 2002. The Committee affirmed that Director of the RSMC Tokyo-Typhoon Center would serve as a member of the International Committee (IC) for the IWTC-V in the capacity as a regional representative of the Typhoon Committee.

### *Hydrological Component*

58. The following decisions had made by the Committee after detailed discussion of the various recommendations submitted by the Chairman of the Meeting of the TC Hydrologists.

- (1) The Committee decided to re-establish the Working Group to be responsible for the planning and implementation of the recommendations of the Expert Review Mission in consultation with interested Members and the Asian Disaster Preparedness Centre. This is aimed to maintain the momentum and interest generated by the comprehensive review on the activities of the Committee's hydrological and DPP components. The Working Group includes the following experts.

- Mr Chong Sun Fatt, Malaysia as Chairman
- Mr Junji Miwa, Japan
- Mr Kim Dong-Kwon, Republic of Korea (tentative)
- Ms Noppakhun Somsin, Thailand (tentative)

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 and TCS to provide secretarial services.

- (2) To request TCS in cooperation with the Philippines to organized a 4-day expert workshop for TC hydrologists on "Integration of Risk Analysis and Management of Water-related Disaster into Development Process" to be held in July/August 2002 in Manila to promote greater information exchange and technology transfer among Typhoon Committee hydrologists. It also agreed to consider the detailed budget required to organize the workshop during the deliberation of agenda item 8. In order to enhance the effectiveness and impacts of the workshop, the Committee also approved the proposal by the Meeting of the TC Hydrologists on the following:

- ◆ To request Japan to provide the services of experts to prepare for the organization of the Workshop, to facilitate the exchange of experiences and to prepare programme for follow-up action taking into account the recommendations of the Expert Review Mission carried out in 2001.



- ◆ To request ESCAP to assist TCS and Philippines in preparing the technical programme of the Workshop.
- ◆ To allocate one day of the four-day Workshop to discuss detailed proposal on follow-up actions as submitted to the Workshop.

### Training Component

59. The Committee agreed to support the following events in 2002:

- Participation of national storm surge forecasters at a Storm Surge Workshop (Hanoi, Viet Nam, 21 to 24 January 2002).
- Participation in the training workshop on weather forecasting for operational meteorologists to be organized by KMA under the sponsorship of KOICA in Seoul, 18 March 13 April 2002.
- Participation of six (6) typhoon forecasters at a Workshop on Hurricane Forecasting and Warning, including topics related to Public Weather Services (Miami, USA, 15 to 27 April 2002);
- Attachment of two (2) typhoon woman forecasters to RSMC Tokyo-Typhoon Center in July 2002;
- Workshop for TC hydrologists on Integration of Risk Analysis and Management for Water related Disasters into Development Process, in Manila in July/August 2002; and
- Participation of typhoon experts at the Fifth International Workshop on Tropical Cyclone (IWTC-V) (Cairns, Australia, 3 to 12 December 2002).

60. The Committee reiterated that summary of the outcomes of all the training and conference event supported from the Trust Fund and the research fellowships, which particularly benefit the Committee, be submitted by the parties concerned to the Members immediately after their completion.

### Other Matters

61. The Committee requested that all documentation for the next session should be dispatched to the Members one month in advance in electronic form. It also agreed that upon the deadline of submission of inputs by the Members and Chairmen of the Working Groups, two months before the Session, TCS would issue the first draft for the documents to enable these to be sent to the members one month in advance. Subsequent updated versions could be made available to the Members later on. The Members were requested to provide the Secretariats with updated information on the addresses of at least two contact points for each Member. The National reports with corresponding summary and the report of the Working Groups should be also sent to the TCS, ESCAP Secretariat and the Members by electronic means as much as possible or hard copies be brought in sufficient number to the session.

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

### i) Arrangements for the Typhoon Committee Secretariat (TCS)

62. The Committee expressed its gratitude to the Government of the Philippines for hosting the TCS and for providing a full-time meteorologist and support staff and proposed that such arrangements continue.

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

64. The Committee expressed its appreciation to the Government of the Republic of Korea for providing the services of a hydrological expert until the end of January 2001.

65. The Committee expressed its appreciation to the Government of the Philippines to consider providing the services of a hydrological expert attached to the TCS.

66. The Committee requested that the TCS Coordinator to submit a report on the TCS office and staffing structure taking into account the new information technology in the work of the TCS and the services of the TCS Hydrologist to be provided by the Government of the Philippines.

67. The Committee expressed its appreciation to TCS for publishing the Typhoon Committee Newsletter, the ESCAP/WMO Typhoon Committee Annual Review and requested the TCS to study producing the Typhoon Committee Annual Review in CD-ROM format and report the findings to the Committee at its 35<sup>th</sup> session.

### ii) Technical cooperation

68. The Committee reviewed all the resources available to support the work programme of the Committee, including the contributions from Members themselves and external support from WMO/VCP, ESCAP, TCDC, TCTF, bilateral assistance and other potential donors.

69. The Committee took note with appreciation of the initiative of WMO to establish the Emergency Disaster Response Group to coordinate and assist the NMHSs in disaster events. The Committee encouraged the Members to provide WMO information in case of any disaster events in order to enable WMO to evaluate the needs of the NMHSs. If requested, WMO would provide the Members information of bulletins for severe weather services.

70. The Committee took note of the offer by the Asian Disaster Reduction Centre (ADRC) to prepare and distribute an on-line list of Internet Web sites on disaster prevention and preparedness information and suggested interest Members to provide the ADRC with the related information for inclusion in the ADRC list. The Committee also took note with appreciation the offer of ADRC to make available to interested TC Members the video entitled "Protect Yourself from Storms and Floods" produced by the Disaster Management Bureau of the Cabinet Office of Japan in cooperation with NHK, Japan's public broadcasting corporation as an example of public awareness programme with the participation of the mass media.

### iii) Typhoon Committee Trust Fund (TCTF)

71. The WMO representative presented to the session a detailed breakdown of expenses of the TCTF. The Committee expressed its gratitude to WMO for submitting the financial report which covered the period from January 2000 to 31 August 2001. The session requested WMO that a revised balance sheet as of 31 December 2001 be provided to the Members by 1 May 2002, which shall show all items of income and expenses with expenses identified to current and prior years. The Committee also requested that the WMO and TCS provide the members at the 35<sup>th</sup> session, with a further break down for two parts: part 1 covering the period from 1 January to 31 December 2001, and part 2 for the period from 1 January 2002 to 31 August 2002 for an accounting of the expenditures from the Trust Fund which, item by item, compares actual with authorized expenditures.

72. The Committee reviewed and approved the financial report on the TCTF and the balance of the fund as of 31 August 2001 as shown in Appendix XIX.

73. WMO Secretariat informed the Committee that China; Hong Kong, China; Japan; Macao, China; Malaysia; Republic of Korea; Singapore; Thailand; and the USA had already made their 2001 contributions to the TCTF.



74. The Committee expressed the view that a certain degree of self-reliance still has to be achieved. In this connection, the Committee urged its Members to continue to enhance their contributions to the Trust Fund as substantial support to the Committee's activities.

75. The Committee, after careful consideration, agreed to the use of the TCTF for the following specific purposes from 1 January to 31 December 2002:

- (i) Operating costs of TCS, including the support for the TCS Coordinator (approx. US\$ 26,220);
- (ii) Publishing the Typhoon Committee Newsletter No. 14 (approx. US\$ 1,400);
- (iii) Printing and distribution costs of the publication of the 2001 Typhoon Committee Annual Review (TCAR) [500 copies] (approx. US\$ 5,400);
- (iv) Augmentation of travel funds for TCS staff mission, including attendance at the thirty-fifth session of the Typhoon Committee (approx. US\$ 7,000);
- (v) Printing and distribution costs of documents for the thirty-fifth session of the Committee (approx. US\$ 1,700);
- (vi) Support for the attendance of participants at a four-day expert workshop for TC hydrologists on Integration of Risk Analysis and Management for Water-related Disasters into Development Process, in Manila in July/August 2002 including the participation of 2 invited experts with printing and local support (approx. US\$ 17,000);
- (vii) Support for the attendance of six (6) typhoon forecasters at a Workshop on Hurricane Forecasting and Warning, including topics related to Public Weather Services (Miami, USA, 1 to 27 April 2002) (US\$ 21,000 --- approved by the Chairman of the Committee on August 2001);
- (viii) Support for the attendance of typhoon experts at the Fifth International Workshop on Tropical Cyclones (IWTC-V) (Cairns, Australia, 3 to 12 December 2002) (approx. US\$ 14,000);
- (ix) Support for attachment of two (2) typhoon woman forecasters to RSMC Tokyo - Typhoon Center (US\$ 4,000); and
- (x) Support for the attendance of national storm surge forecasters at a Storm Surge Workshop (Hanoi, Viet Nam, 21 to 24 January 2002) (approx. US\$ 2,000).

(Total: US\$ 99,720)

- (xi) Any other emergency case that can be justified for the use of the TCTF requiring the concurrence of both the TCS Coordinator and the Typhoon Committee Chairman.

76. The Committee decided that total actual expenditures for the year 2002 however are up to and not exceed US\$ 100,000.

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

77. The Committee welcomed the offer of the delegate from Thailand to host the thirty-fifth session in Chiang Mai, in November 2002. The pre-session meeting of TC hydrologists will take place on the day before the opening of the session.

#### X. SCIENTIFIC LECTURES (agenda item 10)

78. The following scientific lectures were presented:

- a. The Rainstorm of a Tropical Depression that Affected Shanghai on 5 August 2001 by Dr LEI Xiaotu (China)
- b. Wind Profiler Network and its Impacts on Numerical Weather Prediction at the Japan Meteorological Administration by Dr Takeo KITADE (Japan)
- c. Experience on Numerical Prediction of Tropical Cyclones at the Korea Meteorological Administration by Dr Woo-Jin LEE (Republic of Korea)
- d. Current State of Flood Forecasting and Hazard Mapping in Japan by Mr Junji MIWA (Japan)
- e. WMO Severe Weather Information Centre (SWIC) and World Weather Information Service (WWIS) by Dr Hung-Kwan LAM (Hongkong, China)

79. 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 2001.

#### XI. ADOPTION OF THE REPORT (agenda item 11)

80. The Committee adopted the report of the session at 10:55 am, 4 December 2001.

#### XII. CLOSURE OF THE SESSION

81. 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 the United States of America and the National Weather Services of the United States of America for the successful hosting of the 34<sup>th</sup> session of the Typhoon Committee. They also expressed gratitude to Mr James Weyman, Acting Director of the Pacific Division of the National Weather Services, and his staff for the warm hospitality and excellent arrangements made. Their thanks also goes to the Richard H. Hagemeyer Pacific Tsunami Warning Center, the RSMC Honolulu and the Joint Typhoon Warning Centre for the hospitality extended to the participants in hosting the visits to their respective centers.

82. The session was closed by the Chairman at 11:34 am, 4 December 2001.



**APPENDIX I**

**LIST OF PARTICIPANTS**

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**ESCAP/WMO Typhoon Committee**  
**28 November - 04 December 2001**  
**Honolulu, Hawaii, USA**

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## APPENDIX II

### AGENDA

1. Opening of the Session
2. Election of officers
3. Adoption of the agenda
4. The Committee's activities during 2001
  - 4.1 Meteorological component;
  - 4.2 Hydrological component;
  - 4.3 Disaster prevention and preparedness component;
  - 4.4 Training component; and
  - 4.5 Research component
5. Review of the 2001 typhoon season/annual publications
6. Coordination with other activities of the WMO Tropical Cyclone Programme
7. Programme for 2002 and beyond
8. Support required for the Committee's programme
9. Date and place of the thirty-fourth 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 polar orbiting meteorological satellite FY-1C launched on 10 May 1999 has been working over 30 months, longer than the designed lifetime of two years. The second on-orbit checkout was conducted prior to the second anniversary of the satellite operation. It demonstrated that the satellite's condition was as good as that when the first checkout was made after the launch. All five on-board subsystems, namely, the attitude controlling, energy supplying, heat controlling, transmission and remote sensing, are in good status. The backup system & equipment, the redundancy designed for the sake of reliability, are not used by far.

Various FY-1C products have been developed at NSMC and they have been used in meteorology, hydrology, climate research, agriculture and environment monitoring. The CHRPT data is open to all users including international users. Operational effort is now undertaken to make FY-1C products accessible through Internet.

The fourth FY-1 polar orbiting meteorological satellite, FY-1D, has finished all mandatory factory tests. Its launch was planned for the autumn of 2001. In view of the good status of FY-1C satellite, its launch has been postponed to the first half of 2002.

There are two experimental geo-stationary meteorological satellites, FY-2A and FY-2B, in orbits. FY-2A stationed at 86.4 E for back-up purpose keep discontinued observations and testing. FY-2B was launched on June 25, 2000 and stationed at 105 E. All functions have been realized, high quality VIS, IR, WV images were received until February 2001.

On February 28, 2001, the first day after the satellite entered the spring eclipse, the local oscillator of up-converter ceased working, leading to interruption of image transmission and anomaly of DCP subsystem. During the whole eclipse period, the satellite temperature was carefully controlled. Several measures were taken after the satellite came out of the earth shadow and that brought the DCP subsystem back to work again. Through further implementation of temperature control, the local oscillator has worked again, but the power output decreased. On June 18, 2001, image transmission was recovered, however, the EIRP for transmission is 8dB below the normal level. It is possible for user to receive the data using a 2.4-meter antenna. The bit error rate of transmission signal is comparatively high and the quality of imagery is affected. Currently, the up-converter of S-band transmitter works normally. The image acquisition, data transmission, data collection and turn around ranging have all been recovered for operation.

FY-2C satellite is planned to replace FY-2B that was launched on June 25, 2000. It is expected that FY-2C will be launched in 2003.

Thirty-nine Automatic Weather Stations (AWSs) which were imported from VAISALA company in Finland and mainly installed in National Basic Meteorological Stations and National Reference Climatological Stations of Qinghai Province were made operational on January 1, 2001, and had passed CMA's testing later this year. The establishment of another sixty-two AWSs, which is part of Meteorological Service System for the Three Gorges Project, has been under way in 2001. Most of the tasks, such as purchasing of the equipment and personnel training, were completed. As planned by CMA, there will be a total of 161 AWSs by January 1, 2001.

The satellite based domestic telecommunication network is running stable, by which the CMA can collect the national meteorological data in 30 minutes.

The High Performance Computer Center was established in CMA on 25 July 2000. The center has Chinese-made HPC (peak perf. 384 Gflops) SW-1, USA-IBM/SP (80 Gflops) etc.

In 2001, series of precipitation sensors and air pressure sensors were tested and experimentally used respectively, in laboratory and testing sites. These two tests, organized by CMA in order to choose the reliable and advanced sensors for the AWS, have been completed and the analysis of testing data is underway. In addition, a software used for observation operation has been developed by an expert group in CMA. It is suitable not only for the manual observing stations but also for the AWSs.

The Beijing - New Delhi circuit was established on August 1, 2001. The circuit is digital leased line with a protocol of X.25 PVC, and the speed of the link is 9600 bps. According to both sides arrangement, alphanumeric and binary messages are transmitted on the circuit. In 2001, the FTP test was done on the Beijing-Moscow circuit. On November 5, the 2001, Beijing-Tokyo circuit will be updated. The new circuit between Beijing and Tokyo is Frame Relay link. Its port speed is 64 kbps, and TCP/IP protocol is adopted. Messages, including alphanumeric, binary and fax data, will be switched via TCP sockets on the new circuit.

Medium range forecast system T213L31 was put into operational run recently. Its higher resolution (about 0.5625 °) and better physical process package could provide better medium range forecast compared with T106L19 especially less than 4 days. Based on the former research, work will be carried out on typhoon track prediction using T106L19, research work on using T213L31 to predict typhoon track and could expect better results.

Because of some tropical depressions over China, coastal waters often cause enormous losses in lives and property for people who live in China coastal areas, and many tropical depressions often become tropical storms in short time and bring about more immense damages. So, in order to reduce losses in lives and property and improve the effect of service, NMC has begun to add the reports of tropical depressions since August 2001. If a tropical depression enters the area of the 48h warning line and its max winds near center reach force 6-7 wind (10.8-17.1 m/s), NMC issues reports of tropical depression two times (00UTC and 12UTC) every day. The report includes past location and intensity, forecasting location and intensity for 24 hours.

The delegate from **Hong Kong, China** reported that under the joint efforts of the Hong Kong Observatory and the China Meteorological Administration, the Guangzhou - Hong Kong portion of the Beijing - Hong Kong GTS link was upgraded. The new link has a data transfer rate of 64 kilobits per second, more than 6 times faster than the original link but at only one-third of the cost.

Forecasting aids, aimed at providing forecasters with intuitive and graphical tools to prepare forecasts and handle tropical cyclone situations more effectively, have been developed.

A reception system for high-resolution images from polar-orbiting satellites was installed and put into trial operation as a contingency measure to back up reception of images from the GMS-5.

The Observatory's website was continually enhanced. Enhancements included addition of weather radar images, an audio web page for the visually impaired users, and a WAP version for mobile phone use. The audio web page provided information in Chinese, English and Putonghua.

With the assistance of the of Australian Bureau of Meteorology and US National Weather Service, aircraft of Qantas and several US airlines made a number of Aircraft Meteorological Data Relay (AMDAR) observations flying in and out of the Hong Kong International Airport. The Hong Kong Observatory has started preparing for trial AMDAR observations using a commercial aircraft of a local airline in 2001. AMDAR data were assimilated into the Operational Regional Spectral Model.

The feasibility of operating a local non-hydrostatic model at resolution of a few kilometers had been studied. Trial model runs will be performed in the rain season of 2002 to assess its usefulness in heavy rain

forecasting. An Open Laboratory was set up for numerical experimentation and development using mesoscale models with a web-based graphical interface to facilitate users to select tailor-made model configurations and to carry out case studies. The Observatory's nowcasting system, SWIRLS (Short-range Warning of Intense Rainstorms in Localized Systems) was upgraded with a new application called GTrack Viewer which monitors the movement, merging or splitting of echo groups through ellipse fitting and tracking.

Wind-powered generators were installed at seven remote automatic weather stations to conserve energy and alleviate dependence on conventional electricity power supply.

The delegate from **Japan** reported that the Geostationary Meteorological Satellite, GMS-5 has been operated generally satisfactory since the expiration of the designed life of five years in March 2000. In order to secure its stable and continued operation, the picturing operation of GMS-5 was curtailed in July 2001 to reduce the load on the motor drive of the satellite. The launch of the MTSAT-IR, the successor of GMS-5, has been postponed from the early 2003 to the summer of the year, due to the delay in its manufacturing process. Accordingly, the start of the operation of MTSAT-IR, including data dissemination through Low Rate Information Transmission (LRIT), has been re-scheduled for the end of 2003. The Japan Meteorological Agency (JMA) will operate the GMS-5 with every caution to maintain its observation as far as the take over by MTSAT-IR.

The mainframe computer and the Numerical Analysis and Prediction System (NAPS) of JMA were replaced on March 1, 2001. In this renewal, a Meso-scale Model with a high horizontal resolution of 10 km, which is aimed at assisting forecasters in warning operations, and a medium range ensemble prediction system to be used for one week weather forecasts were put into operation. Improvements were also carried out on existing models, the spatial resolution were increased for Typhoon Model, and the frequency of operation of typhoon Model was doubled.

As of November 1, 2001, JMA defined the status of the numerical products of JMA being provided via GTS or the RSMC Data Serving System as "Essential" data in the sense of Resolution 40 adopted by the WMO Twelfth Congress. The "Essential" data include grid point values (GPVs) of the Global Spectral Model, Global Wave Model and one-month Ensemble Prediction Model of JMA. This policy was intended, first and foremost, to facilitate the use of NWP products in the National Meteorological Services including Members of the Typhoon Committee.

The TCP/IP protocol and Frame Relay link were introduced for the Tokyo-Seoul circuit in November 2000 and the Tokyo-Bangkok circuit on July 2001. The transmission speed of the Tokyo-Khabarovsk circuit was also upgraded from 9.6 kbps to 14.4 kbps. Migration of GTS protocol to TCP/IP and utilization of Frame Relay links will be continued to promote, in partnership with relevant countries, for the better efficiency in data exchange in the Asian meteorological community.

The Wind Profiler Network was developed by JMA in April 2001. The network consists of 25 sets of profilers that make high resolution measurements of the vertical profile of winds. Each profiler provides wind speed/direction at altitudes from 200m up to 3-4 km in winter and 6-7 km in summer with height resolutions of 200-300 m, every 10 minutes. With this new system, upper air observations in Japan have been enhanced together with existing 18 balloon-based stations and substantial improvements have been made in the performance of the Numerical Analysis Prediction System (NAPS) of JMA.

The delegate from **Macao, China**, reported that the PCVAT ground receiving system was installed to receive meteorological information (SYNOP, TEMP, ECMWF GRID, Satellite images...etc) from Beijing. MYSQL database for enhancement of intranet and its development was installed to process more efficiently collective meteorological information. Video-conference briefing system linking between the forecasting center and the airport meteorological office to enhance weather monitoring and forecast discussion.



A lighting detecting system was installed together with a processing and graphical display program being developed. Thus with help of the system and Doppler weather radar, SMG started to issue the thunderstorm warning since March 23 2001. Besides, a broadband UV sensor was also installed to measure UV radiation. UV index is being calculated and disseminated hourly through Internet to the public.

A SUN Enterprise E250 Server has been implemented for transferring Oracle Database Server from VMS platform to Solaris. New Oracle Application Server for intranet development was also installed helping our colleagues to access more conveniently and efficiently to the Oracle database.

The MM5 was upgraded to version 3 and is running twice daily on 10 CPU parallel processing computer with initial time 00 and 12UTC to provide 48 hour forecast. Products are being generated automatically on schedule to the Intranet. Software of Typhoon Information Integration System has been developed and enhanced to manage and process various information collected. The system also helps to issue and disseminate local tropical cyclone warnings and reports to various systems such as internet, intranet, mobile phone weather system and television show etc. Weather chart plotting software was also renewed and modified and transferred from Window platform to Linux platform.

The delegate from **Malaysia** reported that the Malaysian Meteorological Service (MMS) automatic computer message switching system became operational on 25 September 2001 using Internet communication framework among meteorological stations and regional meteorological offices. The linkage with Bangkok and Singapore were also upgraded. MMS has also acquired and integrated forecasting system that provides the meteorologists the necessary tools on simple work station.

MMS is conducting research activities related to the effects of tropical storms/typhoons on regional weather, storm surge modeling and impacts of tropical storms on monsoons. A total of 234 staff have undergone various training.

The delegate from the **Philippines** reported that Data Collection Platform (DCP) and accessories were installed in Barangay Dahican, Mati Davao Oriental (Latitude 6° 56' 43" N / Longitude 126°15' 24" E) from May 5 to 11, 2001. The equipment consists of the Auria central processing unit cabinet including the pressure sensor, solar power panel and charger, DCP transmitter type BM-19 including the GPS receiver, 10 m fiberglass wind mast for wind direction and wind speed sensors, and Precip-Mecanique rain gauge. Communication tests were conducted between the Auria CPU and the DCP transmitter using the supplied AEMOD-12 asynchronous modems.

For the same location, tests were also conducted on transmission and reception of meteorological data from the DCP to the Japan Meteorological Agency via the GMS-5 satellite. After it has been established that all sensors were working properly, the synoptic data collected by Mati DCP will be sent back to the Philippines through the GTS.

A Weather Surveillance Radar Doppler 88 (WSRD88) was acquired and installed late last year and is now in operation. It was installed at Mt. Sto. Tomas, Baguio which is hoped to improve further PAGASA's capability to detect and accurately track cyclones that develop in the South China Sea area.

A set of STAR Upper Air-System located in Southwest Philippines (Puerto Princesa Palawan) was installed and commissioned last year, but was found to have defective receiver. Henceforth, it was repaired and now is fully operational.

The structure of the weather disturbance associated with the 1998 summer monsoon surge was determined using SCSMEX observational data. A mesoscale model, MM5, was used to simulate the observed structure of the disturbance during the rainfall episode and forecast the rainfall due to the monsoon surge.

The delegate from the **Republic of Korea** reported that the Korea Meteorological Administration (KMA) has established additional 40 Automatic Weather Stations (AWSs) in remote islands and mountainous areas this year and will have 500 AWSs by 2003. KMA deployed the 5<sup>th</sup> ocean data buoy 70 km off the east coast of Korea and installed the 7<sup>th</sup> S-band Doppler radar at Jindo island, southwest part of Korea this year. As part of KMA's Argo program, KMA also deployed ten Argo floats in the West Pacific Ocean in 2001.

KMA replaced the lightning detection system. The new lightning system with 10 sensors is capable of detecting a cloud-to-cloud discharge, in addition to cloud-to-ground discharge, which was impossible in the old system. The new system consists of 7 IMPACT and 13 Ldar sensors that detect cloud-to-ground and cloud-to-cloud discharges, respectively.

In addition to last year's installation of ATM switches at the KMA headquarters and regional offices, this year, KMA installed ATM switches at 37 weather stations, the dedicated leased lines to the lines of the National Superhighway. As a result, the network speed between KMA headquarters and Regional offices and between Regional offices and Weather Stations were upgraded to 14 Mbps and 4 Mbps, respectively.

KMA has been developing the Forecaster's Analysis System (FAS) in cooperation with the Forecast System Laboratory of NOAA. This system was designed to easily overlay, combine and animate different types of data and analysis on single display. FAS consists of several display workstations and servers for data processing. The Linux operating system was chosen for FAS to take as much advantage of the vendor independent system as possible. FAS uses the Network File System to interconnect all workstations and servers. With the exception of some data sets, including radar data, all data sets are stored on the data server in the NetCDF format. The operational FAS is scheduled to be launched at the end of 2002.

An ensemble prediction system (EPS) with breeding mode has been developed for the probabilistic forecasts on medium range. The intermittent data assimilation system with the global spectral model T 106 L21 is used to find breeding modes. A total of 32 breeding modes are used for the EPS. The ensemble mean field has higher accuracy in terms of RSME errors than the deterministic one.

In **Singapore**, the delegate reported that a new message switch system was commissioned at the national meteorological centre in August 2001. The new Message Switching system uses the Messir message switching software developed by Corobor Systems, a company based in France. The new system consists of duplex communication servers, working in hot standby configuration, Web and Fax-on-demand servers, workstations for use by forecasters and aviation personnel, all running under MS Windows 2000 operating system.

The Communication servers are connected to the GTS network linking Melbourne, Jakarta, Kuala Lumpur, Bangkok, Manila and Brunei, Aeronautical Fixed Telecommunication Network links and other specialized systems in the service including mainframe computers, network servers, radar, satellite reception, lightning and wind profiler systems. The aeronautical and forecaster workstations are used to receive and display meteorological data and other data captured by the communication services.

The main highlights of the systems are easy-to-use PC-based hardware and operating system with fast message switching capability and the very efficient AFTN Databank incorporated into the communication servers. Besides serving data centres in the Asia Pacific Region, the system is also serving some large data centres in Europe.

Singapore implemented a FY-2B/Meteosat-5 satellite reception system in June 2001. The system consists of two 3m parabolic antennae, down converters, receivers, frame/bit synchronizer ingestor boards and PC-based processing systems running under MS Windows 98/2000 operating systems environment. The system is capable of automated operation and the following products can be generated after each satellite transmission: cloud classification, cloud top temperature, land surface temperature, sea surface temperature, precipitation estimation, cloud motion wind vector.

As the FY-2B satellite failed before the actual implementation of the system, the FY-2B subsystem is now used to process the data from GMS-5 and the full range of products is available from GMS-5. While data is received from Meteosat-5, the subsystem has not performed at full capacity because of the severe drift of the ten-year old Meteosat-5 satellite.

Electronic delivery of weather services for aviation, the public and shipping have been implemented with the launch of the Aviation Intranet, Shipping Intranet and public Internet website. All 3 Services provide the latest weather information including information on tropical storms which are threats to countries in Asia and areas of operations of aircraft and ships in the region.

Our website has also been hyper-linked to the US Joint Typhoon Warning Centre in Hawaii.

The delegate from **Thailand** reported that the Thailand Meteorological Department (TMD) assisted members in ASEAN countries in upgrading capabilities of their National Meteorological and Hydrological Services to provide better tropical cyclone forecasts and more effective warning through regional coordinated system, and establishment of natural disaster prevention and preparedness measure. The linkage on GTS circuits with Japan and Malaysia were also upgraded.

TMD hosted the 28<sup>th</sup> Session of WMO/ESCAP Panel on Tropical Cyclones for the Bay of Bengal and the Arabian Sea at the Holiday Inn Crown Plaza Hotel in Bangkok from 14 – 20 March 2001

TMD has launched the first phase of Telemetering System Project since late September 1999. The project was undertaken by TMD so that collection activities related to flood monitoring, flood forecasting and warning are carried out in real time. The system consists of hydrometeorological forecast center workstation PCs and other peripherals. During the year, 68 new telemetric stations were installed. On 31 August 2001, the project has carried out 79 percent of the whole work.

The Management Overview of Flood Forecasting System (MOFFS) version 2C was replaced by MOFFS version 3.

The delegate from the **United States of America** reported that a program was developed and implemented by the Facilities Engineering Branch of Pacific Region Headquarters to replace older equipment for generating hydrogen gas for the inflation of upper air balloons on Guam, Palau, Chuuk and Pohnpei with additional installations planned for Yap and Majuro.

Two Automated Meteorological Observing Stations (AMOS) were installed, one on the Island of Pingelap (WMO 91352) in Pohnpei State and the other in Nukuoro Atoll (WMO 91427) in western Pohnpei State, FSM. This brings to twelve the total number of fully functional AMOS in Micronesia.

Work has started nationally on the Interactive Forecast Preparation System (IFPS) and Digital Forecast Data (DFD) base. The approach is to construct a 4 dimensional DFD base that has the detail and flexibility to support IFPS text product editors and graphics output. WFO Guam begins implementation of the IFPS in the first quarter of calendar year 2002 with the first public products scheduled for the third quarter of 2002.

New Products added to better support the public as follows: short term forecast or nowcast, extended forecast for 3 to 5 days and twice daily climate summary.

The delegate from **Viet Nam** reported that three new digital meteorological radars: a DWSR-2500C at Nha Trang (12°15N, 109°12E), two TRS-2730 digital radars at Vinh (18°40N, 105°41 E) and Viet Nam (21°18N, 105°25E) were successfully installed and put into operation in 2000.

A communication system based on TV Satellite to broadcast all hydrometeorological data from the NCHMF to regional centers was established.

A nested barotropic model with vortex initialization scheme for tropical cyclone motion prediction in the South China Sea was put into operation. The model is from the Bureau of Meteorology (Australia) and the University of Munich (Germany). Global forecast fields at the boundaries are taken from JMA global model. The Delf 3D model of Delf Hydraulics (Holland) for storm surge prediction was also put into operation.

## APPENDIX IV

### PROPOSALS FOR THE UPGRADING OF THE TYPHOON COMMITTEE OPERATIONAL MANUAL METEOROLOGICAL COMPONENT (2002)

#### **Introduction**

1. The typhoon Committee Operational Manual - Meteorological Component (TOM) has been reviewed and updated every year since the first issue in 1987. The 2001 edition of TOM was published in April 2001 in accordance with the approval of amendments to the previous issue of TOM at the thirty-third session of the Typhoon Committee (28 November to 4 December 2000, Macao, China) as proposed by the rapporteur.
2. At the thirty-third session, the Committee decided that a rapporteur of the Japan Meteorological Agency (JMA) would continue the services for updating TOM. On 13 July 2001, the rapporteur, Mr. Tatsuo Ueno, 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 September 2001, proposals were submitted by the six focal points of China, Hong Kong/China, Japan, Macao/China, Republic of Korea and Thailand.
4. Major points of the proposed amendments are as follows:
  - Inclusion of the description of drifting buoy observations in Japan and amendment to the description of ship observations due to the decommission of the JMA meteorological observing ship JFDG in Chapter 2.
  - Inclusion of the description and form of the tropical cyclone passage report agreed at the thirtieth session of the Committee in Chapter 2.
  - Amendment to the Table 5.1 in Chapter 5 to include the improvement of meteorological telecommunication circuits: Tokyo – Bangkok, Beijing – Pyongyang, Beijing – Seoul and Tokyo – Seoul.
  - Addition of the description of operational procedures for the assignment of tropical cyclone names, which were agreed at the thirty-first session of the Committee, to the Appendix 1-A (tropical cyclone name list).
  - Amendment to the Appendix 2-A to update the list of surface observing stations in China and the Republic of Korea and to the Appendix 2-B to update the list of upper-air observing stations in the Republic of Korea.



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

- Addition of the radar station (47102) of the Republic of Korea to the figure of the Appendix 2-C and amendment to the Appendix 2-D to include some changes in specifications of radar stations Macao, China and the Republic of Korea.
- Amendment to the Appendix 3-A and the Appendix 3-D to describe the improvement of tropical cyclone prediction models of Japan and the Republic of Korea.
- Update of examples of advisories issued from the RSMC Tokyo – Typhoon Center (Appendix 4-A).
- Update of the weather forecast areas of the Hong Kong Observatory (Appendix 4-B, p.5)
- Insertion of Appendix 7-A, Annex, p4 on the specifications of GMS VISSR data on DVD-RAM .

**Action Proposed**

5. The Committee is invited to:
  - (a) Note the information given in this document; and
  - (b) Review and approve the proposed amendments to TOM with modifications as necessary.

Page	Line	Present Description	Proposed Amendment
<b>CHAPTER 2</b>			
8	5 - 8	Hourly surface observations are ... ... March 2001.	<< to be replaced >> → Hourly surface observations are made by the JMA meteorological observing ships (call signs of them are : JPBN, JGQH, JDWX, JIVB and JCCX) in the seas adjacent to Japan and in the western North Pacific. The ship JFDG was decommissioned in March 2001.
15	- 17	Sea surface ... ... over the GTS.	<< to be inserted after this paragraph >> → Surface observations, namely air pressure, sea surface temperature, significant wave height and period, are also made by the JMA drifting ocean data buoys every 3 hours in the western North Pacific. When waves are higher than thresholds set beforehand, the buoy changes into the hourly observation mode automatically. All reports are coded in the BUOY code (FM18), and immediately put onto the GTS with the header "SSVB01-19 RJTD".
31		... In Appendices 2-D and 2-E.	<< to be replaced >> → ... In Appendices 2-C and 2-D.
35		(a) the full disk data are obtained hourly;	<< to be inserted after this line >> (note: users are informed of the latest satellite observation schedule by MANAM)
9	1 5	... In Appendix 2-F. ... In Appendix 2-G.	<< to be replaced >> → ... In Appendix 2-E. → ... In Appendix 2-F.
		(after the last paragraph)	<< to be inserted after the last paragraph >> → 2.6 <u>Tropical cyclone passage report</u>  Each Member's tropical cyclone forecast center should compile reliable passage, landfall, near-buoy passage and near-ship passage data, tabulate that data and send it to the TCS a day after cyclone passage for distribution to other Members. The task is assigned to the focal point for the meteorological component of each Member. A proposed tropical cyclone passage report form is shown in Appendix 2-G
<b>CHAPTER 3</b>			
11	4	<u>Description of product</u> ..... time (UTC)	<< to be inserted after this line >> → ocean wave ..... 00
33		Surface wind arrow ..... 24, 36	<< to be inserted after this line >> → ocean wave ..... 24
<b>CHAPTER 5</b>			
20		(Figure 5.1)  Macao (in Figure 5.1)	<< to be deleted >> → "Bangkok - Hong Kong" circuit in the Figure << to be replaced >> → Macao

Page Line	Present Description	Proposed Amendment
		<< to be replaced >>
21 8	Tokyo - Bangkok Cable, ....	→ Tokyo - Bangkok Cable (FR), 16 Kbit/s (CIR) To
11	Bangkok - Hong Kong Cable/Satellite	→ << to be deleted >>
		<< to be replaced >>
18	Beijing - Macao ISDN ....	→ Beijing - Macao ISDN ....
19	Beijing - Pyongyang ...., 75 bauds	→ Beijing - Pyongyang ...., 75 bauds + PC VSAT (\$ broadcast)
20	Beijing - Seoul Cable ....	→ Beijing - Seoul Cable, 64 Kbit/s X.25 Level 3
-21	... + 4800 bit/s (NCDF)	
22-	Tokyo - Hong Kong ... TCP/IO	→ Tokyo - Hong Kong ... TCP/IP
23	... , ISND 64 Kbit/s	... , ISDN 64 Kbit/s
24	Tokyo - Seoul ..., 16 Kbit/s (CIR)	→ Tokyo - Seoul ..., 64 Kbit/s, 128 Kbit/s TCP/IP, 16
22 4	Tokyo 2 FAX	→ Tokyo 1 FAX

#### Appendix 1-A

1	Macao (in the name list)	<< to be replaced >> Macao, China
	(after the name list)	<< to be inserted after the name list >> → Description of operational procedures for the as- sessment of tropical cyclones is to be inserted after (see Attachment 1)

#### Appendix 1-B

1 20	M-DUS	<< to be replaced >> MDUS
35	S-DUS	SDUS

#### Appendix 2-A

1 7	(54): .....683,938,945	<< to be replaced >> (54): .....683,927,945 (insert 927 and dele
31	Macao, China	→ Macao, China
		<< to be inserted into the list >> 098, 102, 106, 121, 127, 135 and 169
2 9	(47): .....	
-12	192	

#### Appendix 2-B

1 3	..... make hourly surface observations .....	<< to be replaced >> ..... make 6-hourly upper-air observations .....
20	Macao, China	→ Macao, China
20	(47): 122, 138, ...	(47): 090, 102, 122, 138, ...

#### Appendix 2-C

1	(in the figure)	<< to be inserted in the graph >> → 47102 (see Attachment 2)
---	-----------------	---

#### Appendix 2-D

8	Macao, China	<< to be replaced >> → by new Appendix 2-D, p.8 (see Attachment 3)
13	Republic of Korea	→ by new Appendix 2-D, p.13 (see Attachment 4)

Page Line	Present Description	Proposed Amendment
<b>Appendix 2-E</b>		
1 3	(a) the full disk data are obtained hourly;	<< to be inserted after this line >> → (note: users are informed of the latest satellite observation schedule by MANAM.)
19	15 minutes interval ...and 0415 UTC	→ (note: users are informed of the latest satellite observation schedule by MANAM.)
		<< to be replaced >>
8	... in Figure 2-F.1.	→ ... in Figure 2-E.1.
25	(Figure 2-F.2)	→ (Figure 2-E.2)
30	(Figure 2-F.3)	→ (Figure 2-E.3)

		<< to be replaced >>
2	Fig.2-F.1 Current ..... (figure caption)	→ Fig.2-E.1 Current .....
3	Fig.2-F.2 WEFAX ..... (figure caption)	→ Fig.2-E.2 WEFAX .....
4	Fig.2-F.3 WEFAX ..... (figure caption)	→ Fig.2-E.3 WEFAX .....

#### Appendix 2-E, Annex

1 33	...in Figure 2-F.4.	<< to be replaced >> → ...in Figure 2-E.4.
3	Fig.2-F.4 Stretched..... (figure caption)	→ Fig.2-E.4 Stretched.....

#### Appendix 2-E, Annex, Attachment

1 2	(See Figure 2-F.5)	<< to be replaced >> → (See Figure 2-E.5)
2	Fig.2-F.5 Time chart ..... (figure caption)	→ Fig.2-E.5 Time chart .....

#### Appendix 2-F

1	Macao, China Macao .....	<< to be replaced >> → Macao, China Macao .....
---	--------------------------	--

#### Appendix 2-G

1	(Tropical cyclone passage report form)	<< to be inserted after Appendix 2-F, p.2 >> new Appendix 2-G (see Attachment 5)
---	--	---

#### Appendix 3-A

		<< to be replaced >>
1 2	(a) .....Model (GSM 9603)..	→ (a) .....Model (GSM 0103)..
6	data cut-off at 2.5 ~ 3.0 hr .....	→ data cut-off at 2.5 hr .....
7	at 6.5 ~ 13.0 hr .....	→ at 7.5 ~ 12.5 hr
10	.....levels (30) .....	→ .....levels (40) .....
22	84 hr ....., 192 hr .....	→ 90 hr ....., 216 hr .....
28	..... on 30 p- .....	→ ..... on 40 p- .....
35	Tiedtke .....enhanced diffusion	→ prognostic cloud water content
36	vertical .....Yamada (1974)	→ vertical .....Yamada (1974) with moist effect included
2 1	(b) .....Model (TYM 9603)..	→ (b) .....Model (TYM 0103)..
5	data cut off at 1.5 hr .....time	→ data cut off at 2.5 hr from synoptic time (0000UTC, 1200UTC) and at 1.5 hr ..... time (0600UTC, 1800UTC)
8	.....levels (30) + .....	→ .....levels (40) + .....
14	.....the last 12-hr prediction .....	→ .....the previous prediction .....
30	.....the latest	→ .....the previous
-31	12-hr track prediction .....	track prediction .....
34	twice (0600UTC, 1800UTC) daily	→ four times (0000UTC, 0600UTC, 1200UTC, 1800UTC) daily
41	.....time (0600UTC, 1800UTC)	→ .....time (0000UTC, 0600UTC, 1200UTC, 1800UTC)
43	78 hr	→ 84 hr



Page Line	Present Description	Proposed Amendment
3 10	C106 double ..... (~40km grid) .....	→ C179 double ..... (~24km grid) .....
11	..... on 15 p- .....	→ ..... on 25 p- .....
24	.....Initial time at T-06 hr	→ .....Initial time at T-00 hr (0000UTC, 1200UTC) at T-06 hr (0600UTC, 1800UTC)

#### Appendix 3-B

15 3	Korea Typhoon Model (KTM)	→ << to be deleted >>
-24	..... (See Appendix 3-D 1.)	<< to be replaced >>
26	..... Barotropic .....(BATS) ...70 hours	→ ..... Barotropic .....(BATS) ... 72 hours
16 6	...resolution: 21 level .....	→ ...resolution: 30 level .....
8	at wave number 106	→ at wave number 213
9	Grid distance: 160 .....and 320 .....	→ Grid distance: 320 .....and 640 .....

#### Appendix 3-D

1 2	(1) Geophysical Fluid Dynamic in KMA .....	→ << to be deleted >>
2 -3	every 6 hours ..... in advance	<< to be replaced >>
33	global objective analysis (....)	→ 3 dimension optimal interpolation (3DOI, 0.5625°)
3 5	60 hr from .....	→ 80 hr from .....
10	21 level .....	→ 30 level .....
12	spectral .....number 106	→ spectral .....number 213
13	grid: 160 Gaussian .....	→ grid: 320 Gaussian .....
19	vertical: Mellor - .....	→ vertical: Non - local PBL scheme
35	first guess .....	→ 3 dimension optimal interpolation (3DOI, 30 km)
-37	data analysis	
4 19	(NOAA weekly mean SST)	→ (GMS, KMA daily SST)

#### Appendix 4-A

1-	Examples of advisories issued from	<< to be replaced >>
2	RSMC Tokyo - Typhoon Center	→ by new Appendix 4-A, p.1 (see Attachment 6) → by new Appendix 4-A, p.2 (see Attachment 7)

#### Appendix 4-B

5	Hong Kong, China (Weather forecast area)	<< to be replaced >> → by new Appendix 4-B, p.5 (see Attachment 8)
---	--	---

#### Appendix 5-A

1 22	Hong Kong, China	<< to be added after the Fax number >>
-29	(24 hours)	→ E-mail: ccchan@hko.gov.hk
34	(Director: M. Shiraki)	<< to be replaced >>
38	E-mail: shiraki@met.kishou.go.jp	→ (Director: T. Aoki) E-mail: tksh.aoki@met.kishou.go.jp
2 5	Macau, China	<< to be replaced >>
6	Macau Meteorological and	→ Macao, China → Meteorological and
32	(Thailand)	<< to be replaced >>
33	(Director: Kriengkrai Khovadhana)	→ (Deputy Director-General: Dusadee Sarigabutr)
35	Telecommunication Division	→ Observation Division
	(Director: Chalermchai Eg-Karntrong)	→ (Director: Songkran Agsorn)

Page Line	Present Description	Proposed Amendment
-----------	---------------------	--------------------

#### Appendix 5-B

1 12	Macau, China .....	<< to be replaced >> → Macao, China .....
------	--------------------	--

#### Appendix 5-C

4 13	MC ..... - Macau	<< to be replaced >> → MC ..... - Macao
------	------------------	--

#### Appendix 5-D

1	MU Macau (Geographic designator)	<< to be replaced >> → MU Macao
	VMMC Macau (Location indicator)	→ VMMC Macao

#### Appendix 6-B

1 11	(ii) hourly ship and buoy ... (SHIP code)	<< to be replaced >> → (ii) hourly ship and buoy ... (SHIP and BUOY codes)
------	---	---

#### Appendix 7-A

1 7	..... value and five-day mean sea surface	<< to be replaced >> → ..... value and cloud .....
-9	temperature and cloud .....	
15	Imagery and tabular form data ( .....).	<< to be inserted after this line >> Imagery (for DVD-RAM data).
18	CD-ROM ( ..... 7-A, Annex, p.3)	<< to be inserted after this line >> → DVD-RAM (specification is given in Appendix 7-A, Annex, p.4)

#### Appendix 7-A, Annex

4	(Specification of GMS VISSR data on DVD-RAM)	<< to be inserted after Appendix 7-A, Annex, p.3 >> new Appendix 7-A, Annex, p.4 (see Attachment 9)
---	--	--

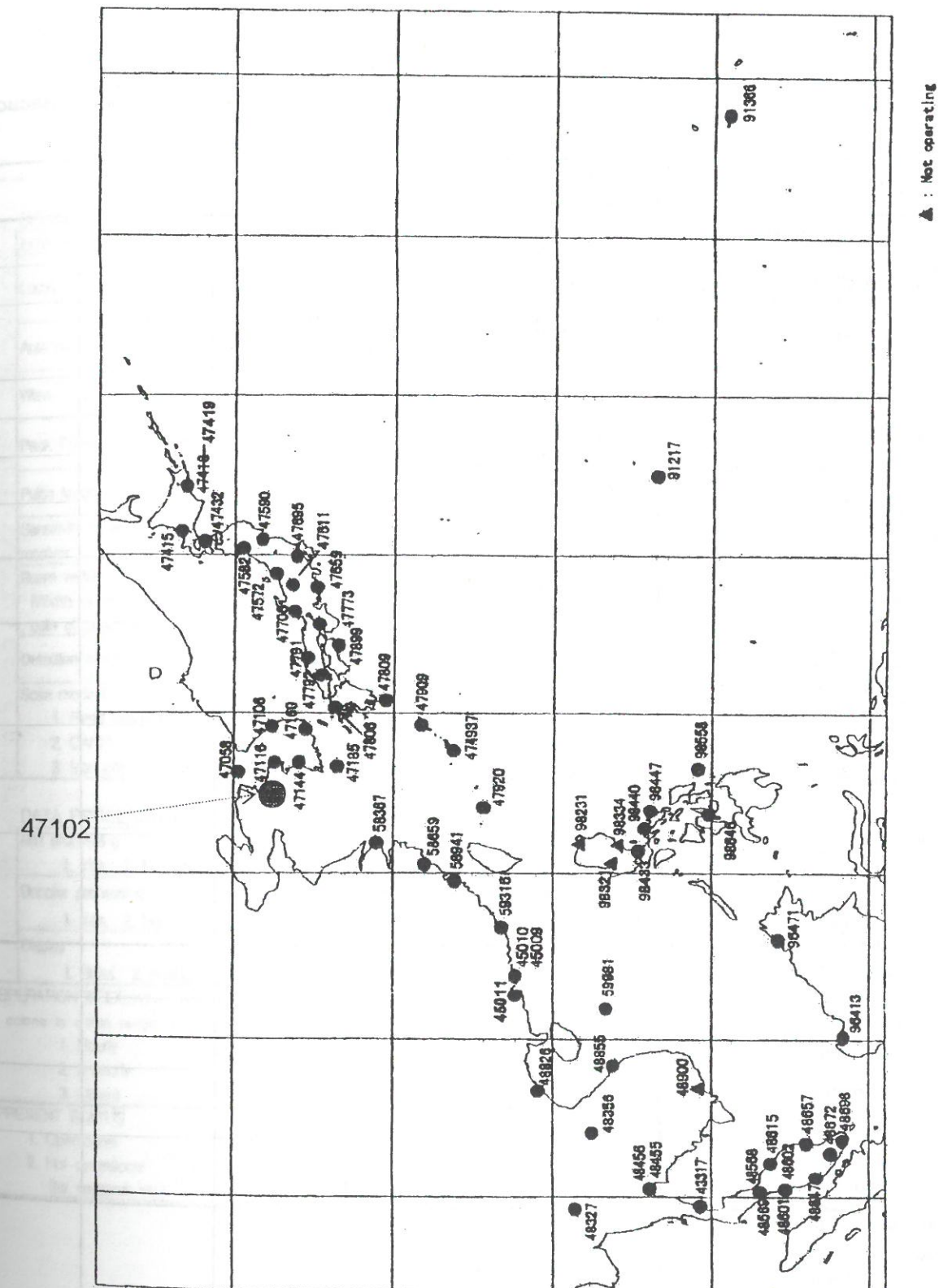


## DISTRIBUTION OF THE RADAR STATIONS OF TYPHOON COMMITTEE MEMBERS

(Attachment

## Operational Procedures for the assignment of names of tropical cyclones

- (a) RSMC Tokyo – Typhoon Center will assign a name each time a 4-digit identification number is to assigned. That is, names on the Typhoon Committee list will only be given to tropical cyclones tropical storm strength or above. Each tropical cyclone should be identified by its name followed the 4-digit number in brackets. The same names and numbers should also be used in bulletins issued by the Tokyo Tropical Cyclone Advisory Centre under the umbrella of the International Civil Aviation Organization (ICAO) as well as in bulletins for Meteorological Area (METAREA)-XI and the Global Maritime Distress and Safety System (GMDSS) issued by both China and Japan. This would contribute to the standardization of the usage of names of tropical cyclones as was desired by the Typhoon Committee.
- (b) The exchange of observational data should be promoted as much as possible in addition to what already exchanged among the warning centres and the meteorological services in the region, ensure that RSMC Tokyo – Typhoon Center would benefit from the best possible data and information needed for it to carry out its work.
- (c) On the operation of the name list, the names will be assigned following the pre-determined order. The name would remain unchanged throughout the life history of the tropical cyclone. To avoid confusion, tropical cyclones given a name before crossing the Date Line and entering the western North Pacific should be assigned a number by RSMC Tokyo – Typhoon Center but should not be assigned a new name in the Typhoon Committee list. RSMC Honolulu Hurricane Center will continue the use of the tropical cyclone names assigned by RSMC Tokyo – Typhoon Center when tropical cyclones cross the Date Line from west to east.
- (d) The names and numbers assigned by RSMC Tokyo – Typhoon Center will be used by all Typhoon Committee Members when issuing warning bulletins intended for the international community, including the press, aviation and shipping.
- (e) The Typhoon Committee, as the authority to maintain the list, shall review the list of names and operation regularly at its annual sessions as the need arises.
- (f) Members may request the retirement of a name from the list particularly in case of tropical cyclone causing extensive destruction or for other reasons. Such notification shall be made preferably within a year of the event. The decision to retire names should be made at the regular review at annual sessions of the Typhoon Committee.





(Attachment

Appendix 2-D, p.8

Name of the Member Macao, Chi

NAME OF STATION		TAIPA GRANDE				
SPECIFICATIONS	Unit					
Index number		45011				
Location of station		22.1599N 113.5634E				
Antenna elevation	m	185				
Wave length	cm	10.9				
Peak power of transmitter	kW	800				
Pulse length	μs	SP 0.83 LP 2.0				
Sensitivity minimum of receiver	dBm	-110 or -111				
Beam width (Width of over -3dB antenna gain of maximum)	deg	1.3				
Detection range	km	SP 100 LP 300(Dual PRF) LP 400				
Scan mode in observation 1. Fixed elevation 2. CAPPI 3. Manually controlled		Others				
DATA PROCESSING						
MTI processing 1. Yes, 2. No		1				
Doppler processing 1. Yes, 2. No		1				
Display 1. Digital, 2. Analog		1				
OPERATION MODE (When tropical cyclone is within range of detection) 1. Hourly 2. 3-hourly 3. Others		Every 15 minutes				
PRESENT STATUS 1. Operational 2. Not operational (for research etc.)		1				

Name of the Member Republic of Korea

NAME OF STATION		Gwanaksan	Jeju	Busan	Donghae	Gunsan	Baengnyeong do
SPECIFICATION	Unit						
Index number		47116	47185	47160	47106	47144	47102
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
Antenna elevation	m	634	81	532	53	227	185
Wave length	cm	5.6	5.6	5.6	5.6	5.6	5.3
Peak Power of transmitter	kW	250	250	250	250	250	250
Pulse length	μs	2/0.5	2/0.8	2/0.8	2/0.8	2/0.8	2-10/1.0
Sensitivity minimum of receiver	dBm	-108	-108	-108	-108	-108	-108
Beam width (Width of over-3dB antenna gain of maximum)	deg	1.2	1.2	1.2	1.2	1.2	0.95
Detection range	km	480	480	480	480	480	512
Scan mode in observation 1. Fixed elevation 2. CAPPI 3. Manually controlled		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
Doppler processing 1. Yes, 2. No		1	1	1	1	1	1
Display 1. Digital, 2. Analog		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)
PRESENT STATUS 1. Operational 2. Not operational (for research etc.)		1	1	1	1	1	1



**ISSUED FROM RSMC TOKYO – TYPHOON CENTER**

## RSMC Tropical cyclone advisory

WTPQ20 RJTD 250000  
RSMC TROPICAL CYCLONE ADVISORY  
NAME TY 0122 PODUL (0122)  
ANALYSIS  
PSTN 250000UTC 18.5N 155.1E GOOD  
MOVE WNW 09KT  
PRES 930HPA  
MXWD 095KT  
50KT 150NM  
30KT 300NM  
FORECAST  
24HF 260000UTC 21.0N 153.7E 100NM 70%  
MOVE NNW 07KT  
PRES 930HPA  
MXWD 095KT  
48HF 270000UTC 26.0N 156.5E 180NM 70%  
MOVE NNE 14KT  
PRES 935HPA  
MXWD 090KT  
72HF 280000UTC 33.0N 162.0E 250NM 70%  
MOVE NNE 20KT =

## RSMC Guidance for Forecast

FXPQ21 RJTD 250000  
RSMC GUIDANCE FOR FORECAST  
NAME T 0122 PODUL (0122)  
PSTN 250000UTC 18.5N 155.1E  
PRES 930HPA  
MXWD 95KT  
FORECAST BY TYPHOON MODEL  
TIME PSTN PRES MXWD  
(CHANGE FROM T=0)  
T=06 19.1N 154.6E +009HPA -015KT  
T=12 19.6N 154.2E +019HPA -020KT  
T=18 20.4N 154.0E +022HPA -029KT  
T=24 21.7N 154.0E +023HPA -033KT  
:  
:  
T=72 38.4N 161.5E +012HPA -028KT  
T=78 39.6N 163.1E +009HPA -020KT  
T=84 40.8N 166.0E +017HPA -028KT  
T=90 //// //// //// //// ////=

## TROPICAL CYCLONE PASSAGE REPORT FORM

TC Number (RSMC No.)

[illegible]



(Attachment 7)

Appendix 4-A,

**RSMC Prognostic Reasoning**

WTPQ31 RJTD 250000

RSMC TROPICAL CYCLONE PROGNOSTIC REASONING  
REASONING NO.11 FOR TY 0122 PODUL (0122)

## 1.GENERAL COMMENTS

REASONING OF PROGNOSIS THIS TIME IS SIMILAR TO PREVIOUS ONE.  
POSITION FORECAST IS MAINLY BASED ON NWP AND PERSISTENCY.

## 2.SYNOPTIC SITUATION

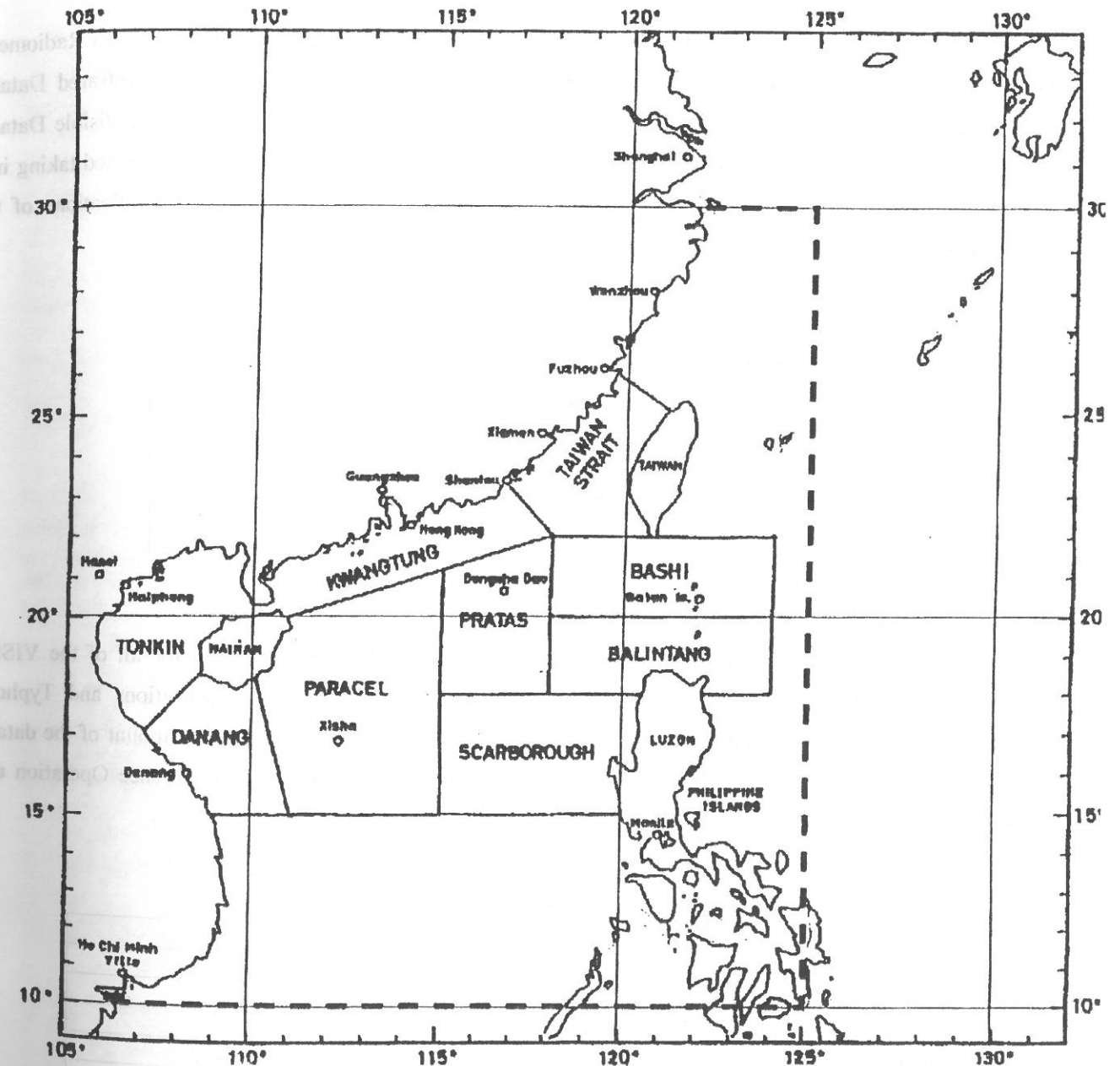
NOTHING PARTICULAR TO EXPLAIN.

## 3.MOTION FORECAST

POSITION ACCURACY AT 250000 UTC IS GOOD.  
TY WILL DECELERATE FOR THE NEXT 24 HOURS THEN ACCELERATE.  
TY WILL RECURVE WITHIN 36 HOURS FROM 250000 UTC.

## 4.INTENSITY FORECAST

TY WILL KEEP PRESENT INTENSITY FOR NEXT 24 HOURS.  
CI-NUMBER WILL BE 6.5 AFTER 24 HOURS.=

**HONG KONG, CHINA****WEATHER FORECAST AREAS**

NOTE: The pecked line encloses the area for which the Hong Kong Observatory issues warnings of tropical cyclones.



## Appendix 7-A, Annex, p.4

## SPECIFICATION OF GMS VISSR DATA ON DVD-RAM

From 1 November 2000, the original raw data of the Visible and Infrared Spin Scan Radiometer (VISSR) of the GMS satellite are archived on DVD-RAM in a digital form. VISSR Infrared Data contains the data of the infrared (IR1, IR2) and Water Vapor (WV) channels, and VISSR Visible Data 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 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) VISSR Infrared Dataset

The VISSR Infrared Dataset contains the raw data of IR1, IR2 and WV for all of the VIS observations including hourly VISSR Observations, 6-hourly VISSR Wind Observations and Typhoon Special Observations. The data are stored in three volumes in a month although the amount of the data varied due to the special operations such as Satellite Eclipse Operation, Solar-interference Operation, Typhoon Special Observation and so on.

Specifications of VISSR Infrared Dataset

Item	Specification
Channel	IR1, IR2 and WV
Resolution	original
Observations	28 or 30 (observations/day)
Image files	84 or 90 (files/day)
File size	maximum 9.2 (Mbytes/file)

## 2) VISSR Visible Dataset

The VISSR Visible Dataset contains the VIS raw data of 16 images a day for the VIS Observations in normal operation, or 18 images a day including Typhoon Special Observations. The amount is varied due to the special operations and so on. The data are stored in six volumes in a month.

Specifications of VISSR Visible Dataset

Item	Specification
Channel	VIS
Resolution	original
Observations	16 or 18 (observations/day)
Observation time	W00, V00, V01, V02, V03, V04* (V04-N, WT1, WT2), V05, W06, V06, V07, V08, V09, V16, V21, V22, V23
Image files	16 or 18 (files/day)
File size	maximum 135 (Mbytes/file)

\*: The observation V04 is replaced to the observations, V04-N, WT1 and WT2 in Typhoon Special Observations.



## APPENDIX V

### ACTIVITIES OF THE RSMC TOKYO-TYPHOON CENTER IN 2001

#### 1. Provisions of RSMC Products

The RSMC Tokyo- Typhoon Center has been providing TC Members with various kinds of products on tropical cyclones in the western North Pacific and the South China Sea via the GTS, HF broadcast, international SafetyNET service and others. Table 1 shows the total numbers of the products issued by the Center on 2001 (as of the end of October 2001).

#### 2. Track Forecast

Operational track forecasts for 22 tropical cyclones which attained TS intensity or higher in 2001 (as of 31 October 2001) were verified against best track data prepared by the Center. Figure 1 shows annual mean errors of 24-hour (from 1982), 48-hour (from 1998) and 72-hour (from 1997) forecasts of center positions. The annual mean position forecast and 405 km for 72-hour forecast. The overall performance of track forecasts in each tropical cyclone are shown in Table 2.

#### 3. Intensity Forecast

in June 2001, JMA has started 48-hour tropical cyclone intensity forecasts with the improvement of its numerical prediction models. Table 3 gives root mean square errors (RMSEs) of 24-and 48 hour intensity forecast for each tropical cyclone in 2001 (as of 31 October 2001). The annual mean RMSEs of central pressure and maximum winds for 24-hour forecasts were 10.1 hPa and 5.1 m/s respectively, while those for 48-hour forecast were 13.7 hPa and 6.3 m/s respectively. JMA plans to extend intensity forecasts up to 72 hours after it considers the performance of them in 2001.

#### 4. RSMC Data Serving System

JMA has been operating the RSMC Data Serving system that allows TC Members to retrieve NWP products such as Grid Point Values (GPVs) and observational data through the Internet and Integrated Service Digital Network (ISDN) since 1995. Eight Members are registered for access to the system. The products and data being provided through the system are listed in Table 4.

#### 5. Publication

The Center published:

- 1) "Technical Review (No4)" that contains three papers on typhoon predictions in March 2001;  
and
- 2) "Annual Report on Activities of the RSMC Tokyo-Typhoon Center in 200" in July 2001

#### 6. Training

Two forecasters from Viet Nam and Cambodia stayed at the Center from 2 to 13 July 2001 for the on-the-job training for typhoon operation. 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 tackled STS Utor (0104) and TS Trami (0105) on a real time basis in reference to the operational procedures of the Center.



## 7. Implementation Plan

Table 5 shows the Implementation Plan of the RSMC Tokyo- Typhoon Center for the period from 2001 to 2005.

Product	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
TCNA20	16	0	0	0	14	20	88	95	161	74			468
TCNA21	17	0	0	0	16	21	95	104	167	79			499
WTPQ20-25	17	0	0	0	16	22	101	112	176	83			527
WTPQ30-35	7	0	0	0	9	11	48	50	88	39			252
FXPQ20-25	16	0	0	0	24	33	140	159	246	122			740
FXPQ30-35	16	0	0	0	16	21	94	108	170	81			506
AXPQ20	7	3	0	0	0	1	1	6	4	2			24
AUXT85													
AUXT20	62	58	62	60	62	60	62	62	60	62			610
FUXT852													
FUXT854	62	58	62	60	62	60	62	62	60	62			610
FUXT202													
FUXT204	62	58	62	60	62	60	62	62	60	62			610

Table 1 Monthly and annual total numbers of products issued by the RSMC Tokyo-Typhoon Center in 2001 (as of 31 October 2001)

Notes:

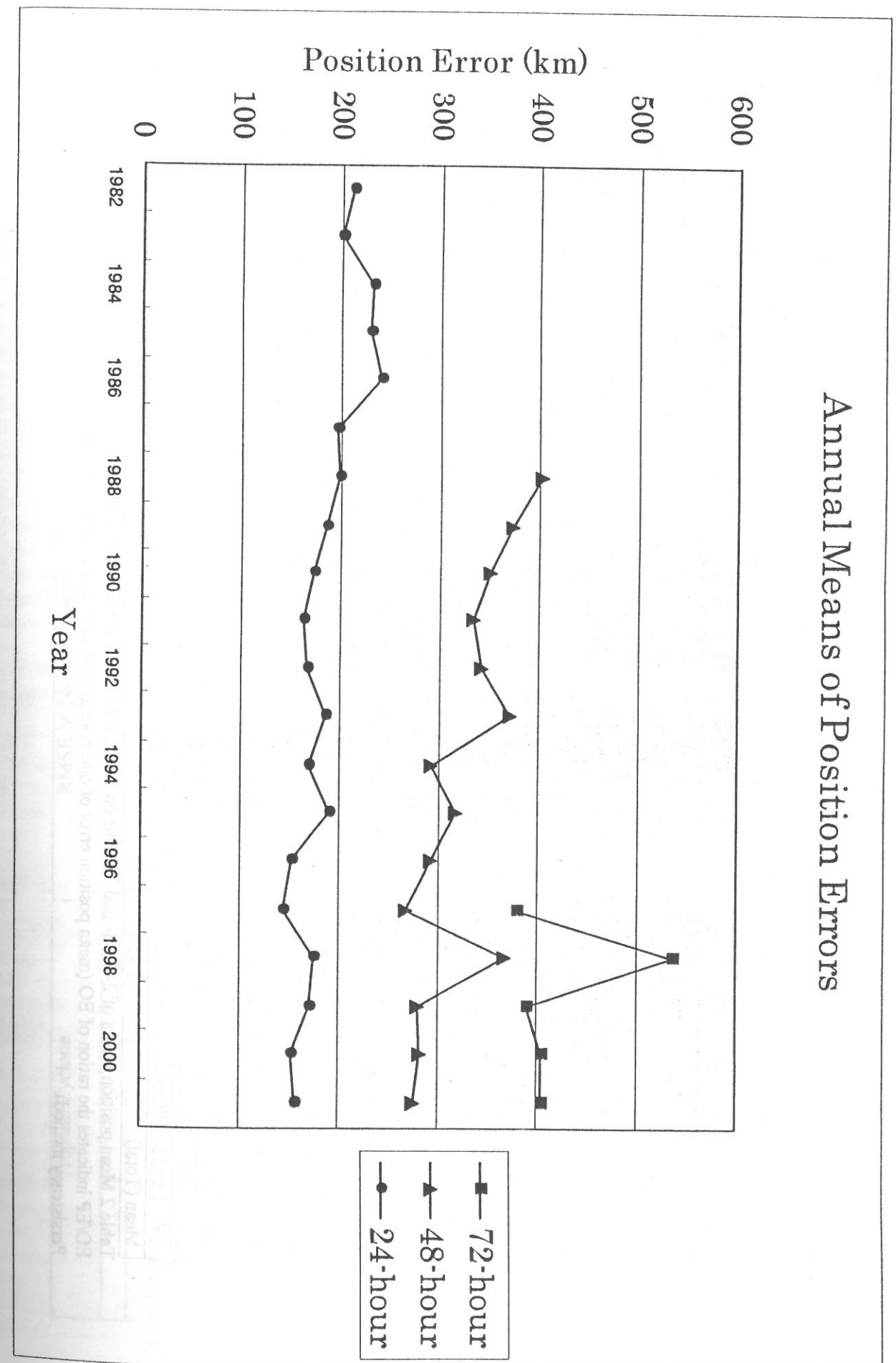
-via the GTS or the AFTN-  
SAREP  
RSMC Tropical Cyclone Advisory  
RSMC Prognostic Reasoning  
RSMC Guidance for Forecast  
Tropical Cyclone Advisory for SIGMET  
RSMC Tropical Cyclone Best Track

-via the JMH Meteorological Radio Facsimile-  
Analysis of 850 and 200 hPa Streamline  
Prognosis of 850 hPa Streamline  
Prognosis of 200 hPa Streamline

TCNA20/21 RJTD  
WTPQ20-25 RJTD  
WTPQ30-35 RJTD  
FXPW20-25 RJTD  
FKPQ30-35 RJTD  
AXPQ20 RJTD

AUXT85/AUXT20  
FUXT852/FUXT854  
FUXT202/FUXT204

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





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 (%)
STS 0101	CIMARON	142	4	10	59	161	54	6	21	245	29	2	-
TY 0102	CHEBI	207	115	11	67	449	167	7	77	591	90	3	39
STS 0103	DURIAN	211	99	6	189	306	12	2	-	-	-	-	-
STS 0104	UTOR	197	110	14	71	348	149	10	50	478	162	6	71
TS 0105	TRAMI	165	19	2	-	-	-	-	-	-	-	-	-
TY 0106	KONG-REY	191	91	24	103	382	206	20	74	584	283	16	61
STS 0107	YUTU	216	89	5	83	483	-	1	-	-	-	-	-
TY 0108	TORAJI	82	38	11	62	177	43	7	55	298	39	3	43
TY 0109	MAN-YI	156	55	25	76	235	90	21	38	279	138	17	26
TS 0110	USAGI	-	-	-	-	-	-	-	-	-	-	-	-
TY 0111	PABUK	141	132	29	65	291	273	25	56	478	462	21	55
TY 0112	WUTIP	172	114	23	132	270	134	18	83	313	99	14	79
TS 0113	SEPAT	208	54	8	74	336	135	3	30	-	-	-	-
TS 0114	FITOW	-	-	-	-	-	-	-	-	-	-	-	-
TY 0115	DANAS	173	84	29	66	276	132	25	46	407	93	21	47
TY 0116	NARI	106	68	41	61	160	86	37	39	282	126	32	45
TY 0117	WIPHA	129	51	10	41	260	80	6	28	293	128	2	-
TY 0118	FRANCISCO	202	97	19	73	361	170	15	53	467	224	11	33
TY 0119	LEKIMA	121	59	17	86	193	65	13	69	186	97	9	37
TY 0120	KROSA	212	79	16	89	377	188	12	52	888	292	8	62
TY 0121	HAIYAN	148	78	20	44	363	197	16	46	666	408	11	71
TY 0122	PODUL	117	59	28	47	217	113	24	39	276	147	20	34
Mean (Total)		156	93	348	70	274	173	268	50	405	285	196	48

Table 2 Mean position errors of 24-, 48- and 72-hour operational forecasts for each tropical cyclone in 2001 (as of 31 October 2001).  
EO/EP indicates the ratio of EO (mean position error of operational forecasts) to EP (mean position error of forecasts by the Persistency method).

Tropical Cyclone		RMSE of 24-hour Forecast				RMSE of 48-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)
STS 0101	CIMARON	10.2	6.3	10	-	-	-	-	-
TY 0102	CHEBI	6.4	2.9	11	15.3	6.1	7	15.3	6.1
STS 0103	DURIAN	11.1	4.6	6	12.1	6.6	2	12.1	6.6
STS 0104	UTOR	5.5	5.3	14	11.7	2.4	10	11.7	2.4
TS 0105	TRAMI	13.0	7.7	2	-	-	-	-	-
TY 0106	KONG-REY	9.4	3.4	24	13.6	4.3	20	13.6	4.3
STS 0107	YUTU	13.2	6.4	5	15.0	7.7	1	15.0	7.7
TY 0108	TORAJI	11.6	6.8	11	15.5	9.4	7	15.5	9.4
TY 0109	MAN-YI	6.9	3.3	25	9.7	5.9	21	9.7	5.9
TS 0110	USAGI	-	-	-	-	-	-	-	-
TY 0111	PABUK	6.3	3.6	29	8.6	4.1	25	8.6	4.1
TY 0112	WUTIP	15.2	5.8	23	21.3	7.8	18	21.3	7.8
TS 0113	SEPAT	2.8	2.2	8	2.0	2.6	3	2.0	2.6
TS 0114	FITOW	-	-	-	-	-	-	-	-
TY 0115	DANAS	9.7	4.7	29	9.4	4.6	25	9.4	4.6
TY 0116	NARI	9.9	6.4	41	9.9	6.2	37	9.9	6.2
TY 0117	WIPHA	9.9	5.3	10	8.5	5.0	6	8.5	5.0
TY 0118	FRANCISCO	12.8	6.2	19	13.2	6.1	15	13.2	6.1
TY 0119	LEKIMA	11.1	5.4	17	18.5	9.6	13	18.5	9.6
TY 0120	KROSA	9.4	4.6	16	15.3	6.2	12	15.3	6.2
TY 0121	HAIYAN	5.8	3.9	20	10.0	5.6	16	10.0	5.6
TY 0122	PODUL	13.9	5.6	28	20.9	8.7	24	20.9	8.7
Mean (Total)		10.1	5.1	348	13.7	6.3	262	13.7	6.3

Table 3 Root mean errors (RMSEs) of 24- and 48-hour intensity forecasts for each tropical cyclone in 2001 (as of 31 October 2001)



Area	20S-60N,80E-160W	20S-60N,60E-160W	Global area	
Resolution	2.5 x 2.5 deg	1.25 x 1.25 deg	2.5 x 2.5 deg	
Level	Surface (P,U,V,T,TTd,R)	Surface (P,U,V,T,TTd,R)	surface (P,U,V,TR)	Surface(P,U,V,TR)
& Elements	850hPa (Z,U,V,T,TTd,ω)	1000hPa (Z,U,V,T,TTd)	850hPa(Z,U,V,T,TTd)*	1000hPa(Z,U,V,T,TTd)
	700hPa(Z,U,V,T,TTd,ω)	925hPa(Z,U,V,T,TTd,ω)	700hPa(Z,U,V,T,TTd)*	850hPa(Z,U,V,T,TTd)
	500hPa(Z,U,V,T,TTd,ζ)	850hPa(Z**,U**,V**,T**,TTd**,ω,Ψ,X)	500hPa(Z,U,V,T)*	700 hPa(Z,U,V,T)
	300hPa(Z,U,V,T)	700hPa(Z**,U**,V**,T**,TTd**,ω)	300hPa(Z,U,V,T)	500 hPa(Z,U,V,T)
	250hPa(Z,U,V,T)	500hPa(Z**,U**,V**,T**,TTd**,ζ)	250hPa(Z,U,V,T)	400 hPa(Z,U,V,T)
	200hPa(Z,U,V,T)	400hPa (Z,U,V,T,TTd)	200hPa(Z,U,V,T)*	300 hPa(Z,U,V,T)
	150hPa(Z,U,V,T)	300hPa(Z,U,V,T,TTd)	100hPa(Z,U,V,T)	250hPa(Z,U,V,T)
	100hPa(Z,U,V,T)	250hPa(Z,U,V,T)		150 hPa(Z,U,V,T)
		200hPa(Z**,U**,V**,T**,TTd**,ω,Ψ,X)		100 hPa(Z,U,V,T)
		150hPa(Z,U,V,T)		70 hPa(Z,U,V,T)
		100hPa(Z,U,V,T)		50 hPa(Z,U,V,T)
		70hPa(Z,U,V,T)		30 hPa(Z,U,V,T)
		50hPa(Z,U,V,T)		20 hPa(Z,U,V,T)
		30hPa(Z,U,V,T)		10 hPa(Z,U,V,T)
		20hPa(Z,U,V,T)		
		10hPa(Z,U,V,T)		
FCST Hours	00,06,12,18,24,30,36,48,60,72	00,06,12,18,24,30,36,42,48,54,60,66,72 12UTC: Surface(P,U,V,T,TTd,R), from 78 to 192 hours, every 6 hours ** ; 96,120,144,168,192(12UTC only)	00UTC: 24,48,72 12UTC: 00,248,72,96,120 * ;144,168,192(12UTC only)	00UTC: 00
Time/Day	2 time (00 and 12 UTC)	2 times (00 and 12 UTC)	2 time (00 and 12 UTC)	

Note:

P: pressure reduced to MSL    Z: geopotential height    ζ: relative vorticity  
U: u-component of wind    V: v-vorticity of wind    Ψ: stream function  
R: total precipitation    T: temperature    X: velocity potential  
TTd: dew point depression    ω: vertical velocity

Products/Data	GMS Data	Typhoon Information	Global Wave Model	Observations data
Contents	(a) Digital (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.	• Wave height • Wave period • Prevailing wave direction  Forecast Times: Initial,06,12,18,24,30,36,42,48,54,60,72(00&12UTC),96,120,144,168,192(12UTC)	(a) Surface data (SYNOP)  (b)Upper air data (TEMP, Part (PILOT, Part
Frequency (Initial time(s))	(a) 4 times (00,06,12 and 18UTC) a day (b) Once (04UTC) a day	4 times (00,06,12 and 18 UTC) a day	2 times (00 and 12 UTC) a day	(a) Mainly 4 times a day (b) Mainly 2 times a day

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

PRODUCT	2001	2002	2003	2004	2005	REMARKS
Satellite Observation GMS S-VISSR MTSAT HiRID MTSAT HRIT GMS/MTSAT WEFAX						24 times/day (full-disk) All observed cloud images (full or half-disk) All observed cloud images (full or half-disk) 8 times/day (4-sector), 24 time/day (Image H), 20 time/day (image I or J)
MTSAT LRIT						24 times/day (IR full-disk) 24 times/day (VIS,IRI,IR3,IR4 East Asia 4 times/day
Cloud motion wind Analysis SAREP (for tropical cyclones) Report of typhoon analysis*						4-8 times/day Dvorak intensity (estimation included)
Sea Surface Temperature Objective analysis Pressure pattern, etc Stream lines						4 times/day 10-day mean and its anomaly
Cloud distribution Long-wave radiation Forecast RSMC Prognostic Reasoning						FAX FAX** GPV** GPV**
RSMC Guidance for Forecast NWP products pressure pattern, etc						2times/day
Stream line RSMC Tropical Cyclone Advisory*						TYM up to 84 hours 4 times/day GSM up to 90 hours 2 times/day
Others RSMC Tropical Cyclone Best Track Annual Report						FAX, GPV, (GSM)
Technical Review	-----	-----	-----	-----	-----	FAX (GSM: 00,24,48 AND 72 hrs)
SUPPORTING ACTIVITY	2001	2002	2003	2004	2005	4 times/day up to 72 hours
Data archive Monitoring of data exchange Dissemination of products						GTS
						(as necessary)
						REMARKS
						RSMC Data Serving System

\* "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.

Table 5 Implementation Plan of the RSMC Tokyo - Typhoon Center (2001 - 2005)



## APPENDIX VI

### SUMMARY OF THE WORKSHOP ON TYPHOON FORECASTING RESEARCH

The workshop on typhoon forecasting research was held in Jeju Island Republic of Korea during 25-28 September 2001, aimed at bringing into focus on the regional interest to promote research on typhoon forecasting, and at stimulating collaboration between academic circle and operational center. Typhoon Committee Members reported their status and prospects for tropical cyclone forecasting. The wide range of research activities were introduced in the workshop, including 21 presentations by experts in various fields, on typhoon forecasting research covering utilization of satellite and radar data, interpretation of both numerical and statistical model output, development of dynamical and conceptual models, and collaboration between academia and operational centers. There were two presentations by Typhoon Research Coordinating Group (TRCG) research fellows on the application of radar data for the land falling cyclone and of the radiosonde data for the typhoon track, respectively, which were encouraging to yield fruitful outcome for the region on the improvement of tropical cyclone forecasting. It was recommended to maintain an active programme of TRCG research fellowship scheme, and furthermore to consider visiting lecturer program as an extension of the TRCG fellowship scheme.

The meeting was informed of cooperative research projects involving the partnership between meteorological services and university researchers in China; Hong Kong, China; Japan and Republic of Korea. In addition, The gap between what motivates researchers and forecasters such as quantitative prediction and understanding of TC, and possible ways to link between two sides were discussed. The presentations for the research work conducted under these projects were very informative and instrumental for the understanding on the cooperative activities in the region.

It was therefore recommended that similar workshops should continue to be held in the future once in 2-3 years. It may be seen as the regional version of the well-established IWTC concept for the Typhoon Committee region.

Taking note of the presentations given at the workshop including the survey on tropical cyclone research conducted by the chairman of TRCG, the meeting assessed the situation in the Typhoon Committee region and came to the view that:

- Track forecasting: The key issues have become that of observing objective means to optimize the utilization of multiple NWP model results and the continued refinement of NWP models. Research should also be carried out to enable forecasters to intervene in cases of potentially large errors.
- Heavy rain forecasting: A concerted effort is urgently required to develop techniques to give quantitative guidance to forecasters. It is recognized that it would have to involve the concurrent use of several approaches including high-resolution mesoscale numerical models, satellite microwave data and radar data applied in a nowcasting mode.
- Local wind forecasting: It has been hampered by the lack of wind distribution information in tropical cyclones especially before they make landfall. It is recognized that the emergence of satellite microwave data as well as the innovative use of radar offer opportunities for this problem to be tackled.
- Intensity forecasting: some progress has been made in recent years through the application of operational NWP models. However, there is much room for improvement before the degree of accuracy demanded by warning operations is reached.
- Satellite microwave data: the availability of satellite microwave data in recent years has begun to benefit the tropical cyclones forecasting operation of a member of meteorological services and to develop techniques to optimize the use of such data, including the ingestion into operational NWP models.



- Internet: the wide range of real-time tropical cyclone related information available on Internet provides an unprecedented opportunity for meteorological services to develop available tropical cyclone warning services with a low cost. Steps should be taken to utilize the opportunity to enable meteorological services in developing countries to establish and strengthen their tropical cyclone warning operations.

It was recommended to bring to the attention of IWTC-V this regional view as well as the research topics including model intercomparison, cooperative development of mesoscale model demonstration of PC based interactive display system, and assimilation of radar data.

## APPENDIX VII

### RESOLUTION TOT EH ESCAP/WMO TYPHOON COMMITTEE FROM THE WORKSHOP ON THE POTENTIAL DEVELOPMENT OF A UNIFIED NORTHWESTERN PACIFIC TROPICAL CYCLONE BEST-TRACK DATA SET

(November 26-27, 2001; Honolulu, Hawaii USA)

The November 26-27, 2001 Workshop on the Potential Development of a Unified Northwestern Pacific Tropical Cyclone Best-Track Data Set.

#### *Recognizing That:*

- 1) The Northwestern Pacific experiences more than one-third of the world's tropical storms and typhoons and that the associated high winds storm surge and intense precipitation have significant consequences for the populations, infrastructure and economies of Members;
- 2) Accurate, timely and high-quality tropical cyclone forecasts and warnings and effective disaster mitigation efforts are crucial to the protection of life and property and the promotion of sustainable development in the Region;
- 3) The ESCAP/WMO Typhoon Committee envisions a Regional Cooperative Programme Implementation Plan (RCPIP) that strives to develop, improve and apply such high quality forecasts and warnings and supports cooperative disaster mitigation efforts to the benefit of individual Members and the region as a whole; and
- 4) Best-track data sets are crucial to the development and validation of tropical cyclone track and intensity forecast models.

#### *Noting That:*

- 1) The Regional Specialized Meteorological center (RSMC) Tokyo-Typhoon Center has responsibility for providing forecast guidance and advisories and maintaining best-track data sets in the Northwestern Pacific and the South China Sea, and has significant data holdings and programs underway focused on the development and issuance of improved forecasts and warnings;
- 2) The National Meteorological and Hydrological Services of Members in the region also have important tropical cyclone data sets, forecasting and warning programs and disaster mitigation activities;
- 3) A number of other research, forecasting and educational organizations within WMO Members make critical contributions to the enhancement of tropical cyclone data sets and the development of improved forecasts and warnings; and
- 4) The ESCAP/WMO Typhoon Committee's vision for the RCPIP calls on Members of the Committee, in cooperation with other Members, to drive maximum benefits to provide the high quality forecasts and warnings and effective mitigation actions through combining resources, free and open sharing of meteorological and hydrological data (according to WMO Resolution 40, Congress 12), sharing experiences in disaster prevention and preparedness and cooperative research and training.

#### *Recognizing Further That:*

- 1) Ongoing observational, research and forecasting activities identify critical gaps in our understanding and highlight opportunities to improve tropical cyclone forecasts through shared tropical cyclone data sets for the Northwestern Pacific;
- 2) Uses of a unified best-track tropical cyclone data set for the Atlantic provide examples of the value of developing high-quality, historical "best-track" information in the form of a basin-wide tropical cyclone climatology;
- 3) A unified "best-track" data set for the Northwestern Pacific that refines and extends current data sets would: enhance the initialization, evaluation and development of current forecast models for tropical cyclone track, intensity, structure, rainfall and storm surge; contribute to the development of a tropical cyclone climatology for the region that integrates observations from a number of platforms; support



decision making in areas such as disaster mitigation, planning, and economic development; provide a valuable education and training tool for use by Members and regional organizations.

*Recommends:*

The development and implementation of unified Northwestern Pacific Tropical Cyclone Best-Track Data Set; and

*Encourages:*

The ESCAP-WMO Typhoon Committee to endorse the development of a unified Northwestern Pacific Tropical Cyclone Best-Track Data Set and to form a Working Group to develop a plan on method, procedures, and resources to establish this data set (as generally outlined in the Annex) submission and consideration by the Typhoon Committee at their 35<sup>th</sup> Session.

ANNEX  
GENERAL OUTLINE OF A POTENTIAL COLLABORATIVE PROJECT TO  
SUPPORT THE DEVELOPMENT OF  
A UNIFIED NORTHWESTERN PACIFIC TROPICAL CYCLONE  
BEST-TRACK DATA SET

**Purpose**

This Annex provides a general outline of the structure of a potential unified Northwestern Pacific tropical cyclone best-track data set and a possible process for developing such a data set.

**Structure of a Unified Tropical Cyclone Best-Track Data Set**

- 1) Development of a unified Northwestern Pacific tropical cyclone best-track data set will build on the substantial data holdings and ongoing efforts of Members' National Meteorological and Hydrological Services, the Regional Specialized Meteorological Center Tokyo-Typhoon Center, and a number of other scientific organizations within WMO Members (hereinafter referred to as Participants) engaged in tropical cyclone research, forecast development, data and information management and education/training;
- 2) To ensure the development of a consistent, high-quality unified data set, Participant should reach agreement on procedures to standardize data set characteristics including: common definitions; resolution and discrepancies; the format and content of the best-track data; the approach and methodology for post-analysis data processing; and the selection and weighting of relevant observations from a variety of platforms (e.g., satellites, ground-based systems, reconnaissance aircraft); quality control, regular updates and evaluation; and the location, maintenance and accessibility of the official data set.
- 3) Based on ongoing efforts and needs in the region, it is anticipated that a unified Northwestern Pacific tropical cyclone best-track data set would reflect a two-tiered approach that encompasses the basic-track data set supplemented by additional data as recommended by the Working Group. Such a two-tiered approach would provide information on tropical cyclone characteristics including but not limited to six-hourly data over land and water for:
  - a. Name, number, date time;
  - b. Location of the storm center;
  - c. Maximum sustained surface winds;
  - d. Minimum sea level pressure;
  - e. Value and radius of the outer-most closed isobar;
  - f. Radius of maximum winds;
  - g. Radii of 34, 50 and 64 knot winds;
  - h. Speed and direction of the storm;
  - i. Rainfall accumulation at the surface;
  - j. Uncertainty indicators; and
  - k. Time at landfall (or point of nearest approach for tropical cyclones that impact land without making landfall) and storm characteristics listed above this time as well as other data (e.g., peak gusts, storm surge and estimates of damage if available).
- 4) A unified Northwestern Pacific tropical cyclone best-track data set would provide a valuable climatology to all Members and Participants to support critical activities such as: development of improved forecasts; development and validation of models and algorithms; research on current climate-related changes in tropical cyclone characteristics; disasters mitigation efforts; planning, economic development, training and education.



## Process for Development of a Unified Northwestern Pacific Tropical Cyclone Best-Track Data Set

- 1) Pursuant to endorsement of project to develop a unified Northwestern Pacific tropical cyclone best-track data set, it is recommended that the Typhoon Committee establish a Working Group to produce detailed plan that would include:
  - a. Rationale and potential benefits of the projects;
  - b. The scientific program/methodology to be employed;
  - c. Identification of the individual data sets that could contribute to a unified best-track data set;
  - d. Guidelines for the preparation and sharing of appropriate data and analytical techniques;
  - e. Plans and procedures for the data set distribution as well as continued maintenance improvement of a unified best-track data set;
  - f. Identification of participating organizations and their respective roles/responsibilities; and
  - g. An estimate of resource requirements.
- 2) The Working Group will consider the issues described above and present the completed plan to 35th Session of the Typhoon Committee for its consideration.

## APPENDIX VIII

### REPORT OF THE PRE-SESSION OF HYDROLOGISTS

Waikiki Marriott Beach Resort, Honolulu, 27 November 2001

1. The Meeting was attended by 16 participants from China; Hong Kong, China; Japan; Malaysia; Republic of Korea; Thailand, USA; ESCAP; WMO and TCS, as listed in Annex 1 and chaired by Mr Chong Sun-Fatt, Chairman of the Working Group on Hydrological Component for 2001.
2. The Meeting decided to recommend to the Typhoon Committee plenary session to re-establish the TC Working Group on Hydrology and also recommended that Mr Chong Sun-Fatt of Malaysia and Mr Ti Le-Huu of ESCAP as its Chairman and Secretary respectively. In view of the limitation of time, the Chairman suggested to following the agenda proposed by the Secretariat as indicated in the Tentative Programme which would focus on the discussion of the findings and recommendation of the Regional Survey, the Report of the Workshop on Evaluation and Improvement of Operational Flood Forecasting Models in the Typhoon Committee Area, the Report of the Expert Review Mission and follow-up action. He also suggested that national reports on hydrological activities be made at the plenary session.
3. The regional survey report submitted to the Meeting was presented by Mr Ti Le-Huu of ESCAP. The report included the analysis of 30 responses from 13 Members of the Committee, reflecting the perception that typhoons have both negative and positive impacts on water resources management. The survey revealed a wide range of technical capability among the Members as well as among related agencies within several Members. These differences were recognized as opportunities for strong cooperation. The survey also identified core and strategic elements and areas for strengthening cooperation among the Members in the hydrological and DPP components. The priority areas for follow-up action included (i) forecasting technology, (ii) public information and education, (iii) institutional development, (iv) network development, and (v) communication network.
4. The report of the "Workshop on Evaluation and Improvement of Operational Flood Forecasting Models in the Typhoon Committee Area", held at the United Nations Conference Centre, Bangkok from 21 to 24 August 2001 was presented by Mr Chong Sun-Fatt in his capacity as the Chairman of the Working Group. He highlighted the wide range of models applied among the Members, including simple and latest models. The exchange of experiences pointed out the fact that selection of models needs to take into account the needs of users, available human resources and most importantly available input data. The workshop also discussed the findings of the regional survey and recommended eleven priority projects for discussion with Members during the expert review mission and further consultation with the Members. The eleven projects are list below:

#### Three-month time frame

- (1) Assessment of national requirements and capabilities on Hydrological and Disaster Prevention and Preparedness (DPP) components
- (2) Pilot project for data sharing between TC members to enhance flood forecasting accuracy.

#### One-year time frame

- (3) Development of guidelines for the Dam Operation in relation to flood forecasting
- (4) On-The-Job Training on Flood Forecasting between TC members
- (5) Extension of flood forecasting systems to selected river basin.

#### Three-year time frame

- (6) Pilot Project on the preparation of Inundation and Water-related Hazard Maps
- (7) Project on the evaluation and improvement of operational flood forecasting system focusing on model performance
- (8) Pilot project on the establishment of a community-based flood forecasting system



#### **Five-year time frame**

- (9) Pilot project on the establishment of flash-flood warning system (including debris flow and landslide)
- (10) Improvement of hydrological products in response to user needs
- (11) Project on the evaluation and improvement of hydrological instruments and telecommunication equipment

5. The expert review mission report was presented by Mr R. Kikuchi of Japan on behalf of the mission members. He provided detailed accounts of discussions during the visits of the two missions and requested the Meeting to discuss the nine-point recommendation for follow-up actions as contained in the review mission report. The recommendations of the review mission are summarized below:

#### **a. Activities of the hydrological component**

- (1) Cooperation among the Members on hydrological reporting

Based on the strong interests in all the Members for further improvement in flood forecasting and related exchange of hydrological information related to typhoons, it was recommended that format of hydrological reporting be developed.

- (2) Cooperation in hydrological network development

Recognizing the existing wide range of hydrological network development level among Members as opportunities for cooperation and mutual assistance, it was recommended that cooperation among the Members be enhanced in hydrological network development. It was recommended cooperation with the Mekong River Commission be made on this subject.

- (3) Flood Forecasting and Warning

It was recommended specific guidelines be formulated for developing an appropriate forecasting and warning system on the basis of a clear distinction between the basic component which is common among members and the component to be addressed in a flexible way according to respective domestic conditions.

#### **b. Activities of the Disaster Prevention and Preparedness Component**

- (1) Improvement of Disaster Information Gathering System

Collection and dissemination of disaster information is recommended to foster understanding of impact of disasters among peoples, authorities and decision makers.

- (2) Development of Integrated Disaster Prevention Systems

In noting that major cities in the Typhoon Committee Area still suffer from chronic flood, the rural areas are frequently affected by landslides or debris flows, it was recommended to introduce non-structural measures, such as the creation of disaster-resistant areas including regulated land use, establishment of a speedy and safe evacuation system and etc., in addition to further pursue a set of necessary structural measures. In this connection, it was recommended the preparation of hazard maps be made to show shelter locations, evacuation routes, and means of information conveyance etc., in addition to flood/landslide risk maps.

- (3) Education and Involvement of Community and NGOs

The Review Mission urges closer cooperation between government agencies and communities through information exchange and flood control drills in addition to education through educational institutions and community activities. Furthermore, as Non-Governmental Organizations

(NGO) play important roles in disaster relief in developing countries, it was recommended to involve these organizations in rehabilitation activities.

- (4) Strengthening technical and financial support in disaster prevention

It was recommended that the Committee should try to enhance public attention to the importance of disaster prevention projects in each member country and initiate activities to encourage investments for preventing disasters.

#### **c. Other recommendations**

- (1) Enhancing visibility of the Committee

It was recommended that the Committee enhance visibility of its activities including those in the hydrological and DPP components through the development of a Typhoon Committee Web page.

- (2) Participation to the 3<sup>rd</sup> World Water Forum

The Third World Water Forum, which will be held for the first time in Asia and the Pacific, is scheduled to take place in Japan in March 2003, when all water issues including water-induced disasters will be discussed. In view of the opportunity offered by this important global forum to enhance the visibility of the Committee, it was recommended the Committee to take active part in the preparation and participation in the Third World Water Forum on water-related disaster reduction.

In this connection, the Expert Review Mission also recommended the following annual 4-day workshops for the TC Hydrologists: (1) "Integration of Risk Analysis and Management of Water-related Disasters into Development Process" in 2002, and (2) "Improvement of forecasts that meet various target groups" in 2003.

- 6. The Meeting agreed to recommend to the Typhoon Committee to entrust the Working Group on Hydrological Component to carry out the following actions:

- a) To work out detailed method and format of hydrological reporting linking to typhoons in order to enhance regional interaction for subsequent consideration by the Members; and
- b) To prepare a detailed programme of activities and projects for implementation and subsequent fund mobilization from interested Members and international organizations.

- 7. The Meeting also recommended to hold an annual workshop for TC hydrologists on "Integration of Risk Analysis and Management of Water-related Disasters into Development Process" in July 2002 in Manila. The proposal to hold this workshop had been submitted to the Committee at its 33<sup>rd</sup> session held in Macao, China. The estimated cost is about US\$18,000. Furthermore, on the basis of the regional survey and review mission, the Meeting recommended that DPP experts of TC be invited to take part in this annual workshop. The Committee may wish to consider the financial implication of the participation of DPP experts and advise for further action.

- 8. The Meeting endorsed the following two recommendations of the Review Mission and submit them to the Committee for consideration:

- a) Authorize establishment of TC Webpage to enhance its visibility on all its activities of the five components; and
- b) Authorize participation of a 4-member delegation of the Committee in the Third World Water Forum to be held in Kyoto, Japan in March 2003.



ANNEX VIII-1

LIST OF PARTICIPANTS IN THE PRE-SESSION MEETING OF 2001

CHINA	Mr. <u>Zheng Yunjie</u> Mr. <u>Yu Yong</u>
HONG KONG, CHINA	Mr. C. C. <u>Chan</u>
JAPAN	Mr. Junji <u>Miwa</u> Mr. Ryosuke <u>Kikuchi</u>
MALAYSIA	Mr. <u>Chong Sun-Fatt</u>
REPUBLIC OF KOREA	Mr. <u>Kim Dong-Kwon</u> Mr. <u>Choe Sung-Che</u> Dr. <u>Chung Se-Woong</u>
THAILAND	Ms. Jira <u>Sukklam</u>
USA	Mr. Edward <u>Young</u> Mr. Kevin R. <u>Kodama</u>
ESCAP	Mr. Ti <u>Le-Huu</u>
WMO	Mr. Katsuhiko <u>Abe</u>
TCS	Dr. Roman Lucero <u>Kintanar</u> Ms. Efigenia Cardenas- <u>Galang</u>

ANNEX VIII-2

BUDGET ESTIMATE FOR WORKSHOP IN  
"INTEGRATION OF RISK ANALYSIS AND MANAGEMENT FOR  
WATER-RELATED DISASTERS INTO DEVELOPMENT PROCESS" IN 2002

Budget estimate for a 4-day Expert Workshop for TC Hydrologists on Workshop on "Integration of Risk Analysis and Management for Water-related Disasters into Development Process" to be held in Manila, Philippines in July/August 2002.

**No of participants**

TC member	13
Expert	1
Filipino participants	20
Other	6
<b>Total</b>	<b>40</b>

**Estimated costs**

1.	Per diem for 13 TC member participants (13*US\$100*5 days)	6,500
2.	Air travel for 13 TC member participants (13*US\$500)	6,500
3.	Per diem and air travel for 2 experts	2,000
4.	Printing and local support	2,000
<b>TOTAL</b>		<b>US\$ 17,000</b>



## APPENDIX IX

### 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 2001, serious local floods occurred in the Pearl River basin in southern China and some tributaries at the downstream of the Yellow River and some medium- and small-sized rivers, while serious drought occurred to the north of the Yangtze River (some rivers became dry). The hydrology departments provided the flood control decision-making departments with timely flood information and forecasts, and issued flood warning in advance.

The Chinese Government promulgated proposals on the Enhancement of Hydrology and put forward 5-year strategic plan for the development of the hydrological information and flood forecasting system. The general objective of this long-term plan is to realize the modernization of hydrological information and flood forecasting in China by 2005. The main signs of modernization of hydrological information and forecasting were determined as automation of data collection, networking of information transmitting, standardization of data processing, scientific hydrological information analyzing, diversification of hydrological information service, standardization of hydrological information management, and knowledgeable hydrological information team.

China finished the pilot projects of establishing 20 sub-centers of hydrological information and forecasting. The sub-centers are equipped with advanced facilities such as the server, router, program-controlled switch, workstation as well as VSAT receiving and transmitting equipments. The advanced database software and hydrological information inquiry service system are also used in sub-centers. More than 100 hydrological stations in the dry western part of the country have been upgraded to national-level stations.

The telecommunications network for flood information transmission is comprised of wire telephone, super short-wave, short-wave, mobile telephone and communication satellite. There are more than 400 satellite stations in China. The construction of the country wide WAN for real-time hydrological information transmission, which covers 7 river committees, 31 provinces (municipalities and autonomous regions) and other important water related engineering departments have completed. The hydrological and meteorological data of all the great historic flood events has been edited into the database. Its operation is expected in 2002.

China completed the development of the National Flood Forecasting System in 2001, which will be in operation the coming year. This system was based on the united real time database in the environment of MapInfo, client/server and explorer/server and contains various kinds of standard forecasting models and methods. With the functions of perfect data processing, model calibration, real time forecasting and image displaying, the system can make automatic and manual forecasting. A web flood control consultation system is being developed, which is in GIS and Internet environment.

The Sharing and Exchange of hydrological data with neighboring countries has been enhanced. In the flood season this year, China has provided and exchanged hydrological data with Russia, Korea, Vietnam, India, Kazakhstan and the Mekong River Committee.

The delegate from **Hongkong, China** reported that water level stations to measure velocities, were being designed and installed by the Drainage Services Department (DSD) for completion in early 2003. The new stations would also provide long-term hydrometric data for computer modelling of the drainage system.

A comprehensive drainage programme has been underway. This programme included 13 Flooding Pumping Schemes and 47 km of river training works in the north-western part of Hong Kong. All the



Drainage Master Plan studies were completed, and the detailed design and construction phase would be shortly.

Estimation of the 4-hour Probable Maximum Precipitation (PMP) was completed by the Hong Kong Observatory to support DSD's flood risk assessment. Another study to estimate the 1-hour and 2-hour PMP was being carried out.

In Japan, the River Bureau of the Ministry of Land, Infrastructure and Transport introduced an effect as from June 1, 2001, a real-time river information service which allows the general public to obtain rainfall, river water level and other river information in real time through the Internet and cellular phones.

In July 2001, Flood Fighting Law was amended. Main points of the amendment are as follows: By the amendment, only the river under national government can be designated for implementing flood forecasting. After the amendment, designated river for flood forecasting was expanded to the river under local government. Secondly, the component local government authorities are required to designate predicted flooded areas and predicted water depth in case the rivers covered by flood forecasts overflow due to design rainfall which provides the basis for river improvement. In providing the residents with detailed information about the Local Disaster Prevention Plan for their municipalities to prepare and use what is known as a flood hazard map.

In March 2003, the Third World Water Forum will be held in Japan. It is a first worldwide forum which relates to water issues in Monsoon Asia. In the Third World Water Forum "World Water Vision" which is one of the outputs in the Second World Water Forum, will be translated into "Water Action Report". It is a good opportunity for the Typhoon Committee as an international organization to input its recommendations in the "Water Action Report".

In Macao, China three new rain gauges were installed at Ka Hó, Taipa Grande and Delegação. Now altogether 9 rain gauges around Macao, rainfall information is being collected real time and displayed on intranet both in tabulated and graphical format. Thus enhance the monitoring of heavy rain situation as well as to issue more efficiently and timely the local rainstorm warning.

In Malaysia, the Department of Irrigation and Drainage (DID) in the year 2001 has installed about 60 new telemetric stations bringing the total number to 280 in 38 river basins. Two hundred manual gauges and 560 gauges in flood-prone areas are maintained to provide additional information during the flood season. As part of the local flood warning system, about 175 automatic flood warning sirens and 60 flood warning boards are being operated.

Replacement of the telemetric system for Kinabatangan river, Pahang river, Muar river, Batu Pahat river and Johor river was completed. Eighty new telemetric stations in 7 river basins of Sarawak state were installed and being commissioned.

The website Infobanjir (<http://jpshydro.moa.my>) is being operated to display through Internet the flood data (near real-time) of 120 rainfall stations and 150 river level stations located in 38 river basins provided with forecasting tools.

An automatic alerting system for flood managers using GSM/SMS (short message system) is being tested. Whenever defined rainfall thresholds or river levels of telemetric stations are exceeded, alarm messages are sent automatically to the mobile phones.

During the year, simple forecasting tools using Stage Regression method were developed for the Perak River, Perak River, Muar River, Besut River and Golok River. River basins provided with forecasting tools.

Malaysia experienced unusually mild Northeast Monsoon from November 2000 to February 2001 with little flooding. Most river of the basins mentioned above received relatively less intense rainfall with the forecasting points with lower flood levels recorded.

However, exceptionally heavy monsoon rains were recorded in the coastal areas of Kelantan and Terengganu states on 22 to 23/11/2000. The river basins of Golok and Besut, which registered 1-day rainfall exceeding 500 mm, experienced severe flash flood which resulted in many deaths.

While monsoon flood was relatively less severe since 1993, flash floods and landslides (include Debris and Mud flow) have been increasing and causing greater damages. The Kuala Lumpur city and around was hit severely on 31/12/2000, 26/4/2001 and 29/10/2001. Rawang Town in the Selangor state also experienced severe flash flood on the 8/3/2001 with losses amounting to about 10 million US\$.

Besides providing flood forecasting and warning services, Malaysian Government also implemented other non-structural measures and structural measures to mitigate flood impacts. Sixteen river basin studies were completed with 12 on-going. 28 town drainage master plans were prepared. Currently 14 major structural flood mitigation projects are being implemented. The Manual on Urban Storm Water Management has been prepared with a view to control at source the urban runoff quantity and quality. The Manual has been mandatory for use beginning from 1 January 2001. Other flood mitigation strategies included land use planning and control, resettlement of populations in flood prone areas, school education and public awareness programmes.

The delegate from the Republic of Korea reported that the five Control Centers under Ministry of Construction and Transportation (MOCT) have held annual workshops for operators engaged in hydrologic observations. In particular, prior to the rainy season, command post exercise (CPX) was carried out.

In 2001, typhoons had little effect on the Korean Peninsula. It resulted in below average precipitation by the end of September totaling to only about 77% of the annual rainfall. By the end of September, the total runoff volume from five major river basins amounted to mere 18.8 billion cubic meters, which is only 44% of the previous year's 43.0 billion cubic meters.

Republic of Korea, however suffered severe damages from two sudden heavy rainfalls that occurred in the middle of July due to monsoon. From the midnight of 14 July to the dawn of the next day, up to 300 mm of rain poured in the Capital of Seoul City and its vicinity areas and caused losses of over 50 lives.

The Ministry of Construction and Transportation (MOCT) of Korea is planning to install flood forecasting systems at seven urban streams. Thirty five telemetry monitoring facilities including 16 of water gauges and 19 of precipitation gauges were being installed at Jungrang, Anyang, Tan and Gap Streams and will be completed by the end of this year. Additional 13 river water-level gauges and 12 precipitation gauges will be installed at remaining 3 streams, Wangsook and Jiseok streams and Geumbo River by the end of 2002. In particular, in the Imjin River Basin, where huge floods occurred in 1999, a rainfall-gauging radar system was installed in addition to the telemetry monitoring facilities in December 2000. This radar system will be under test operations until this December.

A standard flood forecasting model was developed using the Intranet on the Web User Interface (WUI) to keep the consistency of the model at 5 different flood control offices. In addition, two river monitoring cameras have been installed along the Han River in 2000 to monitor the changes of river conditions in real time.

In the Philippines, the Flood Forecasting Branch (FFB) has issued 37 river flood bulletins due to the effect of three tropical cyclones, AURING, FERIA (UTOR, 0106) and JOLINA, in the river basins of Luzon. Among the three tropical cyclones mentioned, Typhoon FERIA has the widest scope, causing widespread flooding in three of the four major river basins being monitored (Pampanga, Agno and Cagayan). In the case

of flood forecasting and warning for dam operation, two of the four major dams, Binga and Magat dams, released stored water due to the effect of two tropical cyclones ISANG and JOLINA. People living within target areas (immediately downstream) of these dams were forewarned before the opening of the gates.

In order to extend flood forecasting and warning services to areas prone to flash flooding, the BRA has embarked on the establishment of a community-based flood forecasting/warning system. Flashy all rivers of Agno river and a tributary of Bicol river, are being targeted as pilot rivers in this undertaking. The scheme is a flood disaster mitigating activity, which calls for the active participation of the locals of the area in the establishment, operation and maintenance of the local system.

As part of the joint collaboration of PAGASA with the National Power Corporation (NPC), some technical personnel were included in the technical working group that will formulate the Flood Operation Rules, Flood and Dam Discharge Warning Manuals of the recently constructed San Roque Dam. This multipurpose Dam whose operation will commence in CY 2002. The purpose of the collaboration is to achieve an efficient operation of dams.

Correlation technique is, at present, being tested in the different river basins being monitored. One of the forecasting points along the Pampanga River has shown very promising results.

Depth-Area-Duration (DAD) tables/curves for notable storms in Luzon have been established. The completion of the derivation of the Generalized PMP for four water resources regions of Luzon, on the other hand, is underway.

In **Thailand**, the flood forecasting and warning systems in the designed three basins, namely Nan, Ping and Prachin River Basin are being monitored on routine basis. DLCM, API, and MIKE 11 modeling systems have been used for flood forecasting and warning systems.

In the **United States of America**, plans for installing new real time stream and rain gages in Guam and the U.S. Geologic Service continue. The project however, has temporarily delayed the delivery of upgrader electronics that will have hourly transmission. Two sites have already been selected for the upgrade.

In **Viet Nam**, 7 new hydrological stations have been established and 6 others upgraded. 23 automatic water level and rain gauges were installed. Almost all 238 hydrological stations have been equipped with rational communication instruments (SSB radio/telephone). Some modern methods and techniques have been applied in data collection, transmission, retrieval and manipulation. GIS technology has been applied in developing software for flood forecasting in Hong, Thai Binh, Mekong rivers and rivers in Central Viet Nam. Software development applicable to LAN for hydrological data collection, processing and timely transmission of hydrological information and forecasts to end-users continued.

## ESCAP

Since the beginning of 2000, ESCAP has increased its technical support to the Typhoon Committee activities, apart from its regular activities on water resources management. The latter include the implementation of a joint FAO-ESCAP pilot project on the formulation of national water visions to action in the region. The synthesis report together with four case studies has been posted on the Web site of ESCAP and FAO. ESCAP also continued the implementation of the project on "Capacity-building in strategic planning and management of natural resources in Asia and the Pacific" which had been approved under the Development Account by the General Assembly, end 1999. Under this project, an expert group meeting was held in June 2001 to discuss regional experiences on strategic planning and management of water resources and the framework for preparation of a set of guidelines on this subject. ESCAP conducted a regional workshop on enhancement of public awareness in water conservation in 2000 and published in 2001 a set of guidelines on promoting public awareness in this area of water resources management. The above findings and publications were distributed widely to the ESCAP members.

At the request of the Typhoon Committee at its 33<sup>rd</sup> session held in Macao, China in 2000, ESCAP secretariat provided technical support to the Committee's Working Group on the comprehensive review for the hydrological component and disaster prevention and preparedness, including the conduct of a regional survey, mobilization of financial support to undertake review expert mission, and preparation of the review report. In addition, ESCAP in cooperation with Thailand and the Typhoon Committee Secretariat organized the 4-day Expert Workshop for TC Hydrologists on "Evaluation and Improvement of Operational Flood Forecasting Models in the Typhoon Committee Area" and "Review Mission Findings" in Bangkok, Thailand from 21 to 24 August 2001. In conjunction with this workshop, ESCAP in cooperation with the United Nations Department of Economic and Social Affairs (DESA), the United States National Weather Service, National Oceanic and Atmospheric Administration (NOAA), and the Secretariat for the International Strategy for Disaster Reduction (ISDR) organized an Interregional Symposium on Water-Related Disaster Reduction and Response also in Bangkok from 27 to 31 August 2001 to promote interregional cooperation and exchange of experiences.

ESCAP secretariat fielded advisory missions to several countries in the region, including Cambodia, Thailand and Viet Nam on various aspects of water resources planning and management and has continued to publish its quarterly *Water Resources Journal*.

## WMO

The Typhoon Committee at its thirty-third session held in Macao, China from 28 November to 4 December 2000, decided to undertake a comprehensive review of the hydrological component and disaster prevention and preparedness (DPP). In this connection, WMO assisted ESCAP in the formulation of a questionnaire with the aim to establish the priorities and focus of efforts to strengthen the hydrological component of the TC. Subsequently, WMO participated in a workshop organized by ESCAP on "Evaluation and Improvement of Operational Flood Forecasting Models in the Typhoon Committee Area" held in Bangkok from 21 to 24 August 2001. As a follow-up to the workshop, the Terms of Reference for two country missions were agreed upon between the hydrologists taking part in the workshop. WMO together with a senior expert provided by the Infrastructure Development Institute of Japan undertook the second of the two country missions from 6-19 October 2001 to Cambodia, Lao, Thailand and Viet Nam. The country mission was undertaken with the following two main objectives:

Strengthening cooperation in the deliberation of the Hydrological and DPP Components at the annual session.

Establishing priority activities and pilot projects for follow-up action as recommended by the Workshop.



## APPENDIX X

### 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 eleven tropical cyclones landed along the coast of China from September 2000 to September 2001, which is more than average. The total damage caused by typhoon was more than US\$ 5 billion, which was lower than normal. CMA issued warnings for all tropical cyclones. The warning lead time is between 5 to 45 hours.

In order to provide better service for disaster mitigation, the Chinese Government set up the China National Disaster Mitigation Committee in October 2000. The Committee is responsible for formulating major national wide disaster mitigation policies, coordinating related activities, promoting international exchanges and cooperation and providing guidance to the government at the local levels in disaster combat.

The delegate from **Hong Kong, China** reported that Senior Meteorologists in the Hong Kong Observatory (HKO) continued to give media briefings whenever tropical cyclone warning signals were hoisted. In particular, the media was given briefings every hour during the close approach of Utor and Yutu in July.

HKO, in cooperation with Radio Television Hong Kong, produced a 6-part TV series to promote public awareness and preparedness on severe weather and natural disasters. The first episode will be aired in mid-December 2001.

A "Server for International Exchange" was developed by HKO to facilitate sharing of information with NMHSs. It was launched in October 2001 on a trial basis. The Server initially provides products of HKO's Operational Regional Spectral Model in GRIB and graphic format and is accessible by interested Typhoon Committee members via the Internet. Other information may be added to the server in due course.

HKO hosted a website, known as Severe Weather Information Centre (SWIC), for WMO. The website collects and displays warning messages issued by RSMC Tokyo – Typhoon Centre and NMHSs for access by the public, international and regional media. The website went into operational trial on 10 September 2001 with 12 Typhoon Committee Members participating in the project. Currently, it contains warnings on tropical cyclones in the western North Pacific and South China Sea region.

On behalf of WMO, HKO took the lead to develop another website, known as World Weather Information Service (WWIS), to display climatological information and weather forecasts for the next few days supplied by participating NMHSs with a view to generating an integrated forecasting service for major cities around the world. By September 2001, the number of participating NMHSs was close to 100 and a demonstration version of the website with climatological information was available for participating NMHSs to comment upon.

The delegate from **Japan**, reported that in 2001, 3 typhoons hit Japan directly. Typhoon 001 (PABUK) was the most devastating of them, bringing heavy rainfall amounting to 1,000 mm in some locations, since this typhoon moved ver slowly. Typhoon warnings were dispatched and approximately 10,000 people were evacuated simultaneously with the advice of the local authorities. Heavy damage was reported, 41 billionUS\$ to social infrastructure, 40,000 US\$ to schools and cultural facilities, 99 million US\$ to agriculture. Transportation was disrupted and power supply was cut. Evacuation helped to minimize human losses, however it resulted in 6 deaths and 32 injured.

Intensive torrential rains and flash floods cases are on the rise in Japan. On September 6, 2001, intensive rainfall with maximum hourly precipitation of 131 mm/hr and totaling to 600 mm in one day hit southwest of Kochi Prefecture. The heavy rainfall concentrated in a very limited area of 5 km by 2 km which could be

described as "pin-point rain attack", a phenomena difficult to forecast. This led to immediate overflow of small river and consequent mud-flows. Although this "rain-attack" occurred before dawn, local response immediate and effective. Emergency headquarters were set up and defense forces were mobilize to assist local police. Although economic damage amounted to 85 million US\$, there were no human casualties. illustrates how timely evacuation and immediate action by local authorities can mitigate human loss. collaboration of NPOs to organize volunteers and cooperation to local authorities were effective.

Japan places importance on international cooperation for disaster prevention and preparedness. A Disaster Reduction Center (ADRC) was established in Kobe, Japan with membership of 23 countries in region with the aim to serve as the focal point for exchange of information for disaster reduction. ADRC provides various databases on its website for this purpose. ADRC maintains a list of contact points of disaster coordinating bodies and scientific institutions. ADRC is remodeling its website to enhance its information dissemination capacities and is ready to volunteer as the website for the distribution of list of internet web for the Typhoon Committee Member Countries to access. If the Typhoon Committee Members can provide ADRC with their list of websites specialized on disaster prevention and preparedness in their respective countries, ADRC will design a suitable website for this purpose.

The delegate from **Macao, China** reported that six tropical cyclones affected the area from September August 2000-2001 but no serious damage. The Civil Defense Prevention Center started the diffusion of disaster prevention through bilingual advertisement on TV, radio and newspaper. Advertising leaflets were sent to residential apartments with the cooperation from Macao Security Force. Schools and child-care centers are being educated with appropriate suggested evacuation guide in case of emergency.

The Typhoon Contingency Plan was updated and revised. An exercise was held in the beginning with the purpose to test and alert all involved organizations. Activities based on general revision, exercise in communication were held. Public works department also concentrates to improve the prevention of landslide. Drainage system was also improved to prevent flooding.

The delegate from **Malaysia** reported that as Malaysia is developing rapidly, there is a serious need to prepare programmes for effective disaster prevention and preparedness through coordination and cooperation approach in the building of culture of prevention, civil protection/public safety and environmental protection. As regard to the above aspect, Malaysia has taken the various measures and approaches including the following:

1. Publishing of Standard Operating Procedures (SOP) for the management of specific disasters. They are:
  - a. SOP for management of forest fires, open burning and haze.
  - b. SOP for the management of industrial disaster, and
  - c. SOP for the management of flood.
2. Exchanging of disaster management information and establishing of networking organization in disaster cooperation and assistance at bilateral, regional and international level.
3. Undertaking research into best practice in disaster management and facilitating external assistance.
4. Conducting continuous public safety training which comprises the police, fire department and other related disaster management agencies
5. Developing competence in emergency disaster management systems especially in petrochemicals, industries and electricity.
6. Conducting seminars or workshops with awareness, promotional sharing or project goals.

7. Developing scientific knowledge, skill and expertise for personnel of relevant agencies for the enhancement of disaster response and management capabilities.

In the **Philippines**, the delegate reported the following Disaster Prevention and Preparedness activities which were undertaken by the Office of Civil Defense, the Secretariat of the National Disaster Coordinating Council which consists of the following components:

- a. Building Information Management System
- b. Strengthening of Local DCCs
- c. Human Resource Development And Emergency Management Training
- d. Early Warning System
- e. Mitigation Activities
- f. Response

The preparation of contingency plans for any eventuality includes creation of crises management of response units.

In the **Republic of Korea**, the delegate reported that the first expert mission was one of the Committee's distinguished activities during 2001. Two mission experts, Mr. Chong Sun Fatt and Mr. Kikuchi Ryosuke visited the National Disaster Prevention and Countermeasures Headquarters on September 14, 2001. A serious discussion on a variety of DPP components including general situation of Korea flood forecasting and warning system, flood risk analysis, sediment disaster and damage information compilation.

One of the highlights of the meeting was to share updated emergency warning system managed by the Ministry of Government Administration and Home Affairs (MOGAHA). The warning message can be broadcast using TV, radio, cable TV and local siren. The warning system using cellular phone and normal telephone was also discussed.

Nowadays, in Korea, the flooding disaster pattern is changed from overflow flood to inland flood due to concentrated heavy rains in short time period.

On the "National Disaster Prevention Day", which is designated on May 25, several events, such as, campaign for disaster prevention, photo display of disaster stricken areas are held.

Next year, the 6<sup>th</sup> basic Disaster Prevention Plan period will start. During this period, Korean Government has its target to establish "Disaster Resistance" by the implementation of comprehensive disaster prevention and preparedness countermeasures.

In **Singapore**, the delegate reported that each year during the Northeast Monsoon, the country faces the threat of spells of prolonged widespread moderate to heavy rain. The main cause of the heavy rain has been found due to the occurrence of a strong North East monsoon surge and the passage in the proximity of Singapore of a low pressure system which develop in the boundary of the monsoon north-easterlies and Pacific easterly winds. The widespread continuous moderate to heavy rain, often accentuated by the presence of a quasi-stationary low pressure system, have resulted in flooding in some low lying parts of Singapore.

The delegate from **Thailand** reported that the Civil Defense Secretariat (CDS) is the coordinating agency for the disaster relief operation of countermeasures against disaster throughout Thailand. During 2000-20001, the CDS has carried out disaster prevention activities as follows:

1. Improved the National Defense Master Plan to clearly determine the jurisdiction and scope of responsibility of agencies concerned in each stage of disaster management.
2. Strengthened coordination and cooperation between departments and agencies involved with disaster prevention and preparedness activities.



3. Improved communication systems for early warning information dissemination and relief operations.
4. Collaborated with NGOs and the public for disaster mitigation and preparedness activities.
5. Organized seminars, meetings, workshops and training courses on disaster prevention and related subjects.

The delegate from the **United States of America** reported that a primary emphasis is working close with customers by inviting them to workshops. This include an Aviation User's Workshop, Marine Use Workshop, Typhoon Preparedness Workshop and a Micronesian Product Meeting. WFO Guam also participates in the Annual Typhoon Preparedness Exercise with government agencies. Annual Tropical Cyclone Workshops are conducted on nine Micronesian Islands providing assistance to the government weather offices and preparedness agencies.

The delegate from **Viet Nam** reported that the National Committee for IDNDR carried out a series of activities during the year which consisted of the following:

1. Strengthening the directing and commanding apparatus for flood and storm control at all levels (central, provincial, district and village)
2. Improved the quality of dike's system in the Red River Delta and in the north of Central Viet Nam along coastal line from Mong Cai to Ha Tien, the Day river diverting system, the reservoirs Hoa Binh, Thac Ba and others.
3. Strengthened flood combating force in all localities along river banks at provincial level especially at village level.
4. Stepped up public education to increase the awareness of tropical cyclone and flood. This included organizing workshops and seminars on disaster management and dissemination of information on disaster mitigation through mass media like newspapers, radio and television through the website.

For sustainable disaster forecasting systems, a national data bank has been established for processing and disseminating further data acquired by hydrometeorological network. Training for meteorologists through local and international fellowships, workshops and seminars had been undertaken.

## ESCAP

The ESCAP secretariat continued its work on disaster prevention and preparedness with emphasis on water-related disasters reduction, particularly for flood mitigation and preparedness. As part of implementation of the recommendations of the programme on "Regional Cooperation in the Twenty-first Century on Flood Control and Management in Asia and the Pacific", ESCAP has started the implementation of a project on "Strengthening Capacity in Participatory Planning and Management for Flood Mitigation and Preparedness in Large River Basins." The project consists of three components: (a) four country case studies including China and Viet Nam; (b) a regional workshop to be held in Bangkok in November 2001; and (c) preparation of a set of guidelines on this subject.

ESCAP organized a special event to commemorate the International Day for Natural Disaster Reduction on 10 October 2001 at the United Nations Conference Centre in Bangkok. The event included two main activities: (a) an exhibition of achievements and ongoing efforts of various international agencies and national agencies in the region on this subject, and (b) a panel of senior experts to discuss recent flood disasters in Thailand and future strategies to cope with new trends. The Panel consisted of the Director General of the Meteorological Department of Thailand, Director General of the Town and Country Planning Department of Thailand, Inspector General of the Ministry of Agriculture and Cooperatives of Thailand and

Programme Manager of the Asian Urban Flood Mitigation Programme of the Asian Disaster Preparedness Centre.

## UN-ISDR (International Strategy for Disaster Reduction)

The Tropical Panel and its regional Committees have an objective to reduce the loss of life and property caused by tropical cyclones to a minimum, thus helping to pave the way for sustainable development. The work of the TCP contributed considerably to the goals on the IDNDR. At a time disasters are having an increasing impact on societies world-wide, it is important that the work of the TCP continues to contribute to the goals of the successor arrangement to the IDNDR, namely the International Strategy for Disaster Reduction, ISDR.

The UN has established the ISDR as a global framework for action with a view to enabling all societies to become resilient to the effects of natural hazards and related technological and environmental disasters, in order to reduce human, economic and social losses. It involves a conceptual shift from an emphasis on disaster response to the management of risk through the integration of disaster reduction into sustainable development. The implementation of the Strategy is premised on the establishment of partnerships between governments, non-governmental organizations, UN agencies, the scientific community. The four goals of the Strategy are to increase public awareness about disaster reduction, to obtain commitment from public authorities, to stimulate inter-disciplinary and inter-sectoral partnerships, and to improve the scientific knowledge of the causes of natural disasters and the consequences of the impact of natural hazards. The UN General Assembly has mandated two additional tasks which are directly relevant to disaster reduction; the continuance of international cooperation to reduce the impacts of El Nino and La Nina and the strengthening of disaster reduction capacity through Early Warning Measures, ADRC is working closely with ISDR secretariat and is serving as a focal point in Asia.

## APPENDIX XI

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

The delegate from **China** reported that the following training events were conducted in 2001:

- a) Training Course on Agrometeorology – The training course was conducted from 2 April to 2 May 2001. There were ten trainees from overseas and seven of them came from RA-II and RA-V regions. The course covered the basic theory, the utilization and remote sensing of agroclimatic resources, crop modeling, field water cycle, new technology and recent research achievements in agricultural meteorology.
- b) WMO Training Course on the Training of Trainers - Twenty five participants from RA-II and RA-V attended the training course from May 7 to 18, 2001. In addition to the Chinese lecturers, nine experts from Japan, USA, Australia, Jordan, Russia, Hong Kong, China, Bangladesh, the Republic of Korea and WMO were invited to lecture in the course. The lectures mainly focused on techniques and trend of training in satellite meteorology, public weather service, climate change, hydrometeorology, meso-scale meteorology, NWP, data processing and tropical weather system
- c) Training Course on Satellite Meteorology – There were 27 trainees from 20 countries and regions who attended the training course from September 22 – October 22, 2001. Most of them came from RA-II and RA-V regions. The course focused on satellite systems, principles of earth-atmospheric remote sensing from satellite, data processing, image interpretation and application.
- d) Training Course on Meteorological Instrumentation – This training was conducted at the request of WMO from March 1 to May 31. Four experts from the Ethiopian National Meteorological Service attended the course. The course covered the principles, applications and maintenance of meteorological instruments.
- e) Long Term Fellowships - China continues to provide long term fellowships in the framework of the WMO Voluntary Cooperation Programme. In 2001, China provided a long- term fellowship to two experts from Viet Nam for study for doctoral degrees and and one long term fellowship for an expert from the United Emirate for the study for a Master Degree in NWP.
- f) TRCG - One expert from the Meteorological Center of the China Meteorological Administration visited the Hong Kong Observatory for a two-month research programme on typhoon forecasting from March to May. One expert from the Guangdong Provincial Meteorological Bureau is now in the Republic of Korea for a period of six months. Two experts from the DPRK visited the Shanghai Typhoon Research Institute from February 16 to April 16, 2001. The two experts cooperated with their Chinese colleagues on typhoon forecasting with NWP tools.

The delegate from **Hong Kong, China** reported that the Hong Kong Observatory (HKO) continued to organize for its staff overseas training, workshops and seminars on various fields of meteorology. One officer served as a lecturer at the "WMO Regional Training Seminar for National Instructors of RA II and RA V" at Nanjing, China in May 2001. A total of 305 meteorologists and meteorological technicians from HKO, 5 meteorological personnel from Macao, China and 4 meteorological personnel from Oman (under the context of WMO's Voluntary Cooperation Programme) participated in training activities organized by HKO. Besides conventional classroom training, the Observatory actively pursued training in the form of e-learning. One of the highlights was the development of a "Simulated Forecasting Office" to facilitate training of weather



forecasters on the use of forecasting techniques and procedures under various weather conditions in a "virtual reality" environment.

The delegate from **Japan** reported that various training courses and seminars are organized with JICA funding. Currently, there are 6 group courses held annually in the field of disaster prevention and preparedness. There are three types of group courses. Field-specific Group Training Course, Country/Region-specific Special Course and Third-country Training. Since these courses are organized on request basis from the participating countries to increase opportunities for human capacity building in disaster prevention and preparedness, Typhoon Committee Members may send requests through diplomatic missions of Japan or JICA offices.

ADRC provides a database on training courses in disaster prevention and preparedness around the world on its website. This is aimed to assist the identification of a suitable course for disaster managers and specialists in Asia to increase their capacities. ADRC would like to encourage the Typhoon Committee Member countries to access this website to obtain the latest information on training activities in their respective countries.

The "International Seminar on MTSAT/LRIT Data Utilization" was held in Tokyo for 3 days in February 2001 for the purpose of effective utilization of data from Low Rate Information Transmission (LRIT) of MTSAT. Thirteen meteorologists from 10 countries and one territory participated in the seminar. The second seminar had just opened from 27-29 November 2001 in Tokyo with the participation of 9 experts from 9 countries. In the first seminar, the LRIT system and browsing software for LRIT were outlined, while the second seminar is being focused on the application of SATAID, the computer aided learning software developed by JMA, for the utilization of LRIT data including tropical cyclone analysis.

RSMC Tokyo-Typhoon Center accepted two forecasters from Vietnam and Cambodia from 2-13 July to perform the project "Attachment of typhoon forecaster to RSMC Tokyo Typhoon Center in typhoon season". Two tropical storms welcomed them. They made analysis and forecasts for the storms using techniques and procedures of RSMC Tokyo-Typhoon Center.

The College of Land, Infrastructure and Transport provides four specialized training courses: Urban Planning Course, River Structure Design Course, River Environment Course and River Management Course.

The group training course for overseas engineers are arranged by their organization prior to implementation. The River Bureaus of the Ministry of Land, Infrastructure and Transport offers three group training courses through JICA: River and Dam Engineering Course II, Volcanology and Erosion Control Sediment Control Engineering and Risk Management Associated with Disasters to Infrastructure.

The delegate from **Macao, China** reported that the local training course on air monitoring had been organized. The course was mainly focused on the knowledge of air sampling equipments and procedures, characteristics of pollutants and calculation of the air quality index and also basic meteorology.

For overseas training activities, staff were encouraged to take every opportunity to participate in various training events that may help to upgrade and renew their knowledge and capability. Therefore, from November 2000 to September 2001, 71 staff attended 31 various training events to include conferences, workshops, technical meetings, seminars, conferences and technical visits.

The delegate from **Malaysia** reported that a total of 233 MMS staff attended the various training courses as follows:

- basic meteorological courses for new meteorological officers and assistant meteorological officers;
- basic courses on the use and maintenance of microcomputers;

- basic electronic, statistics and meteorological instrument courses for meteorological assistants.

MMS personnel also attended the following training, symposium and workshop:-

- Regional Training Seminar on the Use of Environmental Satellite Data in Meteorological Applications for RA II & RA V [4-15 December 2000, Nanjing, China]
- International Workshop on the Dynamics and Forecasting of Tropical Weather Systems [22 - 26 January 2001, Darwin, Australia]
- International Seminar on MTSAT/LRIT Data Utilization [14-16 February 2001, Tokyo, Japan]
- Training Course for Advanced Technology in Weather Forecasting for Operational Meteorology [7 - 26 May 2001, Seoul, Korea]
- Workshop on Typhoon Forecasting Research [25-28 September 2001, Soegwipo, Jeju, Korea]

The delegate from the **Philippines** reported that the Regional Meteorological Center (RMTC) is composed of two components: PAGASA component which conducts the regular Meteorologists and Meteorological Observers Training Courses and other short term specialized training course which cater to the needs of personnel at all levels of the Organization and the University of the Philippines which offers courses towards the masteral and doctoral degrees. In 2001, training courses are limited to short term courses in computer related training course and climatology. At the University, 5 staff are pursuing masteral degrees, while 2 staff towards doctoral degrees. Other staff are pursuing other courses in other universities and schools.

As of 15 October 2001, PAGASA staff have attended 15 foreign training, seminars and conferences abroad.

The delegate from the **Republic of Korea** reported that a total of 13 KMA staff members participated in study visits, seminars and workshops related to techniques for the improvement of typhoon forecasting and analysis.

At the same time, KMA also organized the 2 6-month training courses for its junior forecasters this year. A total of 31 Class I and II meteorological personnel from KMA local Weather Stations attended the courses.

Since 1998, the Republic of Korea has held yearly training courses on weather forecasting for operational meteorologists in the Asia and Pacific region in Seoul. This May, KMA conducted this training course at the KMA headquarters for 3 weeks under the sponsorship of the Korea International Cooperation Agency with 13 participants including 11 forecasters from the Typhoon Committee Members.

The Ministry of Government Administration and Home Affairs (MOGAHA) implements four types of training: disaster prevention education; emergency drill and practice; comprehensive exercise for disaster management at national level and public relations for disaster prevention.

During the year, 1,000 staff members from 248 municipalities were educated. Eight time exercises were conducted on civil defence days. Comprehensive exercise at national level was held on "Disaster Prevention Day". Three hundred persons participated for the exercise. For public awareness, 4 major TV broadcasting companies broadcasted the 40 disaster preparedness campaign more than 100 times in the summer season.

The five Flood Control Offices under MOCT have held annual workshops for operators engaged in hydrologic observations. In particular, prior to the rainy season, command post exercise (CPX) was carried out.

The delegate from **Singapore** reported that the Meteorological Service Singapore (MSS) staff have benefited greatly from their participation in the seminars organized by the ESCAP/WMO typhoon Committee in 2000 and 2001.

A workshop on Regional Climate Forecast Methodology was held in Singapore from 26 November to 2 December 2001. Co-sponsored by the ASEAN Specialized Meteorological Centre (ASMC), Singapore and International Research Institute for Climate Prediction (IRI), Columbia University, New York, USA. This is an effort to develop in the regional/national capacity in the provision of regional/national climate forecasts that are tailored to meet their user needs.

In **Thailand**, the Thailand Meteorological Department (TMD) sent its officials to participate in international training courses. Courses in disaster prevention had been conducted in conjunction with ADP with 1,500 participants to the training course.

In the **United States of America**, the delegate reported that Meteorologists-in-Charge were installed in Palau, Yap and Pohnpei. Additionally, one meteorologist intern is completing his training in Chuuk and another from the Marshall Islands is working on his degree at the University of Hawaii.

The delegate from **Viet Nam** reported that in 2001, 56 staff attended seminars and workshops, 3 staff for a post graduate study, 30 attended short term training, 35 attended conferences and 43 undertook various study tours.

## APPENDIX XII

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

The delegate from **China** reported that in 2001, research was carried out from many aspects. With the MM5 model, it is analyzed, that the impacts between typhoon and westerly trough about the rainfall occurring in front of the westerly trough and far from typhoon itself. Study shows that tropical cyclone motion is governed by quasi-geostrophic balance under adiabatic, frictionless without background field conditions. Analysis shows that it could cause the deviation of TC track that changes of TC size, the maximum velocity and its radius. It is found that the tracks of abnormal landing typhoons maybe affected by the following four conditions such as small angle between TC moving direction and the coastal line, high mountain underlying surface, weak intensity of TC and weak environmental field, especially when the four conditions appear simultaneously. On the other hand, forecasting development of TC is an important and challenging work for both researchers and operational forecasters. With the satellite cloud derived wind data, study shows that tropical cyclone is generally triggered by westerly jet on upper troposphere. With TC data in the Western Pacific during 1949-1995, the climatic features of tropical cyclone activities were also studied, climatic analysis are carried out on the formation number, landing times of tropical cyclones of different intensity and spatial distribution in South China Sea and Western Pacific.

A pilot project in cooperation with USA NWS was carried out in Huaihe River basin and Yellow River basin to study the assimilation technology of rainfall data from different sources such as satellite, radar and rain gauges. In addition, we are developing the Distributed Hydrological Model (DHM) based on Digital Elevation Model (DEM) and GIS.

The delegate from **Hong Kong, China** reported that a total of 23 research papers were completed in 2001 on various topics including tropical cyclones, rainstorms, windshear, public weather services and mesoscale modelling.

Conceptual models to aid the long-range forecasting of tropical cyclone activity over Hong Kong were being developed. Tropical cyclone research projects, in collaboration with local universities, on "Tropical Cyclone Landfall along the South China Coast" and to explore the use of GPS technology in operational forecasting and numerical modeling, was in progress.

Under the Typhoon Committee Research Fellowship Scheme, a forecaster from the National Meteorological Centre, China Meteorological Administration, undertook a two-month attachment programme at the Hong Kong Observatory. A paper entitled "Structural and Diagnostic Analyses of Landfalling Tropical Cyclones near Hong Kong in 1999 and 2000" was prepared and submitted for publication in the Typhoon Committee Annual Review.

The delegate from **Japan** reported that the Meteorological Institute (MRI) carried out a field experiment for typhoon observation called "Typhoon Hunter 2001" in July 2001 with Aerosondes, the unmanned meteorological aircraft system, in cooperation with Nagoya University and the Japan Weather Association. The field experiment was conducted to follow Typhoon Hunter 2000 of last year and was highly successful with a total flight time of Aerosonde 55 hours including 18 hours for the observation over the periphery of Typhoon Toraji (0108). The direct observation of the typhoon revealed detailed structures of wind fields across the top of the boundary layer and radial variations of static energies.

In view of frequent flood disasters in small-to medium-sized river basins, it is a matter of vital importance to know what kind of runoff model is appropriate for flood forecasting and warning in those areas. For small-to-medium sized river basins lacking water level and discharge measurement data, the Public Works



Research Institute (PWRI) has developed a composite rationalization model in meshes based on radar estimated rainfall data and GIS.

Present flood analysis model for preparing hazard map is capable of only stimulating an inundation caused by river overflow (river water). A new flood analysis model capable of simulating both inundation due to river overflow (river water) and inundation induced by insufficient drainage capacity of urban areas is in the process of development.

The delegate from **Macao, China** reported that after a long period of hardwork and cooperation between the Macao Meteorological and Geophysical Bureau and Zhongshan University and supported by Macao Foundation, the "*Climatological Atlas for Asian Summer Monsoon*" was published on May 2, 2001. The volume of the Atlas is the first comprehensive atlas for Asian summer monsoon published at home and abroad. In fact, this Atlas is not only an atlas, but also an important achievement of research on monsoon climatology. The atlas is compiled based on the National Center for Environmental Prediction and National Center for Atmospheric Research (NCEP/NCAR) 40-year (1958-1997) reanalysis data, contains various charts of meteorological elements Display in horizontal distribution and vertical cross section ranging from 20°S - 60°N, 0° - 180°E. - October). The main feature of the atlas is the climatic evolution of the onset, development and decay of Asian summer monsoon which is displayed in terms of its pentad-by-pentad evolution, thus the major parts of the atlas are pentad mean charts. The seasonal mean charts for four decades (1958-1967, 1968-1977, 1978-1987, and 1988-1997) are also included. In addition, the atlas encloses also extra four pieces of CD-ROM.

The delegate from **Malaysia** reported that with the view of improving accuracy of tropical cyclone forecasting and understanding as well as reducing its impacts, MMS has identified the following research topics:

- Effects of tropical storms/typhoons on regional weather
- Tropical storm motion and intensity modelling
- Impact of planetary scale phenomena (QBO, ENSO etc.) on the frequency and intensity of tropical storms/typhoons over Northwestern Pacific and the South China Sea
- Storm surge modelling
- Impacts of tropical storms on the monsoon activity in the Southeast Asian region, including land withdrawal dates.

The delegate from the **Philippines** reported that the baseline information for the design of an accurate and effective monitoring, prediction and response system to meteorological phenomena were generated through research and development. This covered environmental, meteorological and hydrologic research to increase the understanding of tropical cyclones and other weather systems. Research outputs also serve as inputs to development activities of various sectors, notably, agriculture and water resources and specialized applications. The following are the scientific and technical papers completed during the year:

- a. Development of a Wave Model for Selected Philippine Seas
- b. Regional Rainfall Probability Forecasting in the Philippines Quantitative Rainfall Forecasting through the use of Numerical Weather Prediction (NWP) Products
- c. Analysis of Storm Surge Potential of Various Land-falling Typhoons Originating from the Philippine Ocean

#### On-Going Researches

- Extreme Rainfall hazard Mapping in the Philippines

- Bio-climatic Mapping of the Philippines
- Flood Hazard and Vulnerability Mapping
- A Study of Tropical Cyclone Activities Over NW Pacific Before, During and After the 1997 - 1998 El Niño Episode
- Tropical Cyclone Health related Hazards in Three Major Cities of the Philippines

The delegate from the **Republic of Korea** reported that the major research conducted by KMA during the year 2001 includes the improvement of Typhoon Analysis and Prediction (TAPS) and the implementation of Korea Enhanced Observing Period (KEOP).

TAPS was developed to analyze typhoon characteristics, display typhoon tracks using typhoon data from the past 50 years and to improve the accuracy of typhoon forecasts. During the year 2001, the functions of typhoon statistics and the analogue method for typhoon track forecast was improved. In other words, we can easily search for historical typhoons having similar tracks as the current one, or according to year, month and location.

The purpose of KEOP is to improve the prediction skills for severe weather such as typhoons and heavy rains. Its efforts are primarily based on 3-dimensional atmospheric and oceanic intensive observations using advanced instruments such as aerosondes, an autosonde, a boundary layer radar and Doppler radars. KEOP was implemented this September and for years to come will link the international field experiments in cooperation with Japan.

The National Institute for Disaster Prevention under the Ministry of Government Administration and Home Affairs (MOGAHA) has conducted systematic and scientific research in the field of disaster prevention.

In this year, the National Institute for Disaster Prevention is currently involved in 19 research projects such as "Development of Disaster Impact Assessment Manual for Staffs" and "Development of Disaster Prevention Drill Program."

The research results have been adopted as national disaster prevention policies through pilot projects.

The Ministry of Construction and Transportation (MOCT) is involved in various research activities related to hydrological surveys and flood prevention. The most important projects implemented in 2001 are three.

First, the research on river information and GIS system. The purpose of the river information and GIS project is to establish a river geographic information system and to develop flood-risk map. The research will last for seven years scheduled from 1999-2005 and the major tasks implemented in 2001 are DB construction of river-related space and attribute information and development of flood-risk map prototype, etc.

The second research is "Development of Nakdong River Flood Forecasting and Warning System Applying the Neural Network Model". In this study, a neural network rain and runoff forecasting model was developed and has been incorporated with the present operational flood forecasting and warning system to improve the disaster prevention capability for the medium watersheds that show rather fast flood response time.

Thirdly, the general planning for the nationwide rain gauge radar networking and improvement of the flood forecasting and warning system was established.

The delegate from **Thailand** reported that TMD's research activities have been carried out in various fields focussing on agriculture-related activities, severe flood warning in flood prone areas, and preventing people from tropical cyclones as follows:

- Geographic study leading to May 2001 devastating flash flood in Wangchin and Thurn areas.

- Meteorological and geographical research for implementing flood warning system in flood prone areas.
- Typhoon Research Center Project (being suspended due to budget limit)
- This task focused on investigating tropical cyclone behavior physically and dynamically, particularly for tropical storms in the South China Sea and the Gulf of Thailand.

The following case studies related to various fields of meteorology were published:

1. Numerical Ocean Wave Modeling
2. Techniques for forecasting wind waves and swell
3. The Meteorological Analysis and Study of Weather
4. Tropical Cyclone intensity analyses using Meteorological Satellite Imagery
5. Numerical Ocean Wave Modeling
6. Tropical storm track forecast in the South China Sea and the Gulf of Thailand using Barotropic Model
7. The variations of rainfall and temperature over Thailand
8. Scenarios for disaster management
9. Influence of Sub-tropical highs events on rain patterns over Thailand on drought period
10. Synoptic Meteorology
11. Flash Floods in 2000

The delegate from the **United States of America** reported several studies are underway at the Guam office by duty forecasters; Thunderstorm Development in the Deep Tropics and another on Typhoon movement. The Weather Forecast Office Guam issues a monthly update to the Quarterly ENSO Updated publication at the University of Hawaii, which provides the Micronesian countries up to date status.

The delegate from **Viet Nam** reported that the following research activities were undertaken:

- Primary study on the detection of heavy rainfall in tropical storms by using GMS data.
- Study of ENSO effect on tropical cyclone's activity in the South China Sea.
- Nested shallow water barotropic model with vortex initialization.
- Flood flow investigation and warning for water related disaster prevention in the provinces.
- Develop real-time flood flow forecasting technology using TANK model in Hoang Long and Rom rivers.
- Some studies have treated the prediction of flood discharge and the real-time reservoir operation in Hoa Binh, Thac Ba, Tri An, Dau Tieng Hydropower Plants and for management of water resource structures. However, it is necessary to carry out further studies to achieve accurate prediction and control techniques by using recently improved observation technology.
- Some hydrological models were developed for the flood forecasting in Mekong River Delta in some principal river delta in Viet Nam.

## **APPENDIX XIII**

### **SUMMARY OF MAJOR ACTIVITIES OF COMMISSION OF ATMOSPHERIC SCIENCE (CAS)**

The Working Group on Tropical Meteorology Research (WGTMR) met during June 2001 to plan its activities during the next four years. Items of interest to the Typhoon Committee members are abstracted from that meeting report.

#### **Project TC1 – Tropical cyclone formation, motion and intensity.**

Given the progress in optimum use of dynamical model guidance for tropical cyclone track prediction, the WGTMR encourages all major modeling service to distribute this information. The Tropical Cyclone Programme is requested to endorse and work with the WGTMR to accomplish this distribution of forecast tracks and fields.

An international collaboration among researches and forecasters should be organized to advance understanding and prediction of tropical cyclone formation based on global model forecasts of favorable environmental conditions and advanced mesoscale numerical model prediction capabilities.

The WGTMR recommended that an intercomparison and skill study be done on the various seasonal tropical cyclone forecasts issued during the past few years.

The increased impact of cyclones on vulnerable communities requires urgent attention to the compilation and provision of impact data bases for use in assessing forecast and warning strategies.

#### **Project TC2 – Scientific assessment of climate change effects on tropical cyclones**

The WGTMR recommended Project TC2 should continue with an update of the most recent statement (1997) in conjunction with IWTC-V.

#### **Landfalling Tropical Cyclones**

The World Weather Research Program Tropical Cyclone Landfalling component is planning a five-year program with three-four years of research and at least two Forecast Demonstration Projects in Years 4 and 5. These FDPs are designed to develop forecast techniques and a realistic observing system for landfalling tropical cyclones in countries without access to very advanced technology. In addition, techniques for assessing and helping to reduce the impacts of cyclones are to be developed.

The U.S. Weather Research Program Hurricane Landfall program has carried out a successful field experiment (HL 2001). These data sets will be made available to international researches in early 2002. Another field experiment is scheduled for 2004 with a focus on boundary layer fluxes in the high wind regions, and international participation in the planning and execution of HL 2004 is encouraged.

#### **International Workshop on Tropical Cyclone (IWTC-V)**

The IWTC-V will be held in Cairns, Australia during 3-12 December 2002. This workshop is jointly sponsored by the WMO TMRP and TCP to bring together researchers and forecasters each four years to assess progress and plan for the future. An International Committee under the leadership of Professor Russ Elsberry has been established to plan IWTC-V. The keynote session will be on the use of future satellite data sets for forecasters and researchers. Topics for the sessions include: Structure and intensity change; Precipitation estimation and prediction; Motion; Formation; and Impacts. Both forecasters and researchers are to be recruited to serve as rapporteurs for preparing pre-workshop reports (recommendations of



forecasters who could serve as rapporteurs are requested). Special focus sessions on hot topics are being organized.

#### Other TMRP items of possible interest

The TMRP has projects dedicated to the East Asian Monsoon, Long-term Asian/African Monsoon Studies, and American Monsoon Studies. One activity is the organization of International Workshops on Monsoon that are similar to the IWTC series that bring forecasters and researchers together.

Other projects of interest are "Interaction between Tropical and Mid-latitude Weather Systems" and "Application of Limited Area Modeling to Tropical Countries." The first of these projects has sponsored a workshop on extratropical transition of tropical cyclones, and a report will soon be published.

#### APPENDIX XIV

#### REVIEW OF TROPICAL CYCLONES IN 2001 AFFECTING TYPHOON COMMITTEE MEMBERS

TC NAME	RSMC NO.	MONTH	MEMBERS AFFECTED
CIMARON	0001	MAY	PHIL.
CHEBI	0002	JUNE	PHIL, US, CHINA
DURIAN	0003	JUNE	PHIL, JAPAN, VIET NAM, CHINA
UTOR	0004	JULY	MACAO, PHIL, US, CHINA
TRAMI	0005	JULY	PHIL, CHINA
KONG-REY	0005	JULY	JAPAN
YUTU	0007	JULY	PHIL, MACAO, CHINA
TORAJI	0008	JULY	PHIL, CHINA
MANJI	0009	AUG	US
USAGI	0010	AUG	THAILAND, LAO PDR, VIET NAM
PABUK	0011	AUG	US, JAPAN
WUTIP	0012	AUG	US, JAPAN
SEPAT	0013	AUG	JAPAN
FITOW	0014	AUG	MACAO, CHINA
DANAS	0015	SEPT	US
NARI	0016	SEPT	JAPAN, HONG KONG, CHINA
WIPHA	0017	SEPT	JAPAN
FRANCISCO	0018	SEPT	JAPAN
TY LEKIMA	0019	SEPT	PHIL, JAPAN, CHINA
TY KROSA	0020	OCT	JAPAN
TY HAIYAN	0021	OCT	PHIL, JAPAN
TY PODUL	0022	OCT	US, JAPAN

## APPENDIX XV

### SUMMARY OF THE 2001 TYPHOON SEASON

In 2001 (as of 31 October), 22 tropical cyclones of tropical storm (TS) intensity or higher were tracked in the western North Pacific and the South China Sea. The total number is nearly normal compared to an average frequency of 23 by the end of October. Fourteen cyclones out of them (64% of the total) reached typhoon (TY) intensity. Four out of the remainder attained severe tropical storm (STS) intensity and the others remained at TS intensity.

The tropical cyclones season of this year began in the middle of May about one month and a half later than normal with the development of STS Cimaron (0101). Since then tropical cyclone activity in the basin had been suppressed and no tropical cyclone of TS intensity or higher was generated for more than one month.

In late June, cyclogenesis became active and seven tropical cyclones were generated in total by the end of July. As the extension of sub-tropical high was stronger than normal to the west and to the north through this period, six cyclones except TY Kong-rey (0106) took northwestward tracks without recurving and made landfall on the Asian continent or Taiwan. In particular TY Chebi (0102), TS Trami (0105) and TY Toraji (0108) which hit or passed near Taiwan caused serious damage to the region.

Tropical cyclone formation was normal from August to September; six and five cyclones were formed in August and September respectively. After the middle of August the sub-tropical high went back to the east, and many cyclones moved northward east of Japan along the western periphery of the high. Among them TY Pabuk (0111) and TY Danas (0115) hit Japan and brought heavy damage to the country. Meanwhile, two typhoons, Nari (0116) and Lekima (0119) hit Taiwan in September and affected the region again.

The formation in October was slightly below normal. Two typhoons tracked south of Japan and another typhoon developed east of the Mariana Islands.

Other features of tropical cyclone activity in 2001 so far were as follows:

- Tropical cyclones in 2001 tended to track in higher latitudes. The mean existing position of 22 tropical cyclones of 24.3°N was rather high compared to an average position of 20.5°N;
- Mean genesis point of 18.1°N was a little bit higher than an average of 16.2°N; and
- Statistics on their duration of TS intensity or higher, minimum central pressure and maximum sustained winds were all about normal.



**STS Cimaron (0101)**

A tropical depression formed between Mindoro Island and Palawan Island, the Philippines at 1200 UTC 09 May 2001. Moving northward, the depression developed into a tropical storm west of Luzon at 0000 UTC 11 May and was named Cimaron. It turned to the northeast and further intensified into a severe tropical storm south of Taiwan at 0000 UTC 13 May. Slightly weakening to TS intensity, Cimaron kept its northeastward track south of Japan until 0900 UTC 14 May. It then moved eastward and was transformed into an extratropical cyclone near northeast of Okinawa shortly.

**TY Chebi (0102)**

After more than one month rest of tropical cyclone activity from the middle of May, a tropical depression formed northwest of Yap Island at 1800 UTC 19 June. Moving west northwestward, it became a tropical storm at 0600 UTC 20 June. Chebi turned to the northwest east of the Philippines at 0000 UTC 21 June and then attained STS intensity. It further intensified into a typhoon south of Taiwan at 1800 UTC 22 June and moved northward passing through the Taiwan Channel. After Chebi landed on the southeast of China, Chebi rapidly weakened into a tropical storm at 1800 UTC 23 June and into a tropical depression soon. The depression moved northeastward and transformed into an extratropical cyclone over the East China Sea at 1200 UTC on that day.

**STS Durian (0103)**

Durian formed as a tropical depression west of Luzon at 0600 UTC 29 June. It moved northward and became a tropical storm at 0600 UTC 30 June. Slightly turning to the west-northwest, the storm further developed into a severe tropical storm at 1800 UTC 30 June. Durian then made landfall on the Leizhou Peninsula, China on the early morning of 02 July. After the landfall, it weakened to a tropical storm at 0600 UTC 02 July and to a tropical depression around Nanjing, China and Viet Nam on 03 July.

**STS Utor (0104)**

A tropical depression, which formed east of the Palau Islands at 0600 UTC 01 July, moved northward and developed into a tropical storm northwest of Yap Island at 0000 UTC 02 July. Turning to the northwest, the storm gradually intensified and became a severe tropical storm far east of Luzon at 0600 UTC 03 July. The storm kept STS intensity in the South China Sea until it approached the southern coasts of mainland China on 04 July. Utor then made landfall near east of Hong Kong around 2200 UTC on that day and was downgraded to TS intensity afterwards. Moving to the west, it further weakened to a tropical depression over the South China Sea at 1200 UTC 06 July and dissipated on the next day.

**TS Trami (0105)**

Trami was a short-lived storm, which formed as a tropical depression east of Samar Island, Philippines at 0000 UTC 08 July, took almost northwestward track throughout its whole life. On its northwestward track, it developed into a tropical storm northeast of Luzon at 0000 UTC 10 July. It continued to move northwestward and made landfall on southern Taiwan at 0600 UTC 11 July. Soon after landfall it was downgraded to a tropical depression over land and dissipated near the western coast of Taiwan on that day.

**TY Kong-rey (0106)**

Kong-rey was the first typhoon of this season which developed over the waters east of Japan. It formed as a tropical depression, which formed west of Marcus Island at 0600 UTC 21 July, attained TS intensity on its westward track at 0000 UTC 22 July. It developed gradually and was upgraded to a severe tropical storm

of Iwo-jima at 1800 UTC 23 July. Turning to the north-northeast, it further developed into a typhoon northwest of Chichi-jima at 1800 UTC 25 July and reached its peak of maximum sustained winds of 70 knots north of the Island at 0600 UTC the following day. On the east-northeastward track Kong-rey started weakening and was downgraded to STS intensity east of Japan at 0600 UTC 28 July. Accelerating to the northeast, the storm became an extratropical cyclone far east of Japan at 0000 UTC 29 July.

**STS Yutu (0107)**

A tropical depression formed northeast of Luzon at 1800 UTC 22 July. Moving west northwestward, it developed into a tropical storm at 1800 UTC 23 July and into a severe tropical storm southeast of Hong Kong at 0600 UTC 24 July. After reaching peak intensity south off Hong Kong at 0000 UTC 25 July, Yutu weakened into a tropical storm southwest of Hong Kong at 1800 UTC 25 July and made landfall on the coast of southern China around this time. Moving westward, it was downgraded to a tropical depression in southern China at 0000 UTC 26 July and dissipated on that day.

**TY Toraji (0108)**

Toraji formed as a tropical depression far east of the Philippines at 0600 UTC 25 July. Moving northwestward and then west northwestward, it attained TS intensity east of Luzon at 0000 UTC 27 July and STS intensity at 1200 UTC on that day. It became a typhoon and made a slight turn to the northwest at 1800 UTC 27 July and then reached peak intensity of maximum sustained winds of 75 knots northeast of Luzon at 0600 UTC 28 July. On the northwestward track Toraji started weakening just prior to the landfall on Taiwan around 1600 UTC 29 July. It then entered the Taiwan Straits and was downgraded to a tropical depression close to the coast of southeastern China at 1800 UTC 30 July. The depression moved northward and became an extratropical cyclone over land east of Beijing at 0600 UTC 01 August.

**TY Man-yi (0109)**

A tropical depression, which formed north of the Truk Islands at 1800 UTC 01 August, developed into a tropical storm on a northwestward track at 0600 UTC 02 August and into a severe tropical storm east of the Mariana Islands at 0600 UTC on the following day. Slightly turning to the north northwest, it further intensified into a typhoon north of the Mariana Islands at 0600 UTC 04 August and reached its peak of a maximum sustained winds of 80 knots west of Iwo-jima on 1800 UTC 04 August. Man-yi then decelerated and began to change its track to the northeast on 05 August. On the northeastward track it was downgraded to a severe tropical storm east of Japan at 0000 UTC 08 August. Accelerating to the north, it further weakened to a tropical storm at 0000 UTC 09 August and became an extratropical cyclone at 1800 UTC on that day.

**TS Usagi (0110)**

Usagi was a very short lived cyclone of which duration of TS intensity or higher was less than one day. The storm formed as a tropical depression over the South China Sea at 1200 UTC 08 August and moved west northwestward throughout its whole life. It became a tropical storm southwest of Hainan Island at 0600 UTC 10 August and then made landfall on the north of Viet Nam on the early morning of 11 August. Shortly after the landfall, it weakened to a tropical depression around the border between Lao P.D.R. and Viet Nam at 0000 UTC 11 August and dissipated on that day.

**TY Pabuk (0111)**

Pabuk formed as a tropical depression east of the Mariana Islands at 1200 UTC 13 August. Moving northward, it developed into a tropical storm over the northern part of the Islands at 1200 UTC, 14 August. Turning to the west northwest, the storm further intensified into a severe tropical storm south of Iwo-jima at 0600 UTC 15 August and became a typhoon at 1800 UTC on the following day. After reaching its peak at 0000 UTC 17 August, it moved northwestward south of Japan from 18 to 19 August keeping TY intensity. Pabuk then changed its direction to the north northeast on 20 August and made landfall on the Pacific coast of Japan around 1000 UTC 21 August. After the landfall the typhoon passed along the Pacific coast of Japan with

gradual weakening from the evening of 21 to the early morning of 23 August. It was downgraded to tropical depression just east of northern Japan at 03UTC 23 August and dissipated shortly.

#### ***TY Wutip (0112)***

Wutip, which formed as a tropical depression west of the Mariana Islands at 06UTC 26 August, followed an almost northeastward track throughout its whole life of about one week. It developed rapidly to attain TS intensity at 06UTC 27 August, STS intensity at 00UTC 28 August and became a typhoon southeast of Iwo-jima at 12UTC 28 August. After reaching peak intensity of maximum sustained winds of 90 knots east of Iwo-jima at 12UTC 30 August, Wutip slightly turned to the north with weakening east of Chichi-jima at 12UTC 30 August. It returned to northeastward track on the next day. It was downgraded to STS intensity east of Japan at 00UTC 31 August and to TS intensity far east of Japan at 06UTC 02 September. Accelerating to the northeast, the storm transformed into an extratropical cyclone at 00UTC on the following day.

#### ***TS Sepat (0113)***

Soon after the generation of Wutip, Sepat formed as a tropical depression northwest of Wake Island at 18UTC 26 August. It moved north northwestward and became a tropical storm east of Marcus Island at 18UTC 27 August. Accelerating to the north over the waters far east of Japan, it kept the TS intensity for a few days. The turning to the northeast, the storm transformed into an extratropical cyclone at 18UTC 28 August and dissipated on the next day.

#### ***TS Fitow (0114)***

Fitow was a very short lived cyclone with only a half day duration of TS intensity or higher. It formed as a tropical depression over the South China Sea at 00UTC 28 August. The depression moved westward for two days and turned to the northwest passing Hainan Island at 00UTC 30 August. Changing its direction to the northwest, it reached TS intensity over the Gulf of Tongking at 18UTC 30 August and made landfall on the coast around the border between Viet Nam and China on the afternoon of 31 August. After the landfall, it quickly weakened to a tropical depression and dissipated on the following day.

#### ***TY Danas (0115)***

A tropical depression, which formed south of Marcus Island at 00UTC 03 September, moved westward and attained TS intensity at 00UTC 04 September. Turning to the north-northwest, it intensified into a severe tropical storm at 12UTC 04 September and into a typhoon at 00UTC 05 September. It then took northwestward track and reached its peak of maximum sustained winds of 85 knots east of Chichi-jima at 06UTC 08 September. The typhoon migrated to the waters south of Japan with weakening on 10 September, where it made a change of direction to the northeast and hit the coast near Tokyo around 00UTC 11 September. After passing over Tokyo, Danas blew out into the sea on the afternoon of that day and weakened to a tropical storm. It accelerated to the northeast and transformed into an extratropical cyclone at 06UTC 12 September.

#### ***TY Nari (0116)***

Nari was a long-lived tropical cyclone which drifted over waters between Taiwan and Japan for more than ten days. It formed as a tropical depression east of Taiwan at 00UTC 05 September, became a tropical storm at 00UTC 06 September and a severe tropical storm at 21UTC 06 September. After passing Okinawa Island on the morning of 07 September, Nari began to turn northeastward. It then made about one full circle over the waters west of Okinawa from 7 to 14 September. During this period, it developed into a typhoon at 00UTC 11 September, weakened to a severe tropical storm at 00UTC 12 September and passed Kume-jima (Island west of Okinawa) on the early morning of 13 September. On the turn it took southwestward track and hit Taiwan around the midnight of 17 September. It was downgraded to a tropical depression at 06UTC 17 September. Migrating to the west over the

Channel, the depression reached TS intensity again at 18UTC 19 September and made landfall near east of Hong Kong around the noon of 20 September. It quickly weakened to a tropical depression at 06UTC on that day and dissipated over land north of Hong Kong.

#### ***TY Wipha (0117)***

While Nari was tracking over Taiwan, a tropical depression formed southwest of Iwo-jima at 00UTC 17 September. Moving north northwestward, it developed into a tropical storm west of the Island at 18UTC 18 September and into a severe tropical storm west of Chichi-jima at 12UTC on that day. The storm then changed its direction to the northeast south of Japan around 12UTC 19 September. Accelerating to the northeast, Wipha attained TY intensity east of Japan at 18UTC 20 September. After weakening to a severe tropical storm at 00UTC 21 September, it transformed into an extratropical cyclone far east of Japan soon.

#### ***TY Francisco (0118)***

One day after the generation of Wipha, Francisco formed as a tropical depression south of Wake Island at 00UTC 18 September. It moved westward, then northwestward and attained TS intensity southwest of the Island at 00UTC 20 September. Turning to the north northwest, the storm began to develop and became a severe tropical storm at 00UTC 22 September and a typhoon soon at 06UTC 22 September. Francisco took northward track east of Chichi-jima and reached peak intensity of maximum sustained winds of 85 knots east of Chichi-jima at 18UTC 23 September. Accelerating to the north with gradual weakening, it was downgraded to a severe tropical storm east of Japan at 00UTC 25 September and became an extratropical cyclone on that day.

#### ***TY Lekima (0119)***

Lekima, which formed as a tropical depression east of Luzon at 00UTC 22 September, moved westward and reached TS intensity at 12UTC on that day. Turning to the north, it rapidly developed into a severe tropical storm at 18UTC 23 September and into a typhoon north of Luzon at 06UTC 24 September. Lekima continued to move northward as it weakened to STS intensity and made landfall on Taiwan around 12UTC 26 September. Soon after the landfall, it was downgraded to a tropical storm over the land and to a tropical depression at 18UTC 27 September. The depression entered the Taiwan Channel on 29 September and dissipated over the waters west of Okinawa on the next day.

#### ***TY Krosa (0120)***

A tropical depression formed east of the Mariana Islands at 12UTC 03 October. Moving northwestward, it steadily developed to attain TS intensity west of the Islands at 06UTC 04 October, STS intensity at 18UTC on that day and TY intensity of 06UTC 05 October. Krosa recurved west of Iwo-jima on 06 October, where it reached peak intensity with maximum sustained winds of 80 knots. It then accelerated to the northeast and gradually weakened to a severe tropical storm east of Japan at 18UTC 08 October. The storm became an extratropical cyclone over the same waters at 06UTC 09 October.

#### ***TY Haiyan (0121)***

Haiyan formed as a tropical depression east of Luzon at 18UTC 11 October. It reached TS intensity at 12UTC 12 October and then became stationary over the same waters from 00UTC 13 until 18UTC 13 October, when it attained STS intensity and started moving northward. Haiyan turned to the northwest at 12UTC 14 October and developed gradually to attain TY intensity at 15UTC 15 October. It then began to recurve east of Taiwan around 00UTC 16 October. Moving east northeastward, the typhoon gradually weakened to a severe tropical storm north of Okinawa at 00UTC 17 October and to a tropical storm south of Japan at 00UTC on the following day. The storm became an extratropical cyclone east of Japan shortly.



## **TY Podul (0122)**

Podul was the most intense tropical cyclone of this season so far. A tropical depression formed southwest of Pohnpei Island at 00UTC 18 October, it became a tropical storm at 00UTC 20 October. Moving northward, the storm attained STS intensity at 00UTC 21 October and TY intensity at 18UTC that day. It turned to northeastward at 12UTC 22 October and then to northwestward at 06UTC 23 October. On the northwestward track Podul reached its peak of maximum sustained winds of 100 knots south of Marcus Island at 12UTC 25 October and then began to recurve. It accelerated to the north northeast past east of the Island on the evening of 26 October and was downgraded to a severe tropical storm far east of Japan at 18UTC on the next day. The storm became an extratropical cyclone soon.

## **APPENDIX XVI**

### **REGIONAL COOPERATION PROGRAMME IMPLEMENTATION PLAN (RCPIP) 2002-2006**

#### **1. BACKGROUND and INTRODUCTION**

**1.1 Background.** Approximately one-third of the world's tropical storms and typhoons/hurricanes form in the western north Pacific. This is an average (1971-2000) of about 27 tropical storms and typhoons per year, about half of which affect the Members of the Typhoon Committee. Typhoons with their triple threat of high winds, storm surge, and heavy rains can bring devastation to Members. Even relatively weak tropical depressions can produce very heavy rains and widespread flooding.

In the 5 year period from 1995 to 1999, a yearly average of approximately 1145 people died or were missing, nearly 700,000 houses were destroyed, about 1,500,000 people became homeless, and monetary damages were approximately US \$3,620 M in the Typhoon Committee Members areas. (The number of homeless and monetary damages were based on less than 5 years of data because of limited reporting in some years.)

Following the direct impacts of a tropical cyclone as it strikes an area, the long term adverse impacts to agricultural and livestock output, business revenues, and communications and transportation infrastructure can often last 5 years or more. Therefore accurate and timely tropical cyclone forecasts and warnings and disaster mitigation actions are absolutely required to achieve sustainable development and to lessen the human and economic impacts.

**1.2 Introduction.** The ESCAP/WMO Typhoon Committee is currently composed of 14 Members: Cambodia; China; Democratic People Republic of Korea; Hong Kong, China; Japan; Lao People Democratic Republic; Macao, China; Malaysia; the Philippines; Republic of Korea; Singapore; Thailand; Socialist Republic of Viet Nam; and the United States of America. The initial session of the Typhoon Committee was held in Bangkok, Thailand in December 1968.

The functions of the Committee are to:

1. Review regularly the progress made in the various fields of tropical cyclone damage prevention.
2. Recommend to the participating Members plans and measures for the improvement of meteorological and hydrological facilities needed for tropical cyclone damage prevention.
3. Recommend to the participating Members plans and measures for the improvement of community preparedness and disaster prevention.
4. Promote the establishment of programmes and facilities for training personnel from Members of the region in tropical cyclone forecasting and warning, flood hydrology, and control within the region and arrange for training outside the region as necessary; promote, prepare, and submit to participating Members and other interested organizations plans for coordination of research programmes and activities concerning tropical cyclones.
5. Consider, upon request, possible sources of financial and technical support for such plans and programmes.
6. Prepare and submit, at the request and on behalf of the participating Members, request for technical, financial, and other assistance offered under the UNDP and by other organizations and contributors.

To assist in carrying out these functions, the Typhoon Committee maintains and conducts operations in accordance with this Regional Cooperative Programme Implementation Plan (RCPIP) under the five components: meteorology, hydrology, disaster prevention and preparedness, training, and research with contributions and cooperation from its Members and assistance by ESCAP, WMO, UNDP, and other agencies.



Section 2 provides the Committee's vision and broad goals for the RCPIP and then Sections 3 through 7 are the action programmes for the five components listed above. These action programmes consist of a broad goal and three prioritized list of objectives. Under each objective, there are achievable action(s), who needs to be involved, estimated completion date, success measurement, and if needed, the source of financial support. Following the list of the 3 prioritized objectives, are additional important objectives which the Working Group on the Structure of the RCPIP considered. Section 8 is a summary of this RCPIP.

## 2. VISION and BROAD GOALS

**2.1 Vision.** The vision of the Typhoon Committee for the RCPIP is for each Member of the Committee in cooperation with other Members to:

- Provide high quality tropical cyclone forecasts and warnings by highly trained professionals using the best technology available to mitigate the effects of tropical cyclone disasters,
- Obtain through effective tropical cyclone disaster mitigation and water resource actions maximum humanitarian, social, and economic benefits to achieve sustainable development, and
- Derive maximum benefits to provide the high quality forecasts and warnings and effective mitigation actions through combining resources, sharing of meteorological and hydrological data, sharing experiences in disaster prevention and preparedness, and cooperative research and training.

**2.2 Broad Goals.** The broad goals of the Typhoon Committee's RCPIP for the five components are:

- Meteorology.** 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 and the latest information in accordance with WMO Resolution 40 of Congress 12, and effective communication methods.
- Hydrology.** To produce and disseminate accurate and timely flood-related forecasts and warnings plus assessments of the disaster risk and sharing of hydrological data in accordance with WMO Resolution 20 of Congress 13 to assist in mitigating the negative impacts and enhancing the beneficial effects of tropical cyclones.
- Disaster Prevention and Preparedness.** 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 social and economic negative impacts on the sustainable development process.
- Training.** To enhance capacity building for all Members through identification of operational tropical cyclone training needs and then achieve through collaboration in the development and presentation of workshops, seminars, co-sponsored training courses, and computer-based Internet-based courses to fulfill these needs.
- Research.** To effectively collaborate among Members on research activities applicable to more than one Member to facilitate the transfer of technology and relevant research to operational use.

## 3. METEOROLOGY

**3.1 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 and the latest information in accordance with WMO Resolution 40 of Congress 12, and effective communication methods.

## 3.2 Highest 3 Prioritized Objectives and Actions.

**3.2.1** To enhance meteorological observing systems in support of improvements to tropical cyclone forecasting.

**Action:** Identify goal to increase the number of surface observations, upper air soundings, and other observational data (e.g., radar, wind profiler) when a tropical cyclone is within at least 300 km (more, if possible) of observational sites and disseminate these via the most appropriate method.

**Members Involved:** All.

**Estimated Completion Date:** 2003.

**Success:** All Members will meet 75% of their identified goal.

**Financial Resources:** Members.

**Action:** Implement a central server for data exchange accessible by Members with appropriate security measures.

**Members Involved:** A volunteer is required.

**Estimated Completion Date:** 2002.

**Success:** Fully operational server accessible to Members.

**Financial Resources:** A Volunteer.

**Action:** Establish and train human weather spotter networks to report significant rainfall, flooding, storm surge and high surf.

**Members Involved:** Interested Members.

**Estimated Completion Date:** 2003.

**Success:** Interested Members will establish 2 networks.

**Financial Resources:** Members Interested.

**3.2.2** To establish facilities to receive MTSAT satellite and meteorological data and to exchange methods to effectively use these data.

**Action:** Upgrade facilities to receive and process all data from the High Resolution Imager Data/High Rate Information Transmission (HiRID/HRIT) transmissions of the Multi-purpose Transportation Satellite (MTSAT).

**Members Involved:** Interested Members.

**Estimated Completion Date:** 2003/2004.

**Success:** All interested Members have operational systems.

**Financial Resources:** Interested Members.

**Action:** Upgrade facilities to receive and process all data from the Low Rate Information Transmission (LRIT) transmissions of MTSAT.

**Members Involved:** Interested Members.

**Estimated Completion Date:** 2004/2005.

**Success:** All interested Members have operational systems.

**Financial Resources:** Interested Members.

**Action:** Exchange information through Internet and other methods on the effective use of MTSAT data among Members.

**Members Involved:** All.

**Estimated Completion Date:** 2005.

**Success:** One or more documented cases on the effective use of MTSAT data from each Member by 2005.

**Financial Resources:** Members.



- 3.2.3 RSMC Tokyo to provide additional tropical cyclone forecasting guidance to Members and to improve JMA Typhoon Model output.

**Action:** Identify regional tropical cyclone forecasting guidance requirements.

**Members Involved:** All.

**Estimated Completion Date:** Mid 2002.

**Success:** All Members to provide their prioritized list of requirements to RSMC Tokyo with informational copies to all other Members. Conduct a meeting if necessary to discuss the prioritized requirements and establish regional requirements.

**Financial Resources:** Members.

**Action:** RSMC Tokyo will consider Members identified requirements, and if possible implement.

**Members Involved:** Japan (RSMC Tokyo).

**Estimated Completion Date:** 2003/2005.

**Success:** RSMC Tokyo will implement at least two of the identified requirements.

**Financial Resources:** JMA.

**Action:** Provide intensity forecast guidance out to 72 hours.

**Members Involved:** Japan (RSMC Tokyo).

**Estimated Completion Date:** 2002.

**Success:** Guidance intensity forecast out to 72 hours.

**Financial Resources:** JMA.

**Action:** Provide gust forecast guidance out to 72 hours.

**Members Involved:** Japan (RSMC Tokyo).

**Estimated Completion Date:** 2004.

**Success:** Guidance will include gust forecast out to 72 hours.

**Financial Resources:** JMA.

**Action:** Incorporate the interaction of sea surface layer into Typhoon Model (TYM).

**Members Involved:** Japan (RSMC Tokyo).

**Estimated Completion Date:** 2004.

**Success:** Demonstrate improvement of TYM forecast accuracy.

**Financial Resources:** JMA.

**Action:** Introduction of ensemble prediction system to NWP Models.

**Members Involved:** Japan (RSMC Tokyo) and other interested Members.

**Estimated Completion Date:** 2006.

**Success:** Demonstrate positive impact to tropical cyclone forecast.

**Financial Resources:** JMA.

**Action:** Setting up a Web site for dissemination and exchange of numerical model information.

**Members Involved:** Japan (RSMC Tokyo) and other interested Members.

**Estimated Completion Date:** 2002.

**Success:** Accessible to all Members.

**Financial Resources:** JMA.

### 3.3 Other Important Objectives to be Considered.

- 3.3.1 To 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.

- 3.3.2 To establish and upgrade regional telecommunications links.

- 3.3.3 To prepare and distribute a list of Internet web sites which provide tropical cyclone observational and/or forecast data for the ESCAP/WMO Typhoon Committee area.

- 3.3.4 Identify relevant tropical cyclone analysis and forecasting publications and their sources and distribute to the Members.

## 4. HYDROLOGY

- 4.1 **Broad Goal.** To produce and disseminate accurate and timely flood-related forecasts and warnings, plus assessments of the disaster risk and sharing of hydrological data in accordance with WMO Resolution 20 of Congress 13 to assist in mitigating the negative impacts and enhancing the beneficial effects of tropical cyclones.

### 4.2 Highest 3 Prioritized Objectives and Actions.

- 4.2.1 To improve real-time meteorological/hydrological networks and exchange of data among Members.

**Action:** Exchange experts and information to provide technical guidance on methods to improve real-time meteorological/hydrological data collection networks.

**Members Involved:** All Members.

**Estimated Completion Date:** 2003.

**Success:** All Members will meet 75% of their identified goal in the improvement of real-time meteorological/hydrological data collection networks.

**Financial Resources:** Members.

**Action:** Develop and implement plans which include each Member's meteorological/hydrological data requirements from other Members and methods to receive these required data.

**Members Involved:** Interested Members.

**Estimated Completion Date:** 2002 Develop Plan / 2004 Implement Plan.

**Success:** Interested Members will complete and implement plan through bilateral or multilateral cooperation or agreements.

**Financial Resources:** Interested Members.

- 4.2.2 To extend and improve flood-related forecasts and warnings, plus assessments of disaster risks for tropical cyclones.

**Action:** Establish, evaluate, and improve the accuracy of flood forecasting and exchange this information among all Members.

**Members Involved:** All.

**Estimated Completion Date:** 2002 Establish and evaluate baseline accuracy / 2005 Improve accuracy by 20 percent

**Success:** All Members will establish a flood forecasting accuracy baseline and improve it by 20 percent.

**Financial Resources:** Members.

**Action:** To improve flood forecasting and warning systems through the exchange of experts.

**Members Involved:** Interested Members.

**Estimated Completion Date:** 2005.

**Success:** Improvement of flood forecasting accuracy by 20 percent.

**Financial Resources:** Interested Members and WMO.

**Action:** Establish a flash flood and sediment disaster forecasting and warning system in a pilot project area.

**Members Involved:** Interested Members.

**Estimated Completion Date:** 2005.

**Success:** Flash flood and sediment disaster forecasting and warning system will be established in at least a pilot project area in each interested Member.

**Financial Resources:** Interested Members and cooperating organizations.

**Action:** Develop an integrated hazard map of water-related disasters from tropical cyclones for the pilot project area.

**Members Involved:** Interested Members.

**Estimated Completion Date:** 2005/2006.

**Success:** Integrated hazard map of water-related disaster will be developed for at least one pilot river basin in each interested Member.

**Financial Resources:** Interested Members and cooperating organizations.

**Action:** Disseminate through meetings, conferences, and papers the lessons-learned and the basis for the integrated hazard map from the pilot project area.

**Members Involved:** All Members.

**Estimated Completion Date:** 2006.

**Success:** A well-developed network covering all Members, including at least one person taking part in such meetings for each Member, to exchange related information for better understanding of the integrated hazards produced by tropical cyclones.

**Financial Resources:** Members.

#### 4.2.3 To improve forecasts, products, services, and presentations to meet various users' requirements.

**Action:** 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.

**Members Involved:** All.

**Estimated Completion Date:** 2003/2004.

**Success:** All Members will collect and prepare a document of users' requirements.

**Financial Resources:** Members.

**Action:** Implement changes or additions to forecasts, products, services, and presentations based upon the documented users' requirements.

**Members Involved:** All.

**Estimated Completion Date:** 2004/2005.

**Success:** All Members will implement 50 percent of the users' requirements.

**Financial Resources:** Members.

### 4.3 Other important Objectives to be Considered

#### 4.3.1 To develop and extend activities between forecasting agencies and user groups of flood forecasting information in cooperation with disaster prevention and preparedness component.

## 5. DISASTER PREVENTION and PREPAREDNESS

### 5.1 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 social and economic negative impacts on the sustainable development process.

### 5.2 Highest 3 Prioritized Objectives and Actions.

#### 5.2.1 To improve public awareness of the impacts of tropical cyclones and possible mitigation and response actions.

**Action:** Maintain effective communications with the media prior to, during, and after tropical cyclones occurrences.

**Members Involved:** All.

**Estimated Completion Date:** 2003 and afterwards.

**Success:** Demonstrated long-term average decrease in the amount of damage and the number of casualties.

**Financial Resources:** Members.

**Action:** Maintain effective communications between meteorological/ hydrological services and emergency management/disaster response agencies and participate in integrated preparedness programs.

**Members Involved:** All.

**Estimated Completion Date:** 2003 and afterwards.

**Success:** Demonstrated long-term average decrease in the amount of damage and the number of casualties.

**Financial Resources:** Members.

**Action:** Establish and maintain a closer working relationship/partnership with non-governmental organizations which play a crucial role in education, mitigation, and response activities.

**Members Involved:** All.

**Estimated Completion Date:** 2003 and afterwards.

**Success:** Demonstrated long-term average decrease in the amount of damage and the number of casualties.

**Financial Resources:** Members.

#### 5.2.2 To increase availability of disaster preparedness and mitigation information.

**Action:** Make available disaster preparedness and mitigation information via Internet.

**Members Involved:** All.

**Estimated Completion date:** 2004.

**Success:** Make information available on a central server.

**Financial Resources:** Members and a volunteer to maintain server.

**Action:** Prepare and distribute a list of Internet web sites which Members can access for disaster preparedness and prevention information.

**Members Involved:** Asian Disaster Reduction Centre (ADRC).

**Estimated Completion date:** 2003.

**Success:** List of applicable web sites distributed.

**Financial Resources:** ADRC.

**Action:** Exchange relevant tropical cyclone resistant actions which Members have found effective and Members' building codes.

**Members Involved:** All Interested Members.

**Estimated Completion date:** 2005.

**Success:** Completion of exchange among all interested Members.

**Financial Resources:** Members.

#### 5.2.3 To facilitate improved communications systems and methods for warning dissemination and relief operations within each Member's area and among Members.

**Action:** Ensure terminology used by meteorologists and hydrologists can be clearly understood by disaster preparedness and prevention agencies and the public.

**Members Involved:** Members.

**Estimated Completion Date:** 2004.

**Success:** Seventy percent of the people in test group(s) understand terminology being used.



**Financial Resources:** Members.

**Action:** Investigate the availability of amateur radio networks and implement procedures for their use to report significant weather events and as backup communications/dissemination systems.

**Members Involved:** Interested Members.

**Estimated Completion Date:** 2004.

**Success:** Interested Members implement one amateur radio network.

**Financial Resources:** Interested Members.

**Action:** Members share ideas on current and future communications systems in use or planned for warning dissemination.

**Members Involved:** Interested Members.

**Estimated Completion Date:** 2004.

**Success:** Reduction in time for warning dissemination and relief operations communications.

**Financial Resources:** Interested Members.

### 5.3 Other Important Objectives to be Considered.

5.3.1 To facilitate an exchange of information on significant tropical cyclone events among Members especially through sharing prepared case studies.

5.3.2 To facilitate the production and exchange of educational videos for tropical cyclone preparedness.

## 6. TRAINING

**6.1 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.

### 6.2 Highest 3 Prioritized Objectives and Actions.

6.2.1 To facilitate the transfer of the latest forecasting and analysis techniques among Members.

**Action:** Conduct exchange of experts and fellowships.

**Members Involved:** All.

**Estimated Completion Date:** 2006.

**Success:** Each Member will have at least one exchange of experts or fellowship by 2006.

**Financial Resources:** Members.

**Action:** Approximately a one to two-week attachment of two forecasters to RSMC Tokyo.

**Members Involved:** All interested Members.

**Estimated Completion Date:** 2006.

**Success:** Each interested Member will have at least two forecasters attached to RSMC Tokyo by 2006.

**Financial Resources:** WMO and Typhoon Committee Trust Fund.

**Action:** Hold a series of annual workshops on South China Sea Storm Surge, Wave and Circulation Forecasting.

**Members Involved:** Cambodia, China, People's Democratic Republic of Korea, Malaysia, Philippines, Republic of Korea, Singapore, Thailand and Viet Nam.

**Estimated Completion date:** 2006.

**Success:** Each participating Member will have at least two participants attend the workshop series.

**Financial Resources:** WMO, ONR/USA and TCTF.

**Action:** Hold international seminar on MTSAT/LRIT data utilization.

**Members Involved:** All interested Members.

**Estimated Completion date:** 2003.

**Success:** Each interested Member will have at least one participant attend the seminar.

**Financial Resources:** Japan.

**Action:** Attend USA National Hurricane Center training course on tropical cyclone.

**Members Involved:** All interested Members.

**Estimated Completion date:** 2006.

**Success:** Each interested Member will have at least one forecaster attend this training by 2006.

**Financial Resources:** WMO and TCTF.

**Action:** Research available computer-based and Internet-based tropical cyclone training material and publish sources.

**Members Involved:** A volunteer is requested.

**Estimated Completion Date:** 2002 and updated regularly.

**Success:** List will be prepared and disseminated.

**Finance Resources:** Volunteer.

6.2.2 To facilitate group training courses in meteorology, hydrology, and disaster prevention and preparedness to improve tropical cyclone forecasts and warnings.

**Action:** Attend training course on Weather Forecasting for Operational Meteorologists in the Asian Pacific Region.

**Members Involved:** Highest priority to Members whose staffs require training.

**Estimated Completion Date:** Annually through 2006.

**Success:** Highest priority Members whose staffs require training will have at least one participant attend this training.

**Financial Resources:** Korea International Cooperation Agency.

**Action:** Attend training course on Meteorology, River and Dam Engineering, and Disaster Mitigation and Restoration System for Infrastructure.

**Members Involved:** Highest priority to Members whose staffs require training.

**Estimated Completion date:** Annually through 2006.

**Success:** Highest priority Members whose staffs require training will have at least one participant attend this training.

**Financial Resources:** Japan International Cooperation Agency.

6.2.3 To develop new meteorological and hydrology training courses to meet Members requirements.

**Action:** Prepare a separate prioritized lists of training requirements for meteorology and hydrology and circulate among members.

**Members Involved:** All.

**Estimated Completion date:** Mid-2002.

**Success:** Finalized list distributed to all Members.

**Financial Resources:** Members.

**Action:** Following completion of finalized list, determine priorities and sources of the required training. Conduct a meeting to discuss the priority and sources for this training if necessary.

**Members Involved:** All.

**Estimated Completion date:** 2006.

**Success:** Completion of at least one new training course per year.

**Financial Resources:** WMO, Typhoon Committee Trust Fund, and Members.

### 6.3 Other Important Objectives to be Considered.

- 6.3.1 To increase with other Members the availability and sharing of current and new training materials developed by Members, especially via the Internet.

## 7. RESEARCH

- 7.1 **Broad Goal.** To effectively collaborate among Members on research activities applicable to more than one Member to facilitate the transfer of technology and relevant research to operational use.

### 7.2 Highest 3 Prioritized Objectives and Actions.

- 7.2.1 To increase the knowledge and understanding of tropical cyclones through observational programmes to improve tropical cyclone forecasting.

**Action:** Organize an International Intensive Observing Experiment.

**Members Involved:** All interested Members.

**Estimated Completion Date:** Before 2006.

**Success:** Completion of experiment.

**Financial Resources:** Interested Members and WMO.

**Action:** Utilization of the International Intensive Observing Experiment data set in numerical modeling of tropical cyclones.

**Members Involved:** All interested Members.

**Estimated Completion Date:** 2006.

**Success:** Demonstrate an improvement in tropical cyclone forecasting in regional workshop/seminar for all Members.

**Financial Resources:** All interested Members.

**Action:** Conduct additional research into use of current and future remote sensing data

**Members Involved:** All.

**Estimated Completion Date:** Continuing through 2006.

**Success:** Incorporation of additional remote sensing data to improve tropical cyclone forecasting in all Members.

**Financial Resources:** Members.

- 7.2.2 To improve techniques for tropical cyclone track, intensity, storm surge, destructive winds, rainfall and flood forecasting.

**Action:** To develop new forecasting techniques for tropical cyclone related weather.

**Members Involved:** All interested Members.

**Estimated Completion Date:** 2003 and onwards.

**Success:** Incorporation of new techniques into operations and publication of the results demonstrating improvements in forecasts.

**Financial Resources:** All interested Members

**Action:** To disseminate latest achievements and develop new techniques for determining and forecasting tropical cyclone track and intensity.

**Members Involved:** All interested Members.

**Estimated Completion Date:** 2003 and onwards.

**Success:** Incorporation of new techniques into operations and publication of the results demonstrating improvements in forecasts.

**Financial Resources:** All interested Members.

- 7.2.3 To facilitate the exchange of research results among Members.

**Action:** Conduct exchange of meteorological experts among Members through the Typhoon Committee Research Fellowship Scheme.

**Members Involved:** All interested Members.

**Estimated Completion Date:** 2006.

**Success:** At least two by 2006 with the completion of one research paper per exchange.

**Financial Resources:** Members and Typhoon Committee Trust Fund.

**Action:** Make research results and case studies available via Internet

**Members Involved:** All interested Members with a volunteer to establish server and web sites.

**Estimated Completion Date:** 2003/2004 and updated regularly.

**Success:** Complete central web site to host research results.

**Financial Resources:** Members and a Volunteer.

**Action:** Organize workshops on typhoon forecasting research every two years.

**Members Involved:** All members of TRCG working on tropical cyclone forecasts and invited experts.

**Estimated Completion Date:** 2005.

**Success:** At least two forecasters of the TRCG from each participating Member will take part in the Workshops to exchange research results.

**Financial Resources:** WMO, TCTF and volunteers.

### 7.3 Other Important Objectives to be Considered.

- 7.3.1 To increase Members participation in international tropical cyclone research meetings especially encouraging participation in IWTC-5. Solicit funding for Members requiring assistance for participation.

- 7.3.2 To study the relationship between ENSO and tropical cyclone activity, formation, timing and impacts.

- 7.3.3 To develop, maintain, and make available via the Internet to all Members a tropical cyclone historical data base for the northwest Pacific and Asia.

## 8. SUMMARY

Approximately one-third of the world's tropical storms and typhoons/hurricanes form in the western north Pacific. This is an average (1971-2000) of about 27 tropical storms and typhoons per year, about half of which affect the Members of the Typhoon Committee. Typhoons with their triple threat of high winds, storm surge, and heavy rains can bring devastation to Members. Even relatively weak tropical depressions can produce very heavy rains and widespread flooding.

Following the direct impacts of a tropical cyclone as it strikes an area, the long term adverse impacts to agricultural and livestock output, business revenues, and communications and transportation infrastructure can often last 5 years or more. Therefore accurate and timely tropical cyclone forecasts and warnings and disaster mitigation actions are absolutely required to achieve sustainable development and to lessen the human and economic impacts.

Because of the frequency and impacts of tropical cyclones in the ESCAP/WMO Typhoon Committee Members' area, the Typhoon Committee at its Thirty-Third Session, as part of Agenda Item VII Programme for 2001 and Beyond decided to reestablish the Working Group on the Structure of the Regional Cooperative Programme Implementation Plan (RCPIP). The task of the Working Group was to present their recommendations for a vision statement and a broad action plan for the RCPIP to the thirty-fourth session of the Committee for its consideration.



The Working Group on the Structure of the RCPIP met once in Tokyo at the very kind invitation of Japan Meteorological Agency and then conducted all further work by email correspondence. The Working Group developed the following broad Vision for the RCPIP:

The Vision of the Typhoon Committee for the RCPIP is for each Member of the Committee in cooperation with other Members to:

- a. Provide high quality tropical cyclone forecasts and warnings by highly trained professionals using the best technology available to mitigate the effects of tropical cyclone disasters,
- b. Obtain through effective tropical cyclone disaster mitigation and water resource actions maximum humanitarian, social, and economic benefits to achieve sustainable development, and
- c. Derive maximum benefits to provide the high quality forecasts and warnings and effective mitigation actions through combining resources, sharing of meteorological and hydrological data, sharing experiences in disaster prevention and preparedness, and cooperative research and training.

In addition to this broad vision, the Working Group developed broad goals for the five components of the RCPIP: Meteorology, Hydrology, Disaster Prevention and Preparedness, Training, and Research. The Working Group then listed many different objectives to meet the goals of the five component. After prioritizing the top three objectives for each component, they listed specific actions to achieve these objectives along with which Members would be involved, estimated completion dates (between 2002 and 2006), success criteria, and sources of possible financial support. The objectives which were not in the top three were then listed as other important objectives to be considered.

It is strongly believed that completing the action items for the various components will have a dramatic impact on reducing the loss of life and property and be one of the vital ingredients to achieve sustainable development. This will be accomplished through more accurate and timely forecasts and warnings, disaster mitigation actions, and education for tropical cyclone lessening the human and economic impacts.

## APPENDIX XVII

### TERMS OF REFERENCE OF THE WORKING GROUP ON REGIONAL COOPERATION PROGRAMME IMPLEMENTATION PLAN (RCPIP) 2002-2006

The Typhoon Committee at its 34<sup>th</sup> session adopted the following vision for its RCPIP:

- a. To provide high quality tropical cyclone forecasts and warnings by highly trained professionals using the best technology available to mitigate the effects of tropical cyclone disasters,
- b. To obtain through effective tropical cyclone disaster mitigation and water resource actions maximum humanitarian, social, and economic benefits to achieve sustainable development, and
- c. To derive maximum benefits to provide the high quality forecasts and warnings and effective mitigation actions through combining resources, sharing of meteorological and hydrological data, sharing experiences in disaster prevention and preparedness, and cooperative research and training.

In addition to the above vision, the Committee also adopted broad goals for the five components of the RCPIP: Meteorology, Hydrology, Disaster Prevention and Preparedness, Training, and Research and three priority objectives to meet the goals of the five components.

In adopting the new framework for the RCPIP, the Committee recognized the need to coordinate efforts and to assist Members in the implementation of the RCPIP and therefore decided, at its 34<sup>th</sup> session, to re-establish the Working Group on RCPIP with the following Terms of Reference.

#### *Terms of Reference*

The Working Group on RCPIP shall:

- Assess resources requirements to achieve priority goals of RCPIP based on responses from the Members and assist the TCS in identifying potential donors to facilitate the achievements of priority goals;
- Assist interested Members in identifying goals and necessary resources for the achievements of each action or priority objectives;
- Suggest reporting modalities to the Members to facilitate the monitoring of overall performance of the RCPIP; and
- Advise the Committee on necessary measures to be taken in order to ensure effective implementation of RCPIP.

#### *Membership*

Chairman of the Working Group on RCPIP will be appointed by the Committee. The Working Group will consist of a small group of senior experts from the Members nominated by its Chairman for appointment by the Committee during each Committee session or by the Typhoon Committee Chairman on its behalf.

The current Chairman of the Working Group appointed by the Committee is Mr James Weyman of the United States of America. The term in service of the Working Group is one year subject to extension authorized by the Committee.

#### *Members of the Working Group*

Mr James Weyman, Chairperson, USA  
Mr Mao Hengqing, China  
Mr Edwin W.L. Ginn, Hong Kong, China  
Mr Tatsue Ueno, Japan

Mr Kwang-Joon Park, Republic of Korea  
Mr Yong Pok Wing, Malaysia  
Ms Duong Lien Chau, Viet Nam

### *Operation modalities*

In view of the limited financial resources of the TC Trust Fund, the Working Group is expected to communicate through email and other means which require no financial resources from the Trust Fund. All submission for consideration by the Working Group will have to be made through the focal point of each Member. The TCS is requested to transmit all materials related to RCPIP to the Working Group Chairman.

### *Reporting requirements*

The Chairman of the Working Group on RCPIP is required to submit an annual report to the Committee session for its consideration through the TCS on the findings of activities in all three technical areas of the Committee work and recommendations related to priority research activities to be undertaken in the coming years.

## APPENDIX XVIII

### TERMS OF REFERENCE OF THE TYPHOON RESEARCH COORDINATION GROUP

In order to coordinate efforts on various areas of research on tropical cyclones and their impacts on the socio-economic development process in the Typhoon Committee Area, the Typhoon Committee has established the Typhoon Research Coordination Group (TRCG) with the following Terms of Reference and operational modalities.

#### *Terms of Reference*

The TRCG is to promote research activities on various aspects of tropical cyclones analysis, forecasting and assessment of tropical cyclones and their impacts on the socio-economic development process and encourage cooperation of efforts among the Members. Towards this end, the TRCG is expected to assist in:

- Identifying scientific and technical problems in the analysis and forecasting of tropical cyclones and their impacts on water resources and measures for disaster prevention and preparedness;
- Facilitating the exchange of experiences and knowledge on latest development and techniques related to the above problems;
- Initiating activities and programmes aiming at improving the related products and services to better serve the people in the region; and
- Recommending to the Committee priority areas, programmes and activities for cooperation in research by related experts of the Members.

#### *Membership*

The TRCG will consist of a focal point of all the Members. The Director of the RSMC and all the Chairmen of the TC Working Groups can take part in the deliberations of the TRCG in their ex-officio capacity. The current Chairman of the TRCG is Dr. Woo-Jin Lee of Republic of Korea. The term in service of the TRCG 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 TRCG is expected to communicate through email and other means which require no financial resources from the Trust Fund. All submission for consideration by TRCG will have to be made through the focal point of each Member or through the Chairmen of the Working Groups established by the Committee. The TCS is requested to transmit all materials related to TRCG to the Working Group Chairman.

#### *Reporting requirements*

The Chairman of the TRCG 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 August 2001**

			\$	\$
Balance of fund at 1 January 2000			468,459	
Contributions Received			204,000	
Interest Income			21,427	
Total revenue			<u>693,886</u>	
Less: Expenditure	Liquidated	Unliquidated	Total	
Mission travel - TCS/participants Miami Workshop (2000)	17,909	-	17,909	
Mission travel - TCS staff 34th TC (2001)	-	6,090	6,090	
Mission travel - participants Training at RSMC Tokyo (2001)	4,000	-	4,000	
Mission travel - RCPIP meeting Japan (2001)	4,234	1,335	5,570	
Mission travel - Workshop in Bangkok (2001)	-	14,700	14,700	
Mission travel - Workshop in Cheju, R.O.K. (2001)	-	22,000	22,000	
Mission travel - prior years' expenditure	(348)	-	(348)	
General Office expenses - TCS	39,830	12,757	52,587	
Bank charges	67	-	67	
Reproduction of documents	157	3,000	3,157	
Printing	7,330	9,200	16,530	
Postage (franking)	483	-	483	
Pouch	1,090	-	1,090	
Miscellaneous (IOV charges)	200	-	200	
Contribution to Regional Technical Conference on Tropical Cyclones and Storm Surges, Thailand, Nov 2000	16,098	-	16,098	
Contribution to Hydro Training Seminar, May 2000	8,243	-	8,243	
	<u>99,294</u>	<u>69,082</u>	<u>168,376</u>	
Total expenditure				168,376
Balance at 31 August 2001			\$	<u><u>525,510</u></u>
Represented by:				
Cash in Bank				602,528
Less: Unliquidated Obligations			69,082	
Prior Years' Obligations			5,930	
Accounts Payable			<u>2,006</u>	
				77,018
			\$	<u><u>525,510</u></u>

# DETAILED BREAKDOWN OF EXPENSES IN 2000

Contributions Received	2000	2001	Total
China	12,000	12,000	24,000
Japan	12,000	12,000	24,000
Korea	12,000		12,000
Hong Kong, China	12,000	12,000	24,000
Macao	12,000	12,000	24,000
Malaysia	12,000	12,000	24,000
Singapore	12,000	12,000	24,000
Thailand	12,000	12,000	24,000
United States of America	12,000		12,000
Viet Nam	12,000		12,000
Total	120,000	84,000	204,000

Prepared on 25 September 2001	
Manually corrected 31 Aug 01 statement,	
1) removed Mission travel - Jalkanen (ULO)	-4,913
2) removed Mission travel - 11-13 Sept 2001 (ULO)	-1,230
3) added Bangkok Mission - ULO	14,700
4) added R.O.K. Mission - ULO	22,000
	<u>30,557</u>

## a) Mission Travel - TCS/participants (Miami Workshop 2000)

### Details:

1. TCS Meteorologist - Travel to Oman to Attend 27<sup>th</sup> Panel Session (29 February to 6 March 2000)

LOMARDA, N.C.		
Per Diem	USD	605.63
Terminal Expenses		108.65
Air Ticket (Manila-Oman-Manila)		1187.12
<b>Sub-total (a)</b>	<b>USD</b>	<b>1,901.40</b>

2. TCS Staff Attendance To 33<sup>rd</sup> TC Session - Macao, China (Dec 2000)

KINTANAR, R.L.	USD	1,610.00
GALANG, E.	USD	1,610.00
<b>Sub-total (b)</b>	<b>USD</b>	<b>3,220.00</b>

3. Participants to Miami Workshop (Mar-Apr 2000)

Details:	Lump Sum	Air Ticket
CHUNG, Kwan-Young (Rep. of Korea)	USD 1,233.00	
DINDANG Ambun (Malaysia)	1,234.97	1,415.47
KHOVADHANA, Kriengkrai (Thailand)	1,233.00	1,154.51
LOK, Hon Chio (Macao, China)		2,536.69*
PAN, Jinsong (China)	1,233.00	1,466.45
WONG, Wing-tak (HK, China)		1,280.22*

\*reimbursement basis (air ticket and lump sum support)

Sub-total	USD 4,933.97	7,853.34
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**Sub-total (c) USD 12,787.31**

**TOTAL USD 17,908.71**

**LIQUIDATED: USD 17,909.00**  
**UNLIQUIDATED: -**

**TOTAL for this item: USD 17,909.00**



**b) General Office Expenses (TCS)** **USD 26,368.00**

**LIQUIDATED:** **USD 26,368.00**

**Details:**

OFFICE EXPENSES (plea see attached list)	USD 3,000.00
HONORARIUM/ALLOWANCES	
TCS COORDINATOR	USD 10,560.00
TCS METEOROLOGIST	3,300.00
4 SECRETARY/TYPIST	6,480.00
2 DRIVERS	2,880.00
Total	USD 26,220.00
Currency Adjustment	168.00

**UNLIQUIDATED:**

**TOTAL:** **USD 26,368**

**c) PRINTING** **USD 9,025**

**LIQUIDATED:** **USD 7,487**

TCAR 99	USD 5,787
NEWSLETTER 2000	USD 1,700

**SUB-TOTAL** **USD 7,487**

**UNLIQUIDATED:** **USD 1,538\*\***

\*\* for printing by ESCAP of TC33 Final Report

**TOTAL** **USD 9,025**

**e) POSTAGE (FRANKING)** **USD 371**

**LIQUIDATED:** **USD 371**

**TOTAL:** **USD 371**

**f) FREIGHT** **USD 937**

**LIQUIDATED:** **USD 937**

**TOTAL:** **USD 937**

**g) Contribution To Regional Technical Conference**  
**On Tropical Cyclones And Storm Surges**  
**(Thailand, Nov 2000)** **USD 16,098.00**

Details: (lump sum support in lieu of per diem and air ticket costs)

ALUI, Bahari (Malaysia)	USD 867.00
CHEN, Lianshou (China)	1,445.00
CHUNG, Hyo-Sang (Rep. of Korea)	1,214.00
DUAN, Yihong (China)	1,445.00
GALANG, Efigenia (TCS)	1,040.00
KANBUA, Wattana (Thailand)	506.00
KANG, Bom Jin (DPRK)	1,850.00
KINTANAR, Roman L. (TCS)	1,040.00
LAO, Carina G. (Philippines)	1,040.00
LI, Chadol (DPRK)	1,850.00
NGUYEN, The Tuong (Viet Nam)	925.00
VANNARETH, Seth (Cambodia)	1,431.00
XU, Yinglong (China)	1,445.00

**TOTAL** **USD 16,098.00**

**LIQUIDATED:** **USD 16,098.00**

**TOTAL:** **USD 16,098.00**

**h) Contribution to Hydro Training Seminar, May 2000** **USD 8,243.05**

CHAU, Nguyen Lan (Viet Nam)	USD 1,110.00
EE, Gek May Patricia (Singapore)	1,211.75
HAJI SAID, Fathilah (Malaysia)	1,035.00
INTHAPATHA, Bounseuk (Lao, PDR)	1,845.52
NAI-ANANT, Somchai (Thailand)	1,095.00
NUKINA, Koji (Japan)	1,945.78

**TOTAL** **USD 8,243.05**

**LIQUIDATED:** **USD 8,243.05**

**TOTAL:** **USD 8,243.05**

**Summary of Monthly Expenses of the Typhoon Committee Secretariat  
(January-December 2000)**

Particulars	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Computer Accessories & Internet Service	2095.56	912.00	880.00	1488.24	880.00	880.00	440.00	440.00	880.00	880.00	880.00	880.00
Office Supplies	1710.50	980.00	2096.50	1092.00	1621.25	3999.65	4921.75	6888.30	4475.55	5794.50	7268.10	3472.55
Film Developing/Recopy	1071.00	279.00	2984.00	1086.00							451.50	2162.75
Key Duplication					120.00						810.00	
Table Flags with Stand												
Mailing and Mailing Boxes	3045.00		2937.00	6044.58	4828.00		3158.00	3084.00	4813.00	3084.00	1576.00	3538.00
Vehicle Parts and Repair	2178.00	7955.00	1245.00	505.00	2765.00	3640.00	2157.00	701.60	150.00	1409.75	1360.00	1880.00
Fax (Century Hotel)					75.00							
Airpot						2133.40						
Notarial Fee						50.00						
Newspapers									294.00	308.00	280.00	280.00
Wall Clock									589.00			
<b>Total Expenses</b>	10100.06	10126.00	10142.50	10195.82	10289.25	10703.05	10676.75	11113.90	11201.55	11476.25	12625.60	12228.30
<b>Cash Received</b>	10100.00 (\$250)	10125.00 (\$250)	10137.50 (\$250)	10187.50 (\$250)	10287.50 (\$250)	10700.00 (\$250)	10676.00 (\$250)	11112.50 (\$250)	11200.00 (\$250)	11475.00 (\$250)	12625.00 (\$250)	12225.00 (\$250)