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ESCAP/WMO
Typhoon Committee



Issue 23 • Year 2011
Typhoon Committee
Secretariat
Macao, China

newsletter

EDITORIAL



Another year has passed and the Asia Pacific region was, once more, the region of the globe the most battered by natural disasters. Floods affected some Members of Typhoon Committee, sometimes associated to heavy monsoon rains, other times to tropical cyclones. In China, in the central and southern regions, the floods affected millions people. Also widespread flooding occurred mainly in Cambodia, Lao PDR, Philippines and Thailand, causing enormous socio-economic impacts.

According to the "Review of the 2011 Typhoon Season", provided by RSMC-Tokyo, there was a total number of 21 named tropical cyclones in the Typhoon Committee area in 2011, eight of which with typhoon intensity. Despite not having been a very active season, some of these tropical cyclones caused serious damage in several Members, mainly in the Philippines, where

The Forty-Third Session of the Typhoon Committee

The Government of Republic of Korea, in cooperation with ESCAP and WMO hosted the forty-third Session of the Typhoon Committee, which was held in Lotus Room, Shilla Jeju Hotel, Seogwipo City, Republic of Korea, from 17 to 22 January 2011.

The Session was attended by 95 participants from 11 out of 14 Members of the Typhoon Committee, namely: China; Hong Kong, China; Japan; Macao, China; Malaysia; Philippines; Republic of Korea; Singapore; Thailand; the Socialist Republic of Viet Nam; and the United States of America (USA).

The Session was also attended by 4 observers from Russia-Institute of Experimental Meteorology,

Scientific & Production Association "Typhoon"; from the Asian Disaster Reduction Center; from Thailand-Regional Integrated Multi-Hazard Early Warning System and from Indonesia-Indonesian Agency for Meteorology Climatology and Geophysics (BMKG). Representatives from the Economic and Social Commission for Asia and the Pacific (ESCAP), the World Meteorological Organization (WMO) and Typhoon Committee Secretariat (TCS) also attended the session.

The Session was declared open by his Excellency, Dr. Maanee LEE, Minister of Environment of Republic of Korea, at 10:00 am on Monday, 17 January 2011, in the presence of the Members' representatives, and the welcome address was



the rain associated to the late-season tropical storm Washi triggered severe flash floods and land slides, resulting in catastrophic damage and significant death toll. Japan, not yet recovered from the damage caused by the Great East Japan Earthquake, suffered also the consequences of being hit by the typhoons Talas and Roke.

Other type of natural disaster, the 11 March Great East Japan Earthquake, the largest earthquake ever recorded in Japan, caused serious damage in this TC Member. The world watched astonished through the television broadcasts the buildings shaking and the water of the Pacific moving inland, invading the low coastal areas, dragging everything ahead, boats, containers, cars, buses, houses. About 150,000 people have been displaced, thousands are still missing and more than 13,000 were confirmed dead. To make matters worse the earthquake and tsunami also affected Fukushima nuclear plant causing an accident with such proportions that did not happen since the Chernobyl disaster. This accident leads us to think that nuclear energy is not after all cheap, clean and safe as some politicians would have us believe. The Great East Japan Earthquake has showed how important the structural and non-structural measures are to prevent the consequences of natural disasters. A good example is the fact that the village Fudai was protected by a 15.5 m high and 200 m long seawall and its inhabitants were saved thanks to the experience gained with the previous earthquakes and tsunamis in 1836, 1933 and 1960. However, despite reducing the impact, the 10 meters high and 2.5 km long dyke of the Miyako city and the 8 m above the sea level breakwater in Kamaishi city, these towns suffered the violent invasion of the waters. Unfortunately, despite reducing the impact, the structural measures were not enough to prevent all consequences and a lesson to learn is that every possible effort should be made to prevent the consequences of the extreme behaviours of Mother Nature.

In terms of non-structural measures it was evident that many people were saved thanks to the preparedness education given in the schools and to the performance of regular exercises and drills on how to proceed in case of earthquakes and tsunamis. A significant example was what happened in Kamaishi, where students were saved following the instructions they have learnt at school about on how to proceed in case of tsunamis. This episode has been referred by the media as the miracle of Kamaishi.

In 2011 the combined action of meteorological, hydrological and civil protection services of the Committee Members promoted the evacuation of hundreds of thousands of people facing the threat of approaching tropical cyclones. This combined actions certainly greatly contributed for reducing the death toll.

TCS expresses deep sympathy and solidarity to all our Members that suffered the consequences of natural disasters in 2011.



delivered by Dr Byung-Seong CHUN, Administrator, Korea Meteorological Administration (KMA), Ministry of Environment, Republic of Korea. The other opening statements were delivered by Mr Keun-Min WOO, Governor of Jeju Special Self-Governing Province; Mr Yeon Soo PARK, Administrator, National Emergency Management Agency (NEMA), Republic of Korea; Dr Seok-Hyeon KIM, Director-General, Han River Flood Control Office, Ministry of Land, Transport and Maritime Affairs (MLTM), Republic of Korea; Mr. Olavo RASQUINHO, Secretary of Typhoon Committee in representation of the Chairman of Typhoon Committee; Dr. Tokiyoshi TOYA, the representative of the WMO Secretariat; Mr. Yuichi ONO, representative of ESCAP secretariat.

The Dr. Roman L. Kintanar Award for Typhoon-related Disaster Mitigation was presented to the NOAA-Pacific Region of USA and NEMA of Republic of Korea.

Dr. Byung-Seong CHUN, Administrator of KMA was elected Chairperson and Mr. Nguyen Dai Khanh, Director, Science Technology and International Cooperation Department, National Hydro-Meteorological Service of Viet Nam was elected Vice-





Chairperson of the Committee. Mrs. Hilda LAM, Assistant Director, Hong Kong Observatory (HKO) of Hong Kong, China was elected Chairperson of the Drafting Committee.

Prior to the plenary session for the Committee, parallel sessions of the three Working Groups on Meteorology, Hydrology and Disaster Risk Reduction were convened on the afternoon of 17 January 2011 in three separate meeting areas to review progress of work during the past year, to identify priorities for cooperation and make recommendations to the Committee.

The major outcomes of the parallel sessions of the three Working Groups are described in detail in the Report of the Forty-third Session of Typhoon Committee.



Main Activities of the TC Secretariat in 2011

Since the 43rd Session of TC, held in Jeju, Republic of Korea, on 17-22 January 2011, the Typhoon Committee Secretariat was represented at the in the following events:

PARTICIPATION IN INTERNATIONAL MEETINGS

- **5th Annual City Development Conference, Ho Chi Minh City, Viet Nam, 24-25 February 2011**
- **Workshop on Developing Capacity for Resilience to Water-Related Disasters in Pakistan through Space Applications and Flood Risk Management, 1- 4 March, Islamabad, Pakistan from 1 to 4 March 2011**
- **Expert Group Meeting on Identifying Priority Cooperation Areas for the Regional Cooperative Mechanism on Disaster Monitoring and Early Warning, Particularly Drought, 15-17 March 2011, Beijing, China**
- **Working meeting of UFRM - Beijing, China, 4-5 April, 2011**
- **Civil Protection Scheme Meeting on Tropical Cyclone Prevention – Macao, China 20 April 2011**
- **ESCAP/WMO Typhoon committee Urban Flood Risk Management (UFRM) Good Practice City Visiting to Shanghai, China, 18-20 May 2011**
- **67th Session of ESCAP - Senior Officials segment - Incheon, Republic of Korea, 19-21 May 2011**
- **Workshop on the Assessment System of Flood Control Measures on Socio-economic Impact (ASFCM), Seoul, Republic of Korea, 23 to 24 May 2011**

- **6th International Workshop on Typhoon Committee Working Group on Disaster Risk Reduction, Incheon, Republic of Korea, 25-26 May 2011**



- **Expert Mission on Radar Composite Map Project in Thailand, Thailand, 7 – 9 September 2011**

- **Expert Mission on Web GIS Based Typhoon Committee Disaster Information Service, to Cambodia, Lao PDR and Thailand, 7-13 August 2011**





- **Expert Team Meeting on the “Assessment Report on the Impact of Climate Change with Focus on Tropical Cyclone Track and Impact Area”, Shanghai, China, 21-22 November 2011**
- **Web-based Typhoon Forum Meeting, Shanghai, China, 22 November 2011**
- **The Second Expert Group Meeting on the Great East Japan Earthquake - Learning from the Mega-Tsunami Disaster – Tokyo, Japan, 16-18 December 2011**
- **QPE/QPF Workshop and SABO field Training, Nha Trang, Viet Nam, 6 November 2011**

COORDINATION OF RESEARCH FELLOWSHIP SCHEME

The Typhoon Committee received in 2011 three research fellowships offered by China Meteorological Administration, Hong Kong Observatory and Korea Meteorological Administration. TCS has coordinated the participation of the awardees in the activities under the fellowship scheme.

COORDINATION OF INTERNATIONAL SEMINARS, ON-THE-JOB TRAINING COURSES AND WORKSHOPS

TCS, together with the Working Groups, ESCAP and WMO, coordinated the preparation of the following events:

- **Roving Seminar 2011, Petaling Jaya, Malaysia, 20 - 23 September**
- **The Seventh TCP/JCOMM Workshop on Storm Surge and Wave Forecasting, Macao, 10-14 October 2011**



VISITS TO TCS HEADQUARTERS

- **Representatives of the Forum for Economic and Trade Cooperation between China and Portuguese-speaking Countries – Macao, February, 18**



- **Visit of Mr. Caifang WANG-Executive Deputy Director, WMO Regional Training Center, Nanjing – 24 Mar, 2011**

- **6th TC Integrated Workshop - Damage Assessment Methodology and Pre-Assessment of Typhoon Landfall Impacts, Nha Trang, Viet Nam, 7 -11 November 2011.**

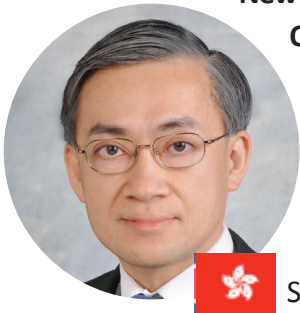


- **Visit of Dr. Tokiyoshi TOYA, Regional Director for Asia and the South-West Pacific, WMO – 8 July 2011**
- **Participants in the Seventh TCP/JCOMM Workshop on Storm Surge and Wave Forecasting, Macao, China – 12 October 2011**



New appointed Directors

New Director of the Hong Kong Observatory



Mr. SHUN Chi-ming was appointed as the Director of the Hong Kong Observatory (HKO) on 14 April 2011. Mr.



SHUN joined HKO in February 1986 as Scientific Officer. He was

promoted to Senior Scientific Officer in April 1998 and then to Assistant Director in December 2008. Since 1993, Mr. Shun specialized in aviation meteorology. He implemented the Terminal Doppler Weather Radar for the new Hong Kong International Airport and led a team to develop the world-first LIDAR windshear detecting system. He served as the MET Vice-chair of the ICAO CNS/MET Subgroup in Asia/Pacific from 2003 to 2009. In February 2010, Mr. SHUN was elected President of the Commission for Aeronautical Meteorology (CAeM) of the WMO. "While I have worked many years in aviation weather service, tropical cyclone forecasting has always been one of my focuses. I look forward to working closely with members of the Typhoon Committee to seek further cooperation to improve warning services for the public", Mr. Shun said

New Appointment of Director-General of MSS

Ms Wong Chin Ling succeeded Mr Foong Chee Leong as the Director-General of the Meteorological Service Singapore (MSS) on 1 April 2011.

Ms Wong holds a BSc (Hons) degree in Physics from the National University of Singapore. She joined the MSS in 1985 and received her professional training in Meteorology at the UK Meteorological Office Training College. Prior to her latest appointment, she was the Deputy Director-General (2010-2011) and had previously



held various portfolios in Forecasting, Research and Development, Corporate Services, International Relations and Operational Services.

Within the framework of ASEAN, Ms Wong has actively participated in the Sub-Committee on Meteorology and Geophysics sessions and regional meetings on transboundary haze pollution. She has represented Singapore at various WMO and ICAO meetings and conferences. She also served as Vice-Chair of the 41st Typhoon Committee Session held in Chiangmai, Thailand.

New Director of the KMA



CHO Seok Joon gained a BSc degree in Meteorology from Seoul National University, Republic of Korea 1977, since then his entire career has been involved in meteorology.

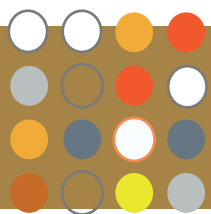
In 1977, he joined the Air Force as Weather Staff Officer and worked on promoting aeronautical meteorological research on extreme weather events to develop related technologies and sharing observation data among public, military and private sector until he discharged as Captain in 1981.

In 1981, he became the first weather reporter at a South Korea' premier public broadcaster, KBS and delivered accurate and timely weather forecast for nearly 20 years.

In 1985, he joined Coca-Cola Korea as PR Marketing manager and pioneered in incorporating meteorological information into marketing activities until 1987.

From 1999 to 2001, running Weather News Channel as Vice President, he broadened the audience by promoting the private meteorological sector, introducing new weather services to meet increasing health and industrial needs.

He became a member of the Policy Advisory Group



for the Advancement of Meteorological Technology and Services at the Korea Meteorological Administration in 2001 and strived to enhance the forecast accuracy under the SDS (Sand Dust Storm) Comprehensive Plan and provided advice on the mid-long term master plan for the vision and direction of the advancement of meteorological services until 2008.

In 2008, he took charge of the Climate Change Center and at Seoul School of Integrated Sciences and Technologies and delivered lectures on “National strategy on climate change in view of industrial development” and “Primary strategy for low-carbon and green growth in the face of the coming energy crisis caused by climate change” as Adjunct Professor.

In 2010, he was elected as Chairperson of the Korea Meteorological Association and focused on modernizing meteorological services to be more efficient and responsive to meet the increasing socio-economic demand by improving communication and feedback loops between service providers and users.

In 2011, he took charge as Director of the Education Center for Sustainability Management at Seoul School of Integrated Sciences and Technologies and has been serving as Visiting professor, raising awareness about the importance of sustainable management of the environment to respond to climate change and volatility among policy makers and decision makers in various sectors.

In 2011, he has been appointed Administrator at the Korea Meteorological Administration.

He published books <Intriguing Weather Stories> on meteorology by introducing everyday weather events, <Economics and Weather/ Economic Impacts of One Degree Celsius> on the rational and scientific management by incorporating meteorological information and other variables into business decisions and <Meteorology in Our Life> on how daily weather events have influenced people’s life and altered human behavior.

New Administrator of the PAGASA



Nathaniel T. Servando was appointed as the Director of the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA), on August 09, 2011. Mr. Nathaniel was an Acting Administrator from the period of January 31, 2011- August 08, 2011, with the functions:

- Manages the operations of the agency
- Prepares plans, programs and activities to implement the institutional mandate
- Formulates policies to enhance programs, operating procedures and systems necessary to exercise essential functions of the agency
- Promotes and maintains linkages with government and non-governmental agencies and private organizations
- Manages Institutional resources to the fullest with effectiveness, efficiency and economy
- Generates resources for the agency

From 2004 to August 2011, he was appointed as a Deputy Administrator for Research and Development:

- Serves as project leader on Meteorological Instrumentation project, and installation of Doppler Weather Radar in the Philippines.
- Supervises and implements Programs related to Research & Development Initiatives.
- Conducts collaborative basic and applied researches in Meteorology
- Assists in the Formulation of Severe weather Bulletins and Advisories to mitigate the adverse impacts of typhoons.
- Assists in making recommendation to higher authorities on the suspension of classes and work in government offices during extreme weather events.
- Assist in answering public queries through media interview on issues related to Meteorology and allied services.
- Assists in Human resources development of PAGASA.



2011



TC News from Members

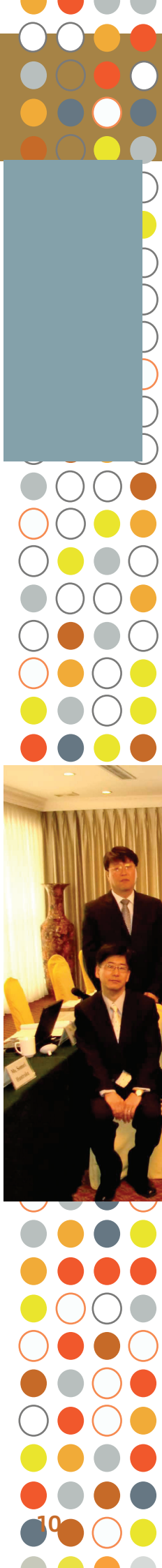
China



1. Donation of CMACast and MICAPS 3.1 system.

The China Meteorological Administration (CMA) presented CMACast user receptions and MICAPS systems (Meteorological Information Comprehensive Analysis and Processing System) to 17 developing countries in Asia (including DPRK, Laos, Malaysia, the Philippines, Thailand, Viet Nam, which are TC Members) on 11 April 2011. Participants from those recipients also attended the Regional WIS Training Seminar from 11 to 14 April 2011, co-sponsored by WMO. CMACast is a new DVB-S2 standard satellite data broadcast system of CMA. It disseminates both the satellite data and routine meteorological data in C band (3400-4200GHZ) via AsiaSat 4 satellite (122.2°E) to its users. MICAPS provides an effective means for forecasters to prepare and issue weather forecasts, including typhoon forecast. It has more powerful functions for the forecasters to interactively view, analyze, combine and manipulate weather data.





2. Meeting on Urban Flood Risk Management (UFRM) Project.

China hosted a meeting on Urban Flood Risk Management (UFRM) Project, from 4 to 5 April 2011 in Beijing. 13 participants from WGM, WGH and WGDRR, Members of Pilot Cities, China and TCS had a thorough discussion on the UFRM Good Practice Survey Report, the Pilot City Mission Report, the proposal of drafting UFRM guidelines, 2011 implementation plan of UFRM, etc.



3. Visit to UFRM good practice city (Shanghai, China, 28-31 May 2011).

The Bureau of Hydrology of the Ministry of Water Resources of China organized a



3-day UFRM good practice city visiting in Shanghai. Supported by Shanghai Meteorological Bureau, Shanghai Water Authority (SWA) and Taihu Lake Basin Water Resource Authority (TBA), delegates from TMD, PAGASA and TCS exchanged experience on UFRM, flood forecasting, urban inundation mapping and possibility of conducting a tangible technical cooperation.

4. On-job Training for Pilot Cities 8-19 August 2011 Shanghai, China.

Shanghai Typhoon Institute of the China Meteorological Administration conducted the UFRM on-job-training on QPE/QPF operation for 3 staffs from TMD, Thailand. The courses mainly focus on three parts: QPE (satellite, radar, GPS, Lidar, lightning), QPF (Data assimilation, GRAPES-TCM, ensemble), WENS (WMO Expo 2010 Nowcast Services Demonstration Project) and MHEWS Operational platform.



5. Expert Meeting on Assessment Report on Typhoon Climate Change. The Expert Meeting on Assessment Report on Typhoon Climate Change was held in Shanghai, China on 21-22 November 2011, with the support of Typhoon Committee Trust Fund and the Shanghai Typhoon Institute of the China Meteorological Administration. 7 experts from China Hong Kong, China; Japan; Macao, China; the Republic of Korea; TCS; USA; and WMO attended the meeting.

6. Workshop on Web-Based Typhoon Forum. The Workshop on Web-Based Typhoon Forum was held on 22 November 2011, in Shanghai, China, with the support of Typhoon Committee Trust Fund and the Shanghai Typhoon Institute of CMA. The theme of the meeting was to discuss how to increase the interactivity and influence of the forum on operational forecast. Participants from National Typhoon Centre of



KMA, National Meteorological Centre of CMA, Shanghai Typhoon institute of CMA and China Eastern Regional Climate Centre of CMA attended the meeting.



9. Verification of landfall typhoon forecast, 2011. Typhoon Landfall Forecast Demonstration Project (TLFDP) led by CMA has released a website of English version in late June, 2011 (<http://tlfdp.typhoon.gov.cn>). The application of the techniques and products in Typhoon Committee region has been promoted. Most models show skills at one or more leading-time levels and some are comparable to or even better than official forecasts in certain aspects. The verification system for tropical cyclone track and intensity forecast, especially ensemble prediction and landfall forecast was improved.

7. 4th China-Korea Joint Workshop on the Tropical Cyclones. 4th China-Korea Joint Workshop on the Tropical Cyclones will be held in Shanghai and Beijing, China on 18-23 December 2011, sponsored by CMA. 6 experts from KMA will attend the meeting.

8. TC Research Fellowships offered by CMA. Mr. Sukrit Kirtsaeng from Thailand was granted a TC Research Fellowships offered by CMA, working on the project entitled "Improvement of Prediction Method for the Rapid Intensification of Tropical Cyclones over the South China Sea" starting from 1 November to 30 December 2011. Another fellowship will be granted to Mr. Raymond Ordinario from the Philippines to work on the project entitled "Application of Numerical Ensemble Prediction to Forecasting Typhoon Sharp Turning Tracks", which will begin from 1 January to 28 February 2012.

10. Publication of Tropical Cyclone Review, 2011. On TC 43rd Session, it was agreed to publish an international journal "Tropical Cyclone Research and Review" with focus on tropical cyclone issues and topics, including operational forecast and scientific research, hydrological effects and disaster risk reduction. STI/CMA and Typhoon Committee have established the editorial committee and an office. The sample edition has been delivered on the meeting and the International Standard Serial Number (ISSN) for the journal was registered.

11. 2nd Assessment Report on the Impact of Climate Change on Tropical Cyclone Track and Impact Areas in TC Region, 2011. To facilitate the exchange of the information among the expert team members, a ftp server for this purpose was set up by the Shanghai Typhoon institute of the China Meteorological Administration. The draft of 2nd assessment report will be revised further by experts after the expert



team meeting in Shanghai and will be presented at the 44th session of Typhoon Committee and to solicit opinions from Typhoon Committee Members.

12. Quick Radar Data Assimilation & Analysis System for Landfall Typhoons.

In the typhoon season in 2011, a quick radar data assimilation & analysis system has been set up at the National Meteorological Centre of CMA, and put into operation. This system is based on ARPS3DVAR and composite cloud analysis techniques, which was developed by the Oklahoma University, as a quick data assimilation platform incorporating Doppler radar-derived data and other data (e.g. conventional data and predicted fields from models). Fig. 1 presents the 10-m wind field products for the strong typhoon Neast (No. 1117) from the quick radar data assimilation and analysis, which provide quantitative and objective basis for operational high wind intensity forecasts.

10m Wind Speed analysis (m/s)

Time: 2011-09-28_21(UTC)

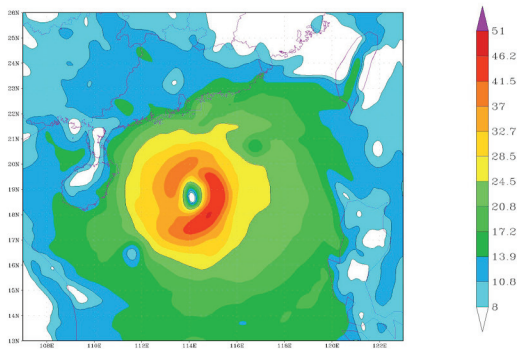


Fig. 1a: .10m wind fields analysis for strong Typhoon *Neast* with quick radar data assimilation (29 Sept. 2011, UTC: 05:00)

10m Wind Speed analysis (m/s)

Time: 2011-09-29_06(UTC)

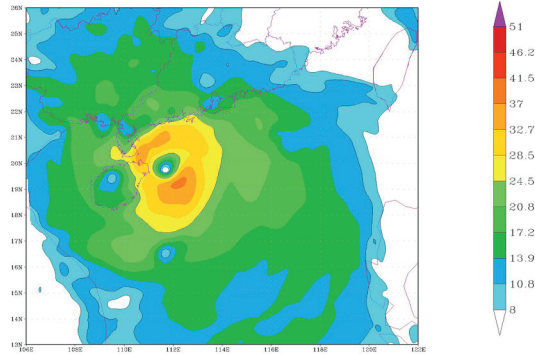


Fig.1b: 10m wind fields analysis for strong Typhoon *Neast* with quick radar data assimilation (29 Sept. 2011, UTC: 14:00)

13. Regional Typhoon Prediction Model - GRAPES-TYM.

Based on GRAPES-MESO, GRAPES-TYM is a meso-scale typhoon prediction model developed by NMC/CMA, as an important component of the refined typhoon forecasting experiment. It has been put into operational use in the typhoon season in 2011 on a trial basis, operating twice a day (i.e. 00, 12 UTC). Its domain is shown in Fig. 2. In 2011, the error ranges for 24-h, 48-h and 72-h typhoon track forecasts are 98, 181 and 311 km respectively, which are broadly equal to those of NMC's global model T213. GRAPES-TYM has improved the initial fields by using typhoon eddy initialization techniques, and it has also made some necessary improvements for the physical processes and dynamic framework of the GRPAES_MESO model. The eddy initialization scheme for GRAPES_TYM is mainly based on artificial eddies from a non-linear equilibrium model, combining with cyclone separation technique, and its operating flow is shown in Fig. 3.

The major improvements to its physical processes and dynamic framework include (1) rectified parameterization for sea roughness under strong wind has improved calculations of both underlying surface momentum and heat flux; (2) a heat-expansion term has been introduced in model's continuous equation, to improve TC intensity forecasts; (3) In the model initialization process, plausible adjustments are made for the model physic values with surface pressure, allowing the model to get full information from the TC eddy initialization scheme.

14. Geostationary Satellite-based Objective Typhoon Positioning System.

During TC season in 2011, a geostationary satellite-based objective TC positioning system was preliminarily set up at NMC/CMA targeted to Northwest Pacific and the South China Sea on a trial run. This system was accomplished by introducing and improving the Advanced Objective Dvorak Technique (AODT) developed by the Cooperative Institute for Meteorological Satellite Studies (CIMSS) at the University of Wisconsin, processing the data from FY2C/D/E, Japan's MTSAT stretched full-disc images from infrared channel 1 (in CSV format); The system also adopts mathematical morphology, graphic processing techniques, intelligent information processing techniques, etc.. Currently, it mainly processes MTSAT imagery data with a 0.05° horizontal resolution from the Kochi University, Japan.

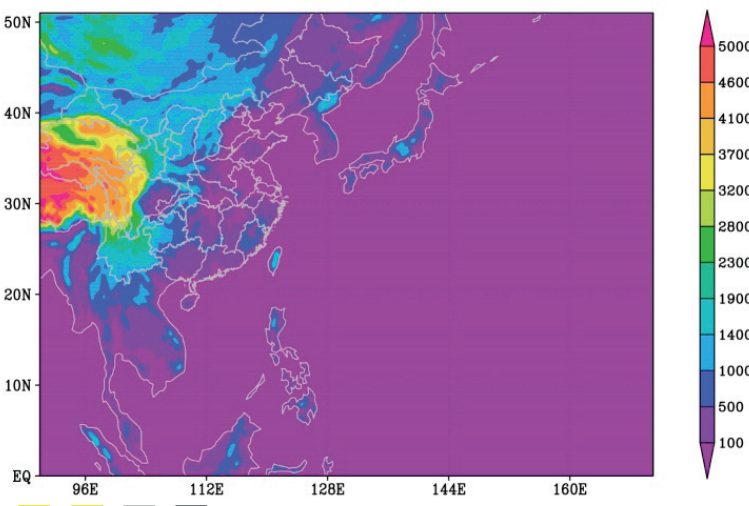


Fig 2: Regional domain of the typhoon prediction model - GRAPES-TYM.

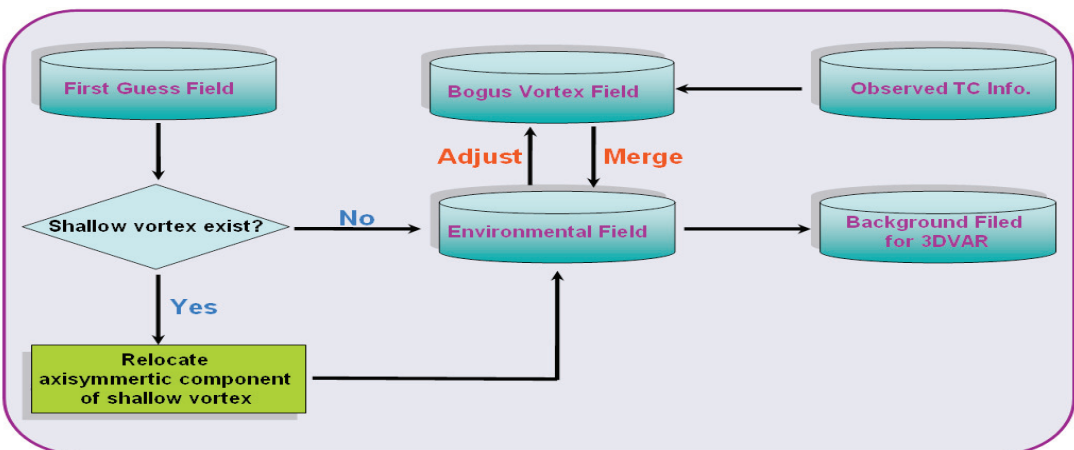


Fig. 3: A flow chart of GRAPES-TYM's TC eddy initialization scheme.

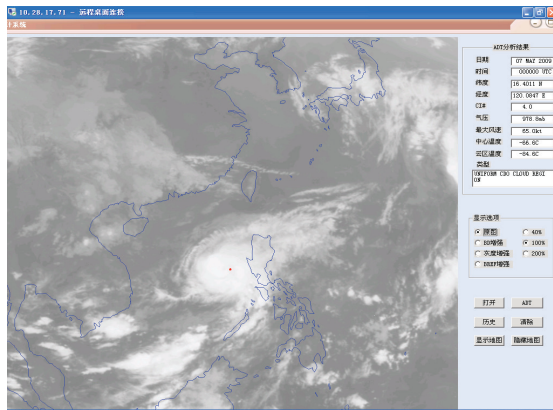


Fig. 4: An interface of objective TC intensity estimation system.

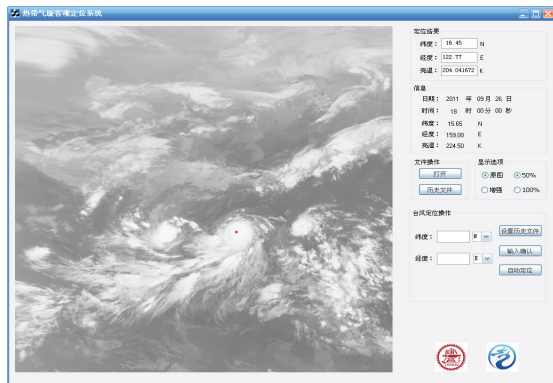


Fig. 5: An interface of the TC positioning system.

15. **Participation in QPE/QPF workshop.** Participant from CMA gave a keynote lecture on the QPE/QPF workshop held in Nha Trang, Viet Nam on 6 November, 2011.

16. **Participation in the 2nd IBTrACS and IWSATC (International workshop of satellite application on tropical cyclone) Workshop.** Experts from Shanghai Typhoon Institute of China Meteorological Administration and Shanghai Satellite Remote-sensing and Measurement Application Centre participated in the 2nd IBTrACS and IWSATC held in Hawaii, USA, from 11-16 April 2011.



17. Mr. Wang Haiping, a forecaster from the Typhoon & Marine Meteorological Forecast Centre of the China Meteorological Administration (CMA) participated in the Seminar on QPE/QPF of the Typhoon Committee (TC) held in Petaling, Malaysia From 19 to 23 September 2011.





Hong
Kong,
China

1. Emergency Preparedness

HKO participates in regular exercises and drills with relevant government departments and organizations for preparedness against tropical cyclones with the view to minimizing casualties and damage. These exercises and drills range from table-top exercises to full-scale operational drills to test the communication between different departments, provision of alerts to members of the public, command and control as well as search and rescue operations. A full-scale operational drill on storm surge flooding at a rural village community was conducted in July 2011 with the participation of 10 departments and organizations. The drill allowed government departments and local communities to familiarize themselves with the related emergency response plan so that they would be able to act swiftly to evacuate residents and minimize the impacts caused by flooding upon the issue of an early alert by HKO.

In 2011, localized storm surge alerts were activated promptly during the approach of tropical cyclones Nock-ten (1108), Nesat (1117) and Nalgae (1119). Appropriate precautions were taken in time against possible flooding caused by storm surge.



Figure 1. Various government departments took part in an operation drill for storm surge flooding at Tai O, a rural village community, on 5 July 2011 (Photo courtesy of Information Services Department)

2. Data Collection Flight for Tropical Cyclone

HKO carried out historically the first reconnaissance flight specifically around the tropical cyclones over the South China Sea in collaboration with the Hong Kong Government Flying Service (GFS). The flights were taken for Tropical Storm Haima (1104) on 20 and 22 June 2011, and for Typhoon Nesat (1117) on 28 September 2011. Up to 20 observations of wind, pressure, temperature and humidity measurements were recorded per second, providing high spatial-temporal resolution of observation along the flight routes. They provided very useful reference (Figure 2) in determining the strength of the storm and supporting decision-making in the provision of tropical cyclone warning



service. The flight observation data were further processed for ingestion into the data assimilation system of the HKO's Non-Hydrostatic Model. Positive impacts are obtained on the analysis of low-level winds and moisture around the tropical

cyclones, as well as reduction of forecast track errors in the model simulation. HKO would continue to collaborate with GFS to collect meteorological data using aircraft, in order to fill in the data void over the northern part of the South China Sea.

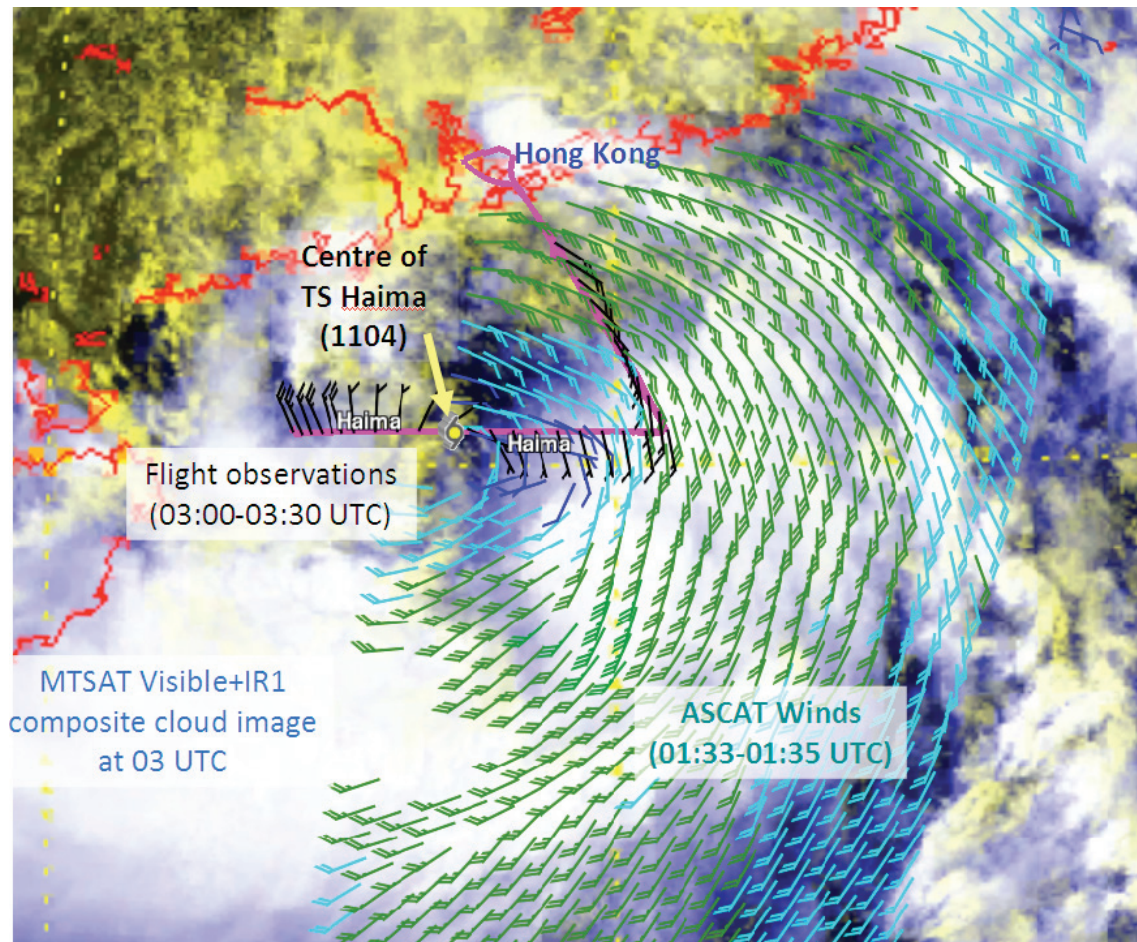


Figure 2. Wind observations (in black) recorded by GFS flight for TS Haima (1104) during 0300-0330 UTC on 22 June 2011 (wind barbs reduced to 10 m above sea level in black and flight path in magenta). ASCAT sea surface winds and MTSAT composite cloud image are overlaid to delineate wind flow and convection around Haima.

4. New vortex tracker for high-resolution numerical weather prediction model

In mid-2010, HKO commissioned the 10-km Non-Hydrostatic Model (Meso-NHM) to replace the old 60-km Operation Regional Spectral Model (ORSM) for generation of various model guidance. A new tropical cyclone (TC) tracking algorithm has also been implemented, taking into account the 850 hPa vorticity, in addition to the mean sea level pressure, to overcome the problem of mis-identifying lee-lows over rugged terrain (such as Taiwan and Luzon) as the centres of TCs in the old TC tracking scheme.

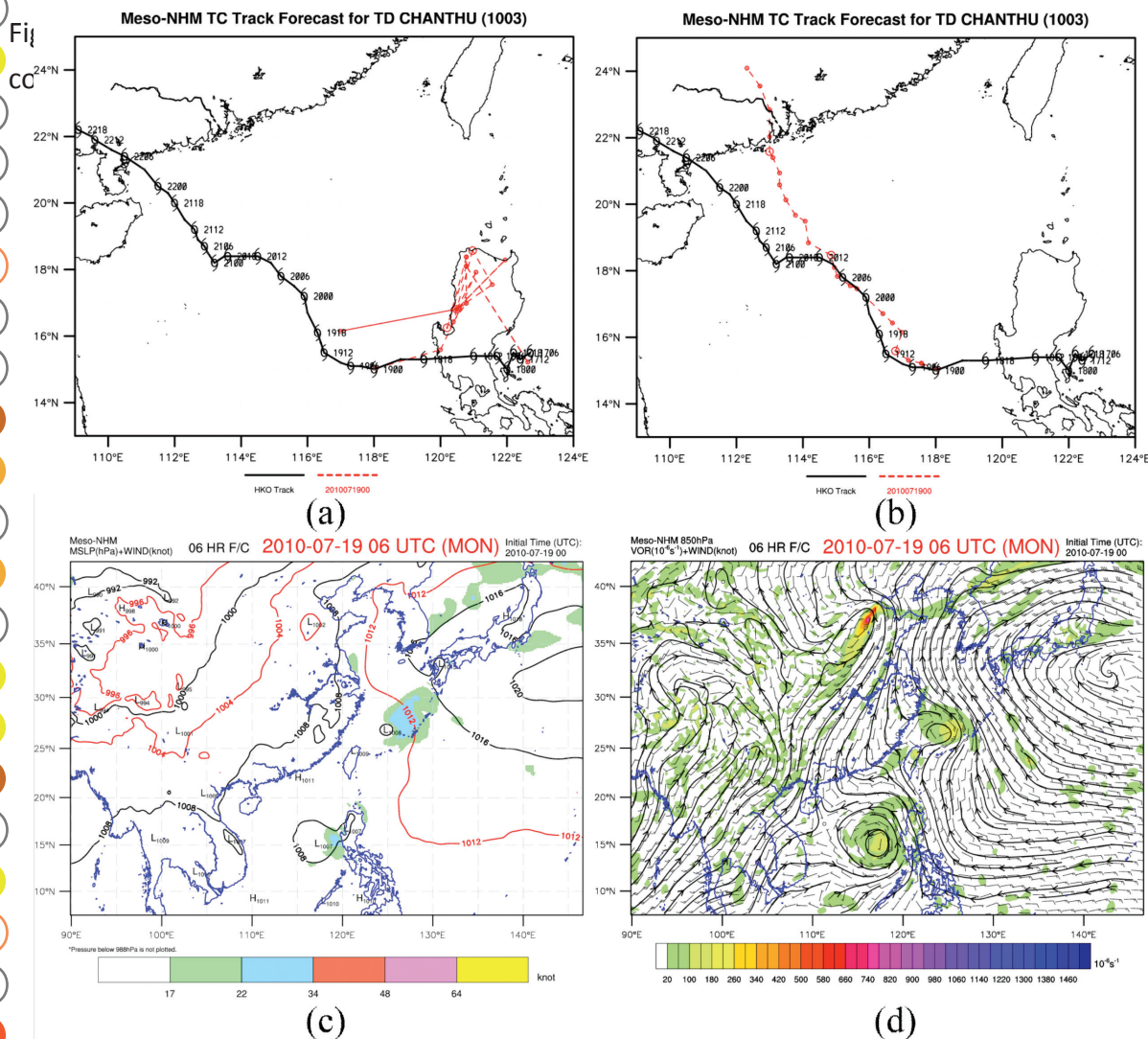


Figure 3. Forecast track of Typhoon Chanthu (1003) generated with (a) the old TC tracker and (b) the new TC tracker; and the corresponding T+6 h forecast of (c) the mean sea level pressure field and (d) the 850 hPa streamline and vorticity field.

With the implementation of the new TC tracker, HKO started the dissemination on GTS of the TC forecast guidance bulletins based on Meso-NHM on 1 June 2011, a sample of which can be found at <http://www.weather.gov.hk/nhm/SAMPLE.TXT>.

5. Real-time tropical cyclone track verification

NWP models sometimes incur very significant biases in forecasting tropical cyclone (TC) motion. Notable examples include Typhoon Fengshen (0806) in 2008 and Super Typhoon Megi (1013) in 2010. Learning from these cases, HKO developed a real-time TC track verification tool and put it into operation for the 2011 TC season. The tool helps the forecasters monitor the development of any TC track biases by different models so



that they can take that information into account when formulating their TC track forecasts. Its application during the passage of Tropical Storm Haima (1104) in June 2011 is illustrated in Figure 4.

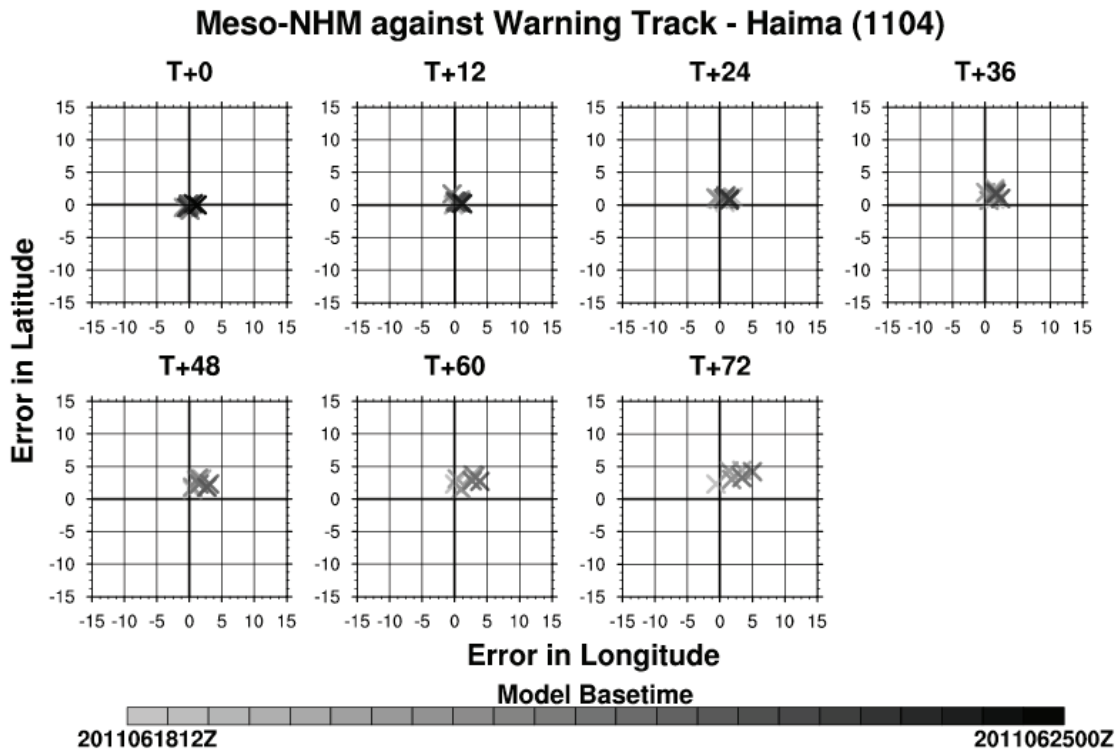


Figure 4. Scatter diagram of the deviations of Meso-NHM TC forecast positions from HKO's warning positions for Tropical Storm Haima (1104).

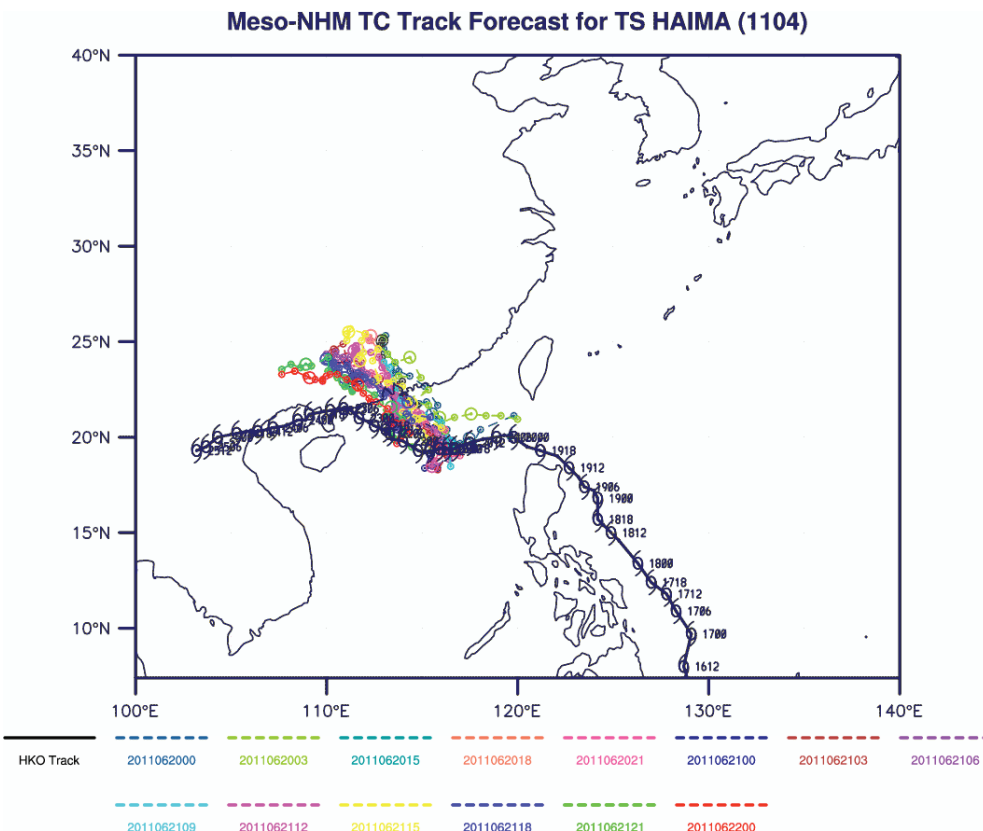


Figure 5. Forecast tracks of Haima from different model runs of Meso-NHM (red the latest). The black line denotes the HKO's warning track.

The real-time verification in the case of Haima suggested that: (i) the TC track forecasts from the model in question (HKO's Meso-NHM) displayed a persistent east bias (and less apparently, a north bias); and (ii) the bias increases with forecast hour. Such information would be helpful to the forecasters to adjust the model forecast TC track (Figure 5), taking into account the persistent bias of the model.

6. Enhancing warning dissemination by the Severe Weather Information Centre (SWIC)

The SWIC website (<http://severe.worldweather.wmo.int/>), operated by HKO for WMO, continues to serve as a major and authoritative channel for dissemination of real-time tropical cyclone warnings and information worldwide. In the 12-month period ending October 2011, the total number of page views exceeded 24 million.

Supported by the Typhoon Committee, the pilot project, SWidget service, started in 2009 to provide users with an electronic widget for warning dissemination in the region through the SWIC platform. Up to October 2011, warnings are available in near real time from five contributing weather services, viz Hong Kong, China; Macao, China; and Guam, USA; Singapore and Republic of Korea. SWidget is gaining popularity with the visit figures up to October 2011 exceeding 14 million since its launch in June 2010. More official weather services are planning or being invited to participate.

To increase the public's awareness of tropical cyclone around the world, a project with cooperation between HKO, WMO and Google is in progress to enhance the presentation of TC information on Google Earth. TC advisories for all ocean basins collected by the SWIC have been converted into RSS format by HKO for incorporation into Google Earth for display.

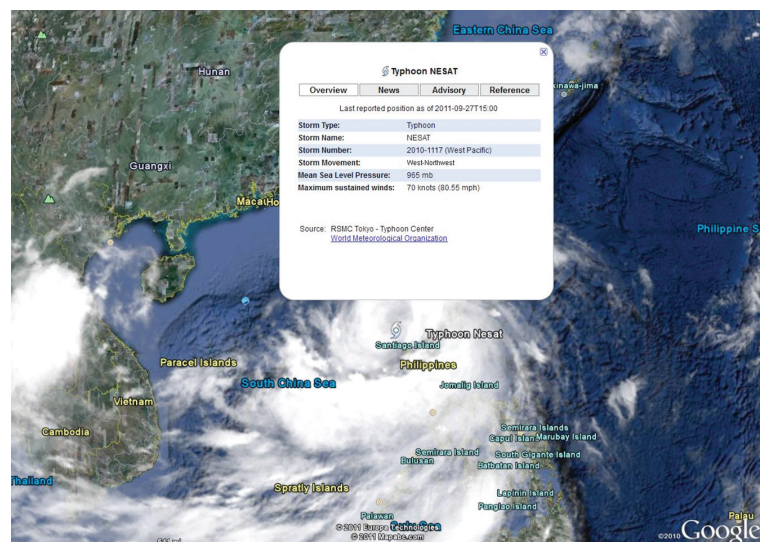


Figure 6. Sample display of Google Earth showing the TC information from SWIC.

7. Disseminating tropical cyclone information and warnings via smartphones and social networking websites

With the rapid increasing popularity of smartphones in the market, HKO developed a smartphone application "MyObservatory" in 2010 to provide individuals with a personalized weather service anytime and anywhere. "MyObservatory" automatically provides the latest location-specific weather

information from the weather stations closest to the user. The application also provides the latest tropical cyclone warnings as well as the tropical cyclone track. In addition, its new version was launched in March 2011 with a new “weather warning push notification” service whereby the application notifies the user immediately when there is a change in the warning status, e.g. the issue of a tropical cyclone warning signal. At present, “MyObservatory” are available in iPhone and Android platforms (http://www.weather.gov.hk/myobservatory_e.htm) and it has been well received with very high popularity. The total number of page views since its launch in March 2010 to the end of October 2011 has exceeded 1,500 million.



Figure 7. Sample displays of “MyObservatory” showing the tropical cyclone forecast track and push notification of the issuance of a tropical cyclone signal.

QR code for download of iPhone Version of MyObservatory

QR code for download of Android Version of MyObservatory

The fast growing popularity of social networking websites offers an unprecedented opportunity as a new channel for effective dissemination of weather warnings and information. Further to its Twitter service (<http://twitter.com/observatoryHK>) launched in September 2010, the HKO started in March 2011 to deliver latest news and real-time weather warnings including TC warnings on another popular social networking platform – Weibo (<http://weibo.com/observatoryHK>). Apart from cost-effectiveness for implementation and maintenance, these popular social networking platforms can reach out to millions of international travelers coming to Hong Kong.

8. Satellite-based forecasting of significant convection associated with tropical cyclones to aid Air Traffic Flow Management

With significant growth of air traffic, the development and movement of convective weather within and in the

vicinity of the Flight Information Region (FIR) is of concern to the Air Traffic Control (ATC) in Hong Kong. HKO has provided to ATC “significant convection forecast products” for key ATC areas in Hong Kong FIR up to 12 hours ahead since June 2010 on a trial basis. A satellite convection cloud prediction system was developed in addition to a radar-based nowcasting system to support forecasters who would fine tune significant convection forecasts

generated from NWP model outputs. The satellite-based system is particularly useful for forecasting convective cloud clusters of major weather systems such as tropical cyclones. Deep convection areas are first differentiated based on the difference of cloud top temperatures from IR1 (10.3–11.3 μm) channel and IR3 (6.5–7.0 μm) channel of the MTSAT satellite. Two colour-coded levels, viz. yellow and red, are used to delineate the vertical extent of deep convection with the latter reaching the upper part of the troposphere or beyond. The forecast positions of deep convection cloud clusters are generated at hourly intervals up to 12 hours ahead by using multi-grid optical flow method and advection technique. They match rather well with the observations in some tropical cyclone cases such as Typhoon Nesat (1117) as shown in Figure 8.

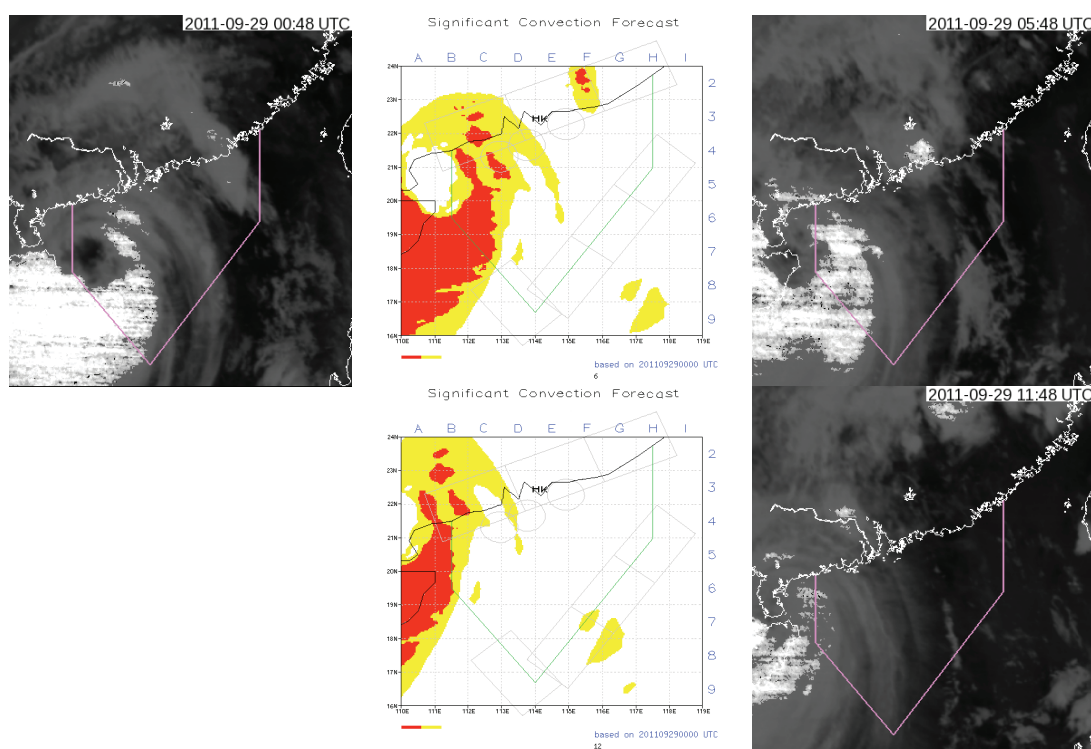


Figure 8. 6-hour forecast (upper middle) and 12-hour forecast (lower middle) of convective cloud clusters generated from the HKO’s satellite convection cloud prediction system based on the deep convection satellite image at the initial time of 00 UTC on 29 September 2011 (left) when Typhoon Nesat (1117) was moving across the northern part of the South China Sea. The red regions represent deep convection in the forecast. On the right are satellite images taken at the respective forecast time where deep convection is shown in bright white.



9. Towards improvement in long range forecast of tropical cyclone activity

Since 2001, HKO has been providing the forecast of annual number of tropical cyclones affecting Hong Kong to the general public to facilitate planning and preparedness against tropical cyclones. The forecast is generally phrased in a range of consecutive numbers, e.g. 5 to 7 tropical cyclones, and disseminated in March well before the start of the tropical cyclone season. Formulation of the annual tropical cyclone forecast used to be based on a conceptual model using the forecast El Niño/La Niña status of the year as predictor. However, years of implementation and experience suggested that the skill is more or less on a par with that of the climatology. In recent years, the Observatory explored a statistical-dynamical method to improve the annual tropical cyclone forecast using dynamical climate model outputs provided by NOAA, USA which is one of the Global Producing Centres for Long Range Forecasts (GPC) designated by WMO.

Tropical cyclone activity affecting Hong Kong is currently defined as the number of tropical cyclones coming within 500 km of the city (N500). The Poisson distribution is employed to model the distribution of N500, involving the average number of occurrence estimated from historical data. In the new statistical-dynamical approach, the forecast is generated by assuming that

the average number of occurrence depends on some dynamical environmental factors, for instance sea surface temperature and upper-air circulation, which are related to tropical cyclone genesis and movement respectively. These environmental factors are extracted from the NOAA global dynamical climate model outputs. In order to have a fair assessment of the forecast skill, cross-validation has been applied to the whole process: from predictor selection to forecast model building and verification of prediction based on data in 1982-2009.

Figure 9 shows the time series of actual observations of yearly N500 of Hong Kong and the forecasts given by the new statistical-dynamical approach. The climatological forecast gives a root mean squared error of 1.87 while the statistical-dynamical approach is able to reduce the forecast error by 30% to 1.28. Model outputs from other GPCs will be tried out and more studies on the extraction of environment factors will be conducted with a view to further improving the forecast skill.



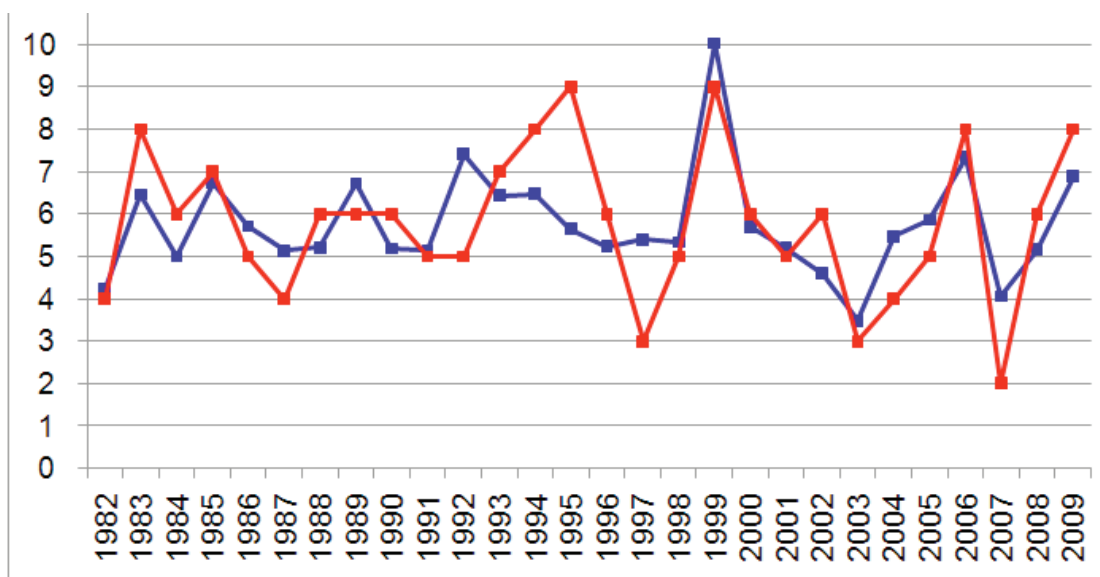
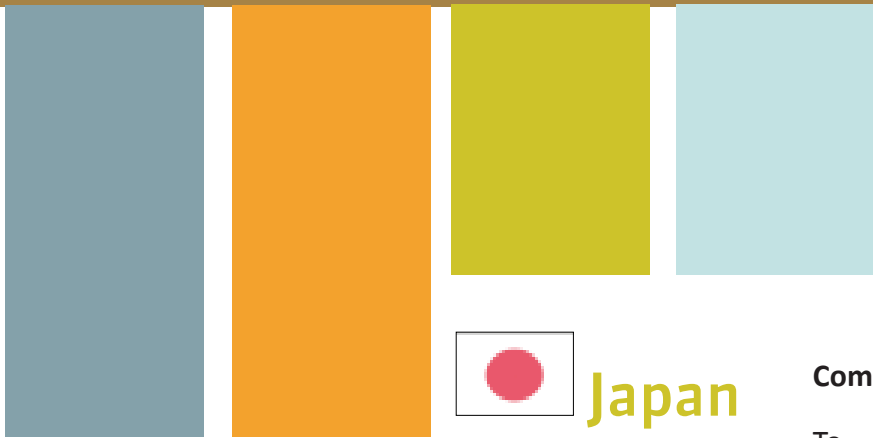


Figure 9. Observations of yearly number of tropical cyclones coming within 500 km of Hong Kong (red) and forecasts given by the statistical-dynamical approach (blue) from 1982 to 2009.

10. Typhoon Committee Research Fellowship

The Typhoon Committee Research Fellowship offered by HKO in 2011 was awarded to Mr. Nursalleh K Chang, Senior Assistant Director of Marine Meteorology and Oceanography Division of Malaysian Meteorological Department. Mr. Chang embarked on a two-month attachment to the Forecast Systems Division of HKO from late October 2011 to work on a project "Implementation of Tropical Cyclone Intensity Forecast in the Tropical Cyclone Information Processing System (TIPS) of the Hong Kong Observatory". The study compared the performance of various guidance techniques in forecasting the intensity of tropical cyclones over the South China Sea and the western North Pacific and the results would be applied in

a new module on TC intensity forecast as an enhancement of the TIPS.



Data. For more details, please visit the GISC Tokyo portal site at <http://www.wis-jma.go.jp/>.

Provision of Storm Surge Distribution Maps for Typhoon Committee Members

To establish a regional storm surge watch scheme suitable for the Typhoon Committee region, the ESCAP/WMO Typhoon Committee adopted the Annual Operating Plan for 2010 at its 42nd session (Singapore, January 2010). In response, JMA has collected bathymetric and tidal data from Typhoon Committee Members since 2010, and has developed and begun operation of a numerical storm surge model covering most of the Typhoon Committee region.

Based on this preliminary work, JMA started issuing storm surge distribution maps for Typhoon Committee Members through its Numerical Typhoon Prediction website (<https://tynwp-web.kishou.go.jp/>) on June 1, 2011.

Registered users can download normal-image (covering the whole calculation area) and enlarged-image (covering areas around the typhoon of interest) storm surge distribution maps and select any 3-hourly forecast maps up to 72 hours from the initial time.

JMA also plans to issue storm surge time series charts for selected stations starting in 2012.

JMA Starts Centres of WMO Information System (WIS)

As designated at the Sixteenth WMO Congress in June 2011, the Japan Meteorological Agency (JMA) began providing services for the Global Information System Centre (GISC) and eight Data Collection or Production Centres (DCPCs) on August 1, 2011.

The WIS is a new framework for the collection and sharing of information in support of all WMO and related international programs. The Global Telecommunication System (GTS) continues to serve time- and operation-critical information as an important part of the WIS, while Internet-based information services are being streamlined under a comprehensive catalogue for Data Discovery, Access and Retrieval (DAR).

JMA will be provided through the new servers of GISC Tokyo. Such services include the RSMC Data Serving System (RSMC DSS), the JMA WIS Prototype Service (MTSAT imagery and NWP products for SATAID software), and JMA High-resolution GSM

11th Typhoon Committee Attachment Training at the RSMC Tokyo - Typhoon Center

JMA's RSMC Tokyo - Typhoon Center provides assistance to members of the ESCAP/WMO Typhoon Committee in typhoon analysis and forecasting services. One of the Center's activities involves holding on-the-job training on typhoon operations for forecasters in the region to improve analysis and forecasting skills through the exchange of views and the sharing of experience in the field.

This year, two forecasters – Ms. Sinthaly Chanthana (from Lao P.D.R.) and Ms. Lai

Un Man (from Macao, China) – visited JMA Headquarters from 20 to 29 July, 2011, to participate in the 11th Typhoon Committee Attachment Training. The information covered included the following areas:

1. The Satellite Analysis and Viewer Program (SATAID)
2. Tropical cyclone analysis (Dvorak)
3. Tropical cyclone forecasting
4. Storm surge
5. Quantitative precipitation estimation (QPE) and quantitative precipitation forecast (QPF)



A courtesy visit to JMA Director-General Dr. Mitsuhiro Hatori

Mr. Hatori between Ms. Lai Un Man (right) and Ms. Sinthaly Chanthana (left) with National Typhoon Center staff (20 July, 2011, Director-General's office)

During the training, Typhoon Ma-on approached Japan and two tropical cyclones (Nock-ten and Muifa) were generated. As a result, the two trainees gained hands-on experience



of TC analysis and forecasting using real-time examples.



Discussion in the operation room (JMA's Forecast Division)



Lecture and training in JMA's seminar room

5th International Conference on Flood Management (ICFM5) September 27 – 29, 2011, Tokyo, Japan

ICFM5 Secretariat, in the International Centre for Water Hazard and Risk Management (ICHARM) organized the 5th International Conference on Flood Management held in Tokyo from September 27 to 29, 2011. More than 450 participants from 41 nations attended the event. ICHARM was established as part of the

Public Works Research Institute of Japan in March 2006 under the auspices of UNESCO.

The call for abstracts and online registration was met with a hugely positive response, with the ICFM5 Secretariat receiving 417 abstracts covering all the topic areas announced. More than 250 participants traveled to Tokyo from overseas for the conference in addition to approximately 200 attendees from across Japan. The International Scientific Committee reviewed all submitted abstracts for relevance to the ICFM5 objectives, and a total of 256 presentations were made during the three-day conference at various gatherings including plenary sessions, special sessions, oral parallel sessions and poster/exhibition sessions.

ICFM5 kicked off on September 27 at the United Nations University (UNU) in Tokyo with a welcome address and opening remarks by ICHARM Director Prof. Kuniyoshi Takeuchi. Mr. Michel Jarraud (WMO Secretary General), Prof. Soon-tak Lee (UNESCO-IHP Chair), Prof. Kazuhiko Takeuchi (UNU Vice-Rector) and Prof. Slobodan Simonovic (ICFM Ad-hoc Committee Chair) also spoke at the opening ceremony.

A number of high-level experts were also invited to make presentations at the International Forum on Mega-Water Disasters on the first day of ICFM5. The forum was held by MLIT and other governmental organizations in conjunction with ICFM5 with the main objective of incorporating recent experiences and lessons learned from the Great East Japan Earthquake and

tsunami into ICFM5. Sessions involving high-level experts and decision makers were convened at the event, and their discussions were reflected during the conference. His Imperial Highness the Crown Prince of Japan and other high-ranking officials, including Mr. Mir Changez Khan Jamali, Pakistan's Minister for Science and Technology, and Mr. Rogelio Singson, Secretary of the Philippine Department of Public Works and Highways (DPHW), also took part in the event.

The second and third days of ICFM5 were dedicated to special, parallel and poster/exhibition sessions. All participants

received a book of abstract proceedings containing more than 300 accepted abstracts in both hard copy and digital form. A copy of the first ICHARM book series on large-scale flood reports was also distributed to all participants as a contribution to the International Flood Initiative. The conference ended on September 29 after a reading of the draft ICFM5 declaration and the announcement of Brazil as the host of ICFM6.

For more information, please visit the ICFM5 website at <http://www.ifi-home.info/icfm-icharm/icfm5.html>.



Tokyo, Japan

27-29 September 2011

ICFM5

5th International Conference on Flood Management



SABO workshop on project for “Hazard Mapping for Sediment-related Disaster”

The SABO Dept. of MLIT, NILIM and SABO technical center, Japan, have been conducting projects “Sediment-related disaster forecasting warning system project” (2002-2008), “Hazard Mapping for Sediment-related disaster” (2009 - On going). For effective and efficient evacuation, establishing the system to connect “Forecasting” and “Hazard map” for warning and evacuation is essential. Therefore prior to 6th TCIWS, On November 6, SABO Workshop was held in Nha Trang, Viet Num, successfully. In SABO Workshop, a lecture and field training, regarding how to establish the warning and evacuation system against sediment-related disaster, was held to explain the system used in Japan and how the meteorological agency, local disaster prevention section, municipality office and local residents act to operate warning and evacuation systems effectively for 20 participants from six TC members (China, Japan, Korea, Lao PDR, Thailand, Viet Num) and local engineers.



Photo-1 Lecture



Photo-2 Field training

In the 6th TCIWS, the progress of the Project was reported that participants of the project had already selected model sites, and will set hazardous area at their model sites by referring the methodology of Japan in 2011. In 2012, the guideline of the project including Japanese technique of “How to identify hazardous area”, “How to make hazard map” and participants’ examples will be published as final report.

Assistance Relating to the Widespread Flooding in Thailand

A variety of assistance efforts relating to the widespread flooding in Thailand has implemented

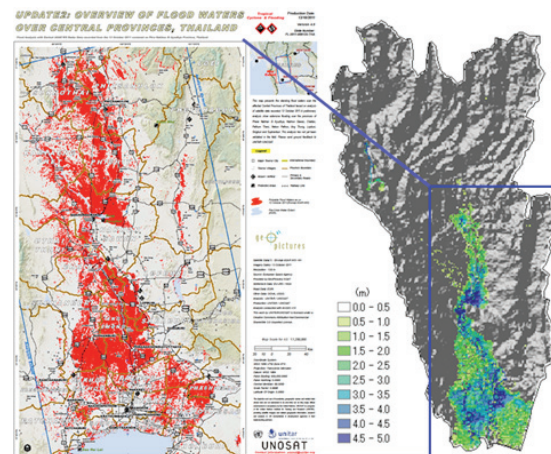
1. Estimation of precipitation in the Chao Phraya River basin

Mean precipitation values for the Chao Phraya River basin for a three-month period (July – September) in each of the last four years (2008 – 2011) were estimated using satellite monitoring data from GSMaP_MVK for 2008 and from GSMaP_NRT for 2009 – 2011 acquired from the website (*1) of the Japan Aerospace Exploration Agency (JAXA). In the estimation, hourly mesh precipitation data (0.1° x 0.1°) for the whole of the basin were accumulated, and the mean precipitation was calculated. The results indicated that precipitation levels for July, August and September 2011 were higher than those of the average for the previous three years (2008 – 2010) by as much as 40%, 27% and 68%, respectively. The total precipitation during the three-month period in 2011 was estimated at 710 mm, which was 45% more than the average for the previous three years (490 mm). This is considered to be the reason for the widespread inundation seen across the whole of the Chao Phraya River basin.

*1 <ftp://rainmap:amechi-zu@hokusai.eorc.jaxa.jp/>

2. Computer simulation of flooding in the Chao Phraya River basin

The International Centre for Water Hazard and Risk Management (ICHARM) conducted computer simulation on the unprecedented flooding seen in Thailand's Chao Phraya River basin. The simulation was based on a rainfall-runoff-inundation (RRI) model with satellite-based topographic and precipitation data. Prior to the official release of the results, it was confirmed that the simulated flood inundation area was largely in agreement with a satellite-based inundation image taken on 13 October. In mid-October, when the flooding was just approaching its peak, the first simulation results were released to facilitate emergency response efforts. The simulation suggested the likelihood that the area from Ayutthaya to northern Bangkok would still be inundated until late November. The results were also shown on several TV news programs including those of NHK. The information has also been helpful for other purposes, and was highly appreciated in work such as the development of restoration plans for submerged industrial estate complexes and resident preparation. ICHARM also conducted field investigations together with UNESCAP to collect necessary field information for the improvement of the model's performance so that it can also be used to review future flood risk management in the Chao Phraya River basin.





3. Dispatch of experts and drainage vehicles

MLIT dispatched seven experts at the beginning of the period of flooding.

Expert on flooding countermeasures: October 19 to November 2

Experts on drainage (two people) support measures (two people): October 29 to November 18

Experts on airports (two people): October 27 to November 1 (one person) and 2 (another person)

Experts on railways (two people): October 26 to November 2

In order to support Thailand's drainage efforts, 10 pump drainage vehicles (belonging to MLIT's Chubu Regional Development Bureau) and 51 (880 man-days) experts which were composed of members from MLIT (fourteen people), Ministry of Foreign Affairs (MOFA) (two people), Japan International Cooperation Agency (JICA) (nineteen people), Japan Water Agency (one people), Advanced Construction Technology Center (one people) and private enterprises (fourteen people) had been dispatched. Drainage activities have been conducted from November 19th to December 20th to support the Thai Government's efforts in the affected areas and around 8,100,000 m³ of water was drained.





1. Introduction of the 'Cold and Warm Weather Alert SMS Service'

Elderly are vulnerable to weather changes. In order to help the elderly be aware of the weather changes at their earliest convenience, the Macao Meteorological and Geophysical Bureau (SMG) introduced the "Cold and Warm Weather Alert SMS Service" to the social welfare organizations. The service aims to enable the social work practitioners to master the forthcoming weather conditions so that they are able to take precautionary measures for the elderly when necessary. Over 40 units of welfare organizations have registered for the service.

2. Official launch of the "Flooding Alert SMS Service"

SMG has launched the "Flooding Alert SMS Service" since August last year. The purpose of setting up this alert service is to notify shop owners situated in the low-lying areas about flooding when it is likely to occur. After a trail service for half a year, the Bureau found a satisfactory outcome of this service. Feedbacks were collected from the users reflecting that the service

is effective as they can have sufficient time to make preparations before the flooding occurs. In the meantime there are over 1,000 registrations for this service.

3. Celebrations of the World Meteorological Day 2011

The theme of the World Meteorological Day 2011 is 'Climate for You'. With that purpose SMG organized a series of activities as below:

Roving lectures were being held between March and June in many colleges in Macao. Topics covered meteorological observations, tropical cyclone and climate change. Our aim is to strengthen students' knowledge on meteorology and to promote our weather services to the community.



Starting from 23rd March 2011, the real-time weather information of Macao will be uploaded into the weather website of the China Meteorological Administration by SMG. Information includes weather forecast and the latest severe weather



warnings of Macao. We hope that the website helps the tourists understand the current weather conditions of Macao and make good preparation for their trip before they come to Macao.

fair was composed of a wide variety of programs, such as lecture about tropical cyclone, game booths to promote basic meteorological knowledge and simple weather observations, which all helped



On 27th March, our Bureau organized a fun fair with the purpose of promoting meteorological science and the public weather services of the Bureau. The fun

to enhance the public's interest in meteorology. In addition, exhibits included exhibition panels and meteorological instruments were situated in the venue.





4. Drawing peoples' awareness on hot weather

On 5th August SMG organized a charity activity with the Union of Neighbors Association of Macao namely "Refreshing Activity for the Summer". Through the activity the Bureau aims to arouse the public's awareness on the coming hot weather, especially drawing the attention of the elderly. The Bureau and the Association visited four solitary elders, reminding them to maintain good indoor ventilation and to avoid discomfort due to overheating. In addition, the Bureau distributed small gifts such as paper fans, refreshing powder drinks, towels and anti-UV umbrellas which are useful for them in summer. Approximately 1,000 packs of cooling items were donated to the elderly. Through the activity the Bureau wished to deliver the community's care and blessings to the elderly and to draw their awareness on hot weather.

5. Organizing the 7th TCP/JCOMM Regional Workshop on Storm Surge and Wave Forecasting

The 7th TCP/JCOMM Regional workshop on Storm surge and Wave Forecasting had been held at the Macao Meteorological and Geophysical Bureau during 10th Oct to 14th Oct 2011. Approximately 30 experts from the 10 members of the Typhoon Committee attended the workshop, including experts from India, the UK, Norway and Timor-Leste.

The aim of the workshop is to enhance capacities of NMHSs for reduction of marine hazards to complement broader disaster preparedness and mitigation activity. In addition, the workshop is a

contribution to the development of the Storm Surge Watch Scheme of WMO and it establishes collaborative link between Typhoon Committee and WMO in coastal hazard risk management.

During the five-day workshop, the two-numbers computing model of the storm surge and wave forecasting was demonstrated and offered to the participants for their home use after the workshop. The event not only provides a platform for academic exchange among professionals engaged in meteorology, but also a learning opportunity for other professionals from other regions to gain the latest knowledge on programs and application, which helps to improve the forecasting accuracy for both storm surge and wave. (5 jpg)

6. Co-organizing activities with other associations for meteorology and climate change promotions

SMG actively collaborated with other bureaus and associations in promoting meteorology, environmental protection and climate change over the year. The Bureau provided game booths, exhibition panels and computing games in several occasions which helped to promote the Bureau's services as well as to propagate the importance of environmental protection.



Malaysia

Typhoon Committee Roving Seminar 2011, 20-23 September 2011, Petaling Jaya, Malaysia

The Typhoon Committee Roving Seminar 2011 (TCRS 2011) was organised by the ESCAP/WMO Typhoon Committee and hosted by the Malaysian Meteorological Department (MMD) from 20-23 September 2011. The theme for TCRS 2011 was

Heavy Rain and Flood Hazards Associated with Landfalling Tropical Cyclones. The Seminar was attended by 39 participants from China (6), Philippines (5), Hong Kong (1), Cambodia (1), Laos (2), Macau (1), Singapore (1), Thailand (3), Vietnam (2) and Malaysia (13) including 3 resource persons from Hong Kong (1), Singapore (1) and Thailand (1) as well as Typhoon Committee Secretariat (1).

The participants were introduced to the QPE/QPF techniques and its applications during the seminar. The cause, assessment and management of flood hazards associated with landfalling tropical cyclones and heavy rain were also discussed. Generally, the participants are satisfied with the organisation of the seminar. They have improved their knowledge and enhanced their skills in forecasting heavy rains and floods that are due to landfalling tropical storms and also the opportunity to learn the “Short-range Warning of Intense Rainstorms in Localized Systems (SWIRLS)” nowcasting system.



PAGASA organized the Meteorologists Training Course (MTC) with 38 participants from PAGASA; Philippines Air Force; Port Villa, Vanatu; Papua, New Guinea; Republic of Kiribati; Apia, Samoa and Brunei Darusalam.



Philippines





Rep. of Korea

1. 43rd Session of ESCAP/WMO Typhoon Committee

The National Typhoon Center/Korea Meteorological Administration (NTC/KMA) hosted the 43rd Session of UNESCAP/WMO Typhoon Committee attended by 11 typhoon committee members, 5 international organizations (UNESCAP, WMO, TCS, ADRC, and RIMES), and 2 observers (Russia and Indonesia) on 17-22 January, 2011.

At this 43rd Session, NTC/KMA was suggested to carry out more projects and support TCS for its members, particularly for Asia which is vulnerable to typhoon damage. Assuming the Presidency of the Typhoon Committee, KMA contributed to promoting high-quality typhoon monitoring and forecasting techniques.



2. Expert Meeting on the Typhoon Activity and Disaster Prevention 2011

The NTC/KMA held “the Expert Meeting on Seasonal Typhoon Outlook and the Prevention of Disaster Caused by Typhoon” on April 18 2011 in Seogwipo, Korea. A total of 60 experts from several organizations related to typhoon disaster prevention such as Seoul National University, Pusan National University, Kongju National University, Jeju National University, and Korea Water Resources Cooperation as



well as KMA. Participants had a discussion on the frequency of typhoons that affect the Korean Peninsula, in particular the outlook on genesis of typhoon in the western North Pacific in 2011. They agreed to work together to improve assessment method of typhoon outlook and identify the relationship between typhoon activity and global warming.



3. International Workshop on Tropical Cyclone-Ocean Interaction in the Northwest Pacific

On 11-13 May 2011, in Seogwipo, Korea, the NTC/KMA held the “International Workshop on Tropical Cyclone-Ocean Interaction in the Northwest Pacific” attended by 50 domestic and foreign experts on typhoon-ocean interaction from U.S. (NOAA, 4 research institutes and universities), Japan (Kyoto University), Taiwan (National Taiwan University) and Korea (8 research institutes incl. the Korea Ocean Research and Development Institute).

Participants made 35 presentations in 7 sessions (incl. poster session), sharing research information on observation, theories, and modeling for better understanding of the interaction between typhoon tracks and the western North Pacific Ocean conditions and had an intensive discussion on the dynamic process of atmosphere-ocean interaction and application of dynamic atmosphere-ocean coupling model. The 3rd workshop will be held in National Taiwan University.



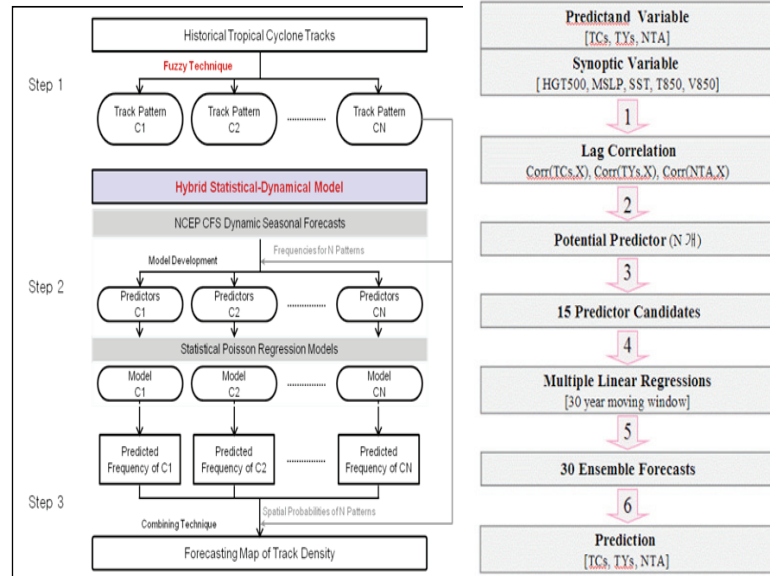
[Presentation of research fellowship students]

5. Test operational running of typhoon seasonal prediction systems

NTC/KMA operates three types of seasonal prediction systems for forecasting typhoon genesis frequency and track patterns. For each season, three-month prediction is made one month prior to the target season. The seasonal prediction outputs consist of monthly statistics for the total number of typhoon occurrences in the western North Pacific (WNP), information on typhoons that would affect the Korean peninsula, possible track patterns. The official seasonal typhoon prediction is determined by consensus of the three systems, the NTC-COAPS system based on FSU/COAPS1 3D primitive equation global spectral model ensembles at a resolution of T126L27 (a Gaussian grid spacing of 0.94°), the NTC-KNU2 system based on multiple linear regression model, and the NTC-SNU3 system based on hybrid type of statistical-dynamical model. The Climate Prediction Division disseminates the prediction information to the public. A web-based seasonal typhoon prediction system which is under construction will enable us to make easy access to seasonal prediction product of each system. KMA and BoM4 will exchange data for

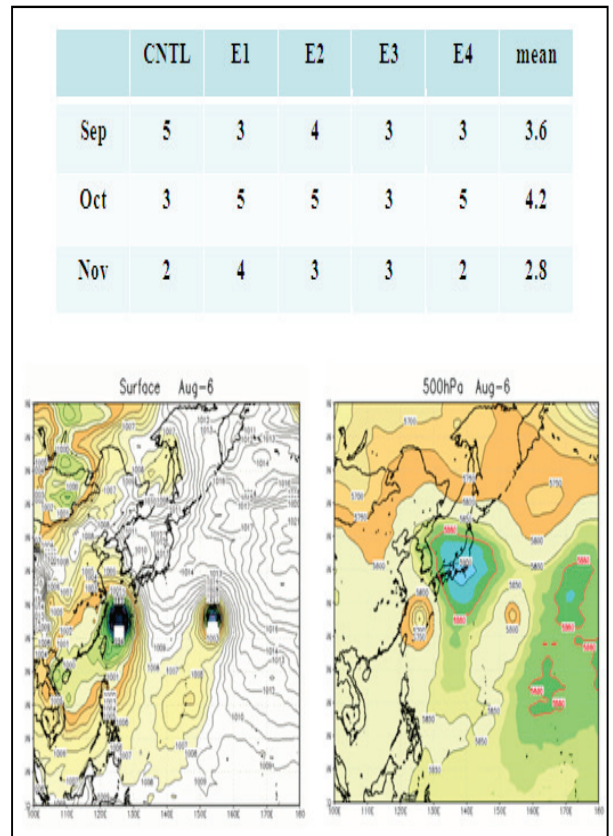
- 1 FSU/COAPS: Florida State University/ Center for Ocean-Atmospheric Prediction Studies
- 2 KNU: Kongju National University
- 3 SNU: Seoul National University
- 4 BoM: Bureau of Meteorology, Australia

dynamical seasonal prediction such as NTC-COAPS and POAMA5-BoM based on the collaboration plan in 2011. When the plan is implemented as planned, we expect to expand our coverage to the Indian Ocean and the southern hemisphere.



Hybrid Statistical-Dynamical Model

Regression Model



Dynamic model Ensemble

5 POAMA: Predictive Ocean and Atmosphere Model for Australia



Singapore

BETTER CLIMATE PREPAREDNESS - New Centre for Climate Research

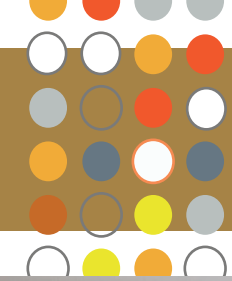
A Centre for Climate Research Singapore (CCRS) has been established within the Meteorological Service Singapore (MSS). The Centre aims to advance the scientific understanding of the tropical climate and weather systems affecting Singapore and the wider Southeast Asia region, by undertaking research and modelling studies.

The CCRS will focus on research studies of the Asian monsoons, the El Nino Southern Oscillation, the Madden-Julian Oscillation and tropical convection, all of which have an important bearing on the the weather and climate of the region, as well as the global climate system. The CCRS will also study the longer term climate variability and change in Southeast Asia as well as regional sea level rise and extreme weather events such as floods, droughts, strong winds and storm surges.

To support the research programmes and activities of the CCRS, the Centre will broaden its research networks and partnerships in Singapore and overseas. In May 2011, MSS signed a Memorandum of Understanding (MOU) with the Hadley Centre of the UK Met Office. The multi-year MOU involves the joint implementation of a regional climate model, climate research and the cross- exchange of climate scientists from the CCRS and the Hadley Centre.



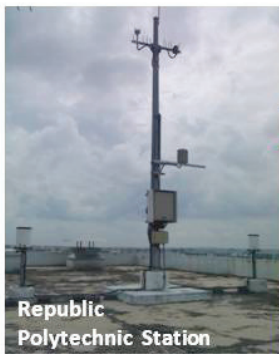
The signing of the MOU signifies the commitment of MSS and the UK Met Office to advance the scientific understanding of the climate and weather of Singapore and the wider Southeast Asia region.



A Regional Climate Workshop on "Modelling Climate Change and Variability in Southeast Asia" was held in Singapore from 10 to 12 May 2011. The workshop marked the inaugural activity of the MOU between MSS and the UK Met Office.

Real-Time Weather Monitoring Network

In 2007, Meteorological Service Singapore (MSS) embarked on a project to install an Online Weather Monitoring Network (OWNet) to provide easily accessible, real-time weather data of high resolution in all parts of Singapore. The project was completed in September 2011.

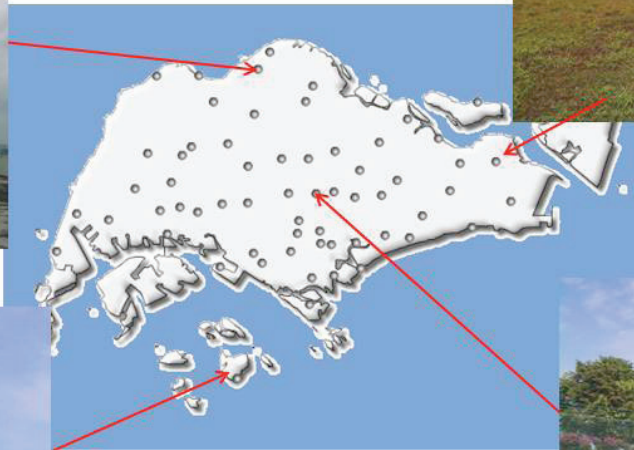


Republic Polytechnic Station

Visibility sensor and the radiation sensors at Changi Met Station

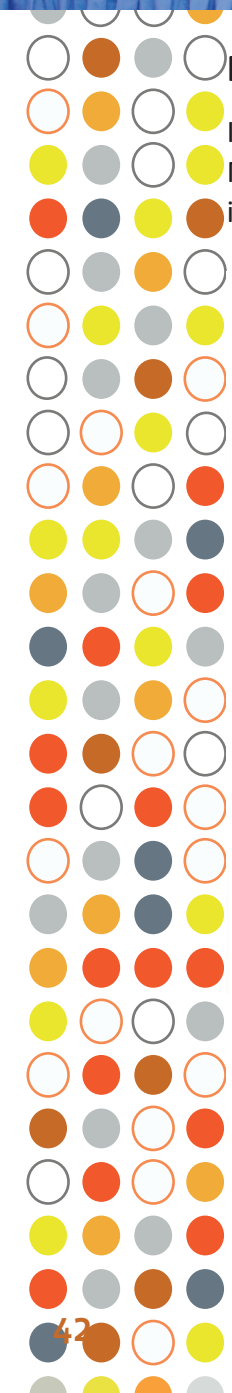


Semakau Weather Station

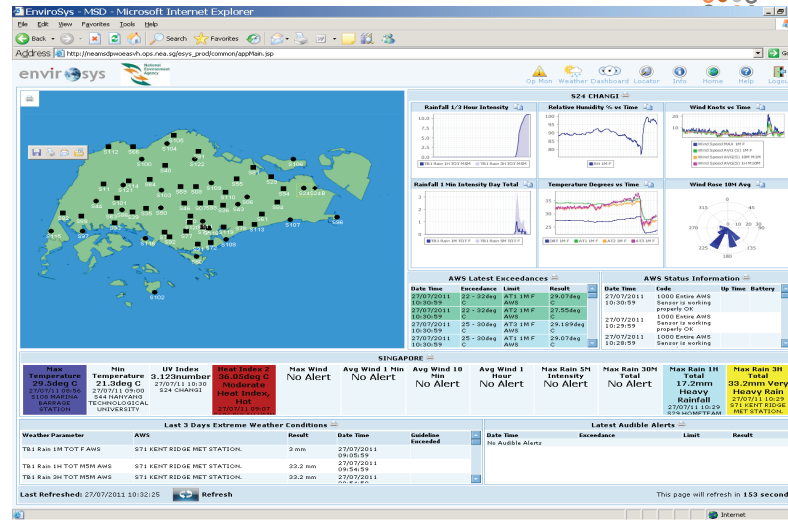


MacRitchie Rainfall Station

The 64 automated weather stations across the island allow the various weather elements to be observed at higher temporal and spatial resolution.



All 64 stations have sensors that measure rainfall, of which 22 stations are equipped with additional sensors that measure wind, temperature, humidity and atmospheric pressure. Sensors to measure incoming infra-red radiation are installed at 5 stations while 2 stations measure total ultra-violet (UV) radiation. MSS's Climate Station at Changi has a range of sensors including a sensor that measures UV Index, a ceilometer, a transmissometer, soil temperature at various depths and an evaporation sensor. All the data are transmitted wirelessly to MSS' Data Centre.



The visualisation display of real-time weather information - a meteorological tool that helps in weather forecasting and climate research

across the island will provide comprehensive data on changes or trends in weather patterns over Singapore. It will also provide data for strategic studies on the impact of climate change on Singapore and support climate-related studies such as environmental, nature and public health studies. These are long term studies requiring in-depth data collection for future applications.

The weather data from OWNet has benefited many public agencies in supporting and enhancing their operations. The rainfall data from OWNet supports agencies involved in dengue control, water resource and flood management. Wind data supports park operations and management as well as pollution control management.

OWNet was designed not only to serve MSS and public agencies but also to provide useful weather information to the public. With the latest telecommunications technology, OWNet provides convenient access to real-time weather data over all sectors in Singapore via WIFI or 3G communication links. Near real-time rain data has been made available on an iPhone application called "MyENV". This provides the public with ease of access to Singapore's weather forecast in the palm of their hand.

MSS will launch a public website for OWNet in 2012. The improved accessibility and resolution of data from OWNet will enable the general public to have a better weather situation awareness and better prepare for weather changes.



Each weather station has an array of sensors to measure different weather elements which are used to support a wide range of applications.

An integral part of the OWNet is the data visualisation or graphical-user interface software that enables viewing of both current and past weather information. The system also enables audible alerts whenever a meteorological element such as amount of rainfall in an hour or maximum 10 minute wind speed exceeds a pre-determined threshold.

The OWNet and the accompanying visualisation user-interface help to support and enhance the operations and conduct of climate studies at MSS. The OWNet provides our weather forecasters and research scientists with high data availability and the ease of access to continuous real-time high resolution data. The dense network of sensors



Thailand

1. Typhoon Committee Roving Seminar 2010

The Thai Meteorological Department, on behalf of Thailand – a member of the Typhoon Committee, was honoured to host the Typhoon Committee Roving Seminar 2010 for tropical cyclone forecasters of the TC's member countries in Ubon Ratchathani Province since 30th November until 3rd December, 2010. 25 delegates altogether from 9 countries (: Cambodia, Hong Kong, Laos, Macao, Malaysia, Vietnam, Singapore, the Philippines, and Thailand) turned up at this event.

The aim of this seminar was to promote collaboration of research effort and coordination of capacity building activities among Typhoon Committee Members on aspects such as tropical cyclone analysis, forecast and warning, as well as impact on socio-economic development. The theme in 2010 will focus on tropical cyclone genesis, monsoon interaction, and satellite analysis, with the following sub-topics:

Topic A : Tropical Cyclone Genesis and Seasonal Prediction of Cyclone Activities by Mr. S.M. LEE (HONG KONG, CHINA)

Topic B : Effects of Tropical Cyclone Interaction with Monsoon, with Emphasis

on Enhanced Rainfall by Dr. ZHANG QINGHONG (CHINA)

Topic C : Tropical Cyclone Satellite Analysis, including Microwave Images by Dr. MARK LANDER (GUAM, USA)



Figure 1 : Group photo at the opening ceremony of the Typhoon Committee Roving Seminar 2010



Figure 2 : The delegates at the Typhoon Committee Roving Seminar 2010



2. The Radar Composite Map Based on Standardized System : Pilot project in Thailand

According to the action plans for 2011 (typhoon committee WGM AOP6 : Development of regional radar network), Thailand was chosen by the typhoon committee to initiate a pilot project of Radar Composite Map Based on Standardized System. Prof. Takehiko Satomura (Kyoto university), Mr. Hirofumi Mizushima (JMA), and Mr. Derek Leong (TCS) was appointed a radar expert mission team by the TC to visit Thailand since 7th – 9th September, 2011 in order to have a discussion and conduct a readiness survey with the TMD's staffs before providing technical suggestion related to the TMD's radar composite map for them as seen below :

1. To investigate the covering radius of radar observation at each station where actual radar observation can be conducted without the presences of mountains as the obstacles. Initial radar composite should be provided by means of simple-CAPPI through the following activities :

- To increase elevation angle, at least, up to 3 angles
- To enhance the working group's capacity by seeking advice from the Typhoon Committee
- To improve the performance of computer resources by adding more servers or improve the performance of on-site processing
- To investigate actual covering radius of radar by means of either echo intensity composite technique or radar beam height with DEM comparison technique

may be applied in observation at each station.

2. Ideal radar stations are chosen for preparing radar composite maps. The chose stations should not be those which are expected to be abolished in the future.

3. There are 2 proposed methods in creating composite maps :

1st method – The suitable value of Z-R relationship of each radar station is obtained before composite map of rain rate (RR) is created,

2nd method – Composite map of echo intensity dBZ is created at the same time when Z-R relationship or conversion coefficients are examined.

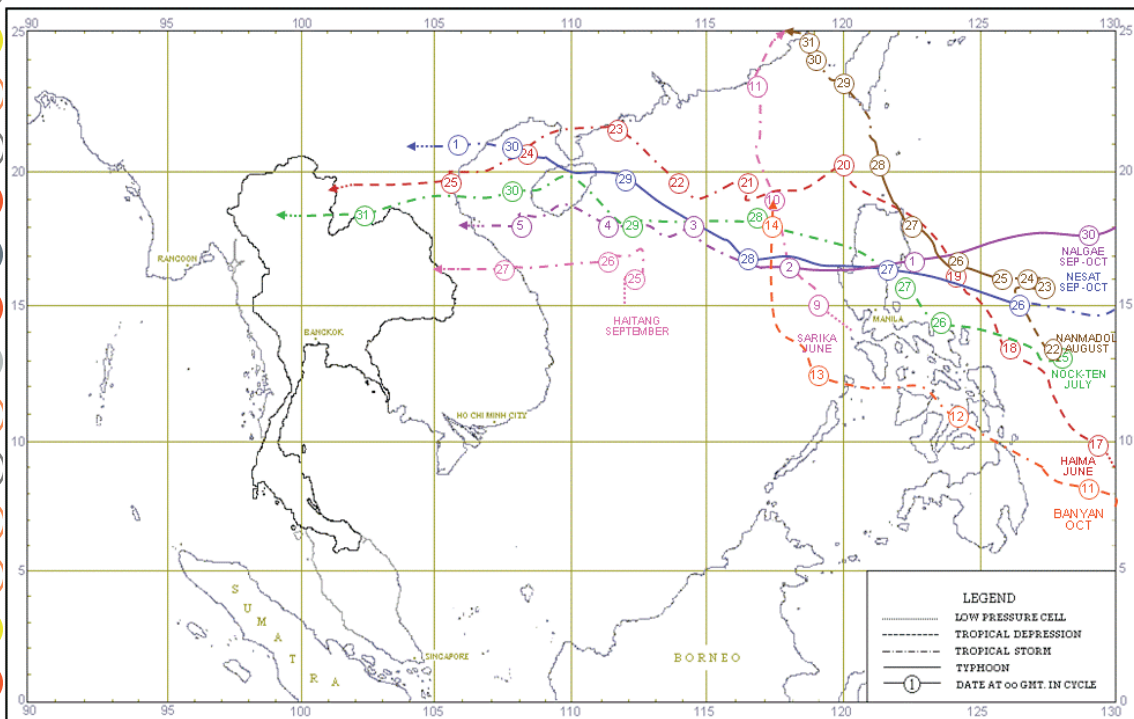


Figure 3 : The appointed radar expert team visited the TMD on 7th September, 2011

Tropical cyclones that affected Thailand in 2011

Excessive rainfalls were noticed in Thailand during the rainy season this year. Incessant heavy rain had taken place since 6th May until the end of October, 2011. Abnormal quantities of rainwater had been measured in several areas. Extensive and prolonged floods consequently occurred in the upper Thailand. Such phenomena were the combined effects of pressure trough, the Southwest Monsoon, low pressure cells, and tropical cyclones moving through the country. There were 8 tropical cyclones altogether that affected the weather over Thailand once each of them had formed and made their ways within the area covering the latitude of 0 – 25 N and the longitude of 90 – 120 E. One of them was a mighty

depression (NOCK-TEN, 1108) while the other 4 were tropical cyclones (: HAIMA, 1104; NESAT, 1116; HAITANG, 1117; and NALGAE, 1119) which had turned into low pressure cells before each of them moved over Thailand and caused the increment of both quantity and distribution of rainfalls. Additionally, tropical cyclones occurring during the rainy season this year also indirectly caused the stationary presence of the monsoon trough across the country almost all the time during such period. As the result, no dry spells took place in Thailand during the rainy season this year. Besides, the amount of seasonally accumulated rainwater in upper Thailand was found to be much higher than normal and caused widespread flash floods, especially in the lower part of the Northern Region and the Central Region until nowadays (as of 14th November, 2011).



=Figure 1 : Tracks of Tropical Storms in 2011, updated on 14th November, 2011 (Source : Climatological Center, Meteorological Development Bureau, TMD)



The Effects of Tropical Cyclones in 2011

Since 25th until 26th June, severe flash floods and landslides had taken place in northern provinces of Thailand : Chiang Rai, Phayao, Nan, and Tak. These natural disasters were caused by a low pressure cell originated from the weakening tropical storm “HAIMA” once it had made landfall in the upper part of Vietnam in the evening of 24th June. This low pressure cell had moved over the Northern Region of Thailand before it dissipated within such area on 26th June. Afterwards, 1 dead person was reported from Mae Sot District, Tak Province while another missing one was reported from Wiang Sa District, Nan Province. 118,856 people from 37,147 families suffered from the disasters and more than 8,500 hectares of agricultural lands were damaged by them. (Source: Department of disaster Prevention and Mitigation as of 29th June, 2011)



Figure 2 : Flash flood in Nan Province – the consequence of the tropical storm “HAIMA” (Source : http://www.moph.go.th/show_hot-new.php?idHot_new=39445)

Since late July until early August, incessantly heavy and very heavy rain in several areas caused severe flash floods in the Northern Region as well as the upper part of the Northeastern Region of Thailand. The cause of the floods was the tropical storm NOCK-TEN which originated from an active low pressure cell in the western area of the Pacific Ocean on 25th July and turned into a tropical storm before passing the Philippines via Luzon, the central area of the South China Sea, Hainan Island, and the Gulf of Tonkin. This storm had made landfall in Vietnam on 30th July. On the following day, it had moved through Laos and turned into a depression before entering Nan Province, Thailand where it later became a low pressure cell over Phrae, Lampang, Chiang Mai, and Mae Hong Son – the Northern Provinces of Thailand.

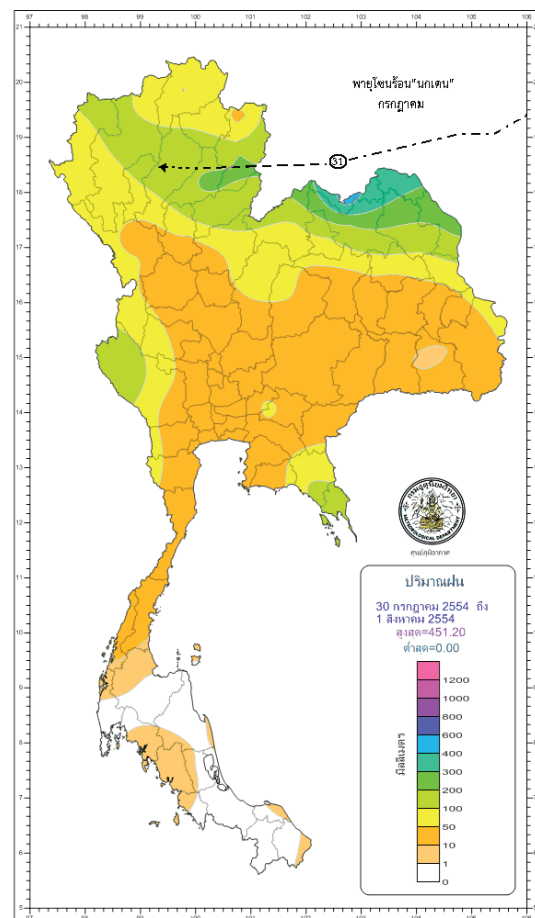


Figure 3 : Accumulated rainwater (mm.) since 30th July till 1st August, 2011 (Source : Climatological Center, Meteorological Development Bureau, TMD)

Since late September until early October, Thailand had been influenced by the tropical storm "HAITANG" as well as 2 Typhoons "NESAT" and "NALGAE", respectively. The effects of these 3 storms could be seen in forms of moderate and rather active monsoon trough and Southwest Monsoon throughout such period. As a result, downpours were periodically reported in upper Thailand. In addition, deluges continuously occurred in several Provinces of upper Thailand : Phitsanulok, Sukhothai, Uttaradit, Lampang, Phetchabun, Phichit, Tak, Kalasin, Loei, Nakhon Sawan, Ayutthaya, Angthong, Sara Buri, Sing Buri, Suphan Buri, and Nakhon Nayok. Flash floods and downhill overflows also took place in Prachinburi District on 24th September as well as the city of Chiang Mai Province on 28th September. Abnormally high flood levels were noticed in some certain areas. The deluges have extended southward and claimed their places in the Central Region as well as Bangkok and its vicinity. Since 25th July until present (as of 14th November, 2011), 64 out of 76 provinces have been flooded. 562 dead people and 2 missing people have been reported so far whereas almost 1.8 million hectares of agricultural lands were damaged. Somehow, restoration has been launched in 42 out of 64 flooded provinces once the situations became back to normal. (Source : the Department of Disaster Prevention and Mitigation as of 14th November, 2011)



Figure 4 : Flash flood at the Don Muang Airport (Source : <http://news.mthai.com/general-news/140655.html>)



(A)



(B)

Figure 5 : Flash floods in Bangkok – on the eastern bank (A) and the western bank (B) of the Chao Phraya River (Sources: <http://www.infoforthai.com/forum/topic/21298> and http://www.kmitl.ac.th/help_sufferer/view.php?cat=1&id=33, respectively)



Figure 6 : Some creative ideas to cope with the floods (Source : <http://variety.thaiza.com>)



TMD's Storm Surge Activities

Miss Kesrin Hanprasert, a meteorologist from the Thai Meteorological Department (TMD), was sponsored by the Intergovernmental Oceanographic Commission (IOC) to join the 2nd Advisory Workshop on Enhancing Forecasting Capabilities for North Indian Ocean Storm Surges which had been held in Delhi, India since 11th until 15th February, 2011. At this event, a topic titled “Application of the IIT Storm Surge Model in estimating the height of storm surges induced by Typhoon Linda” was presented by the TMD’s delegate. Her participation was the consequence of a training with the topic of “Storm Surge Research and Forecasts using the IIT Storm Surge Model” which had been held by the TMD for its meteorologists since the 1st till the 12th June, 2009. Prof. S.K. Dube and Dr. Indu Jain from the Indian Institute of Technology, Delhi, India were invited to be the lecturers of this training. The IIT Storm Surge Model was used to

estimate the height of storm surges induced by Typhoon Linda at Thapsakae District, Prachuap Khiri Khan Province on 3rd November, 1997.

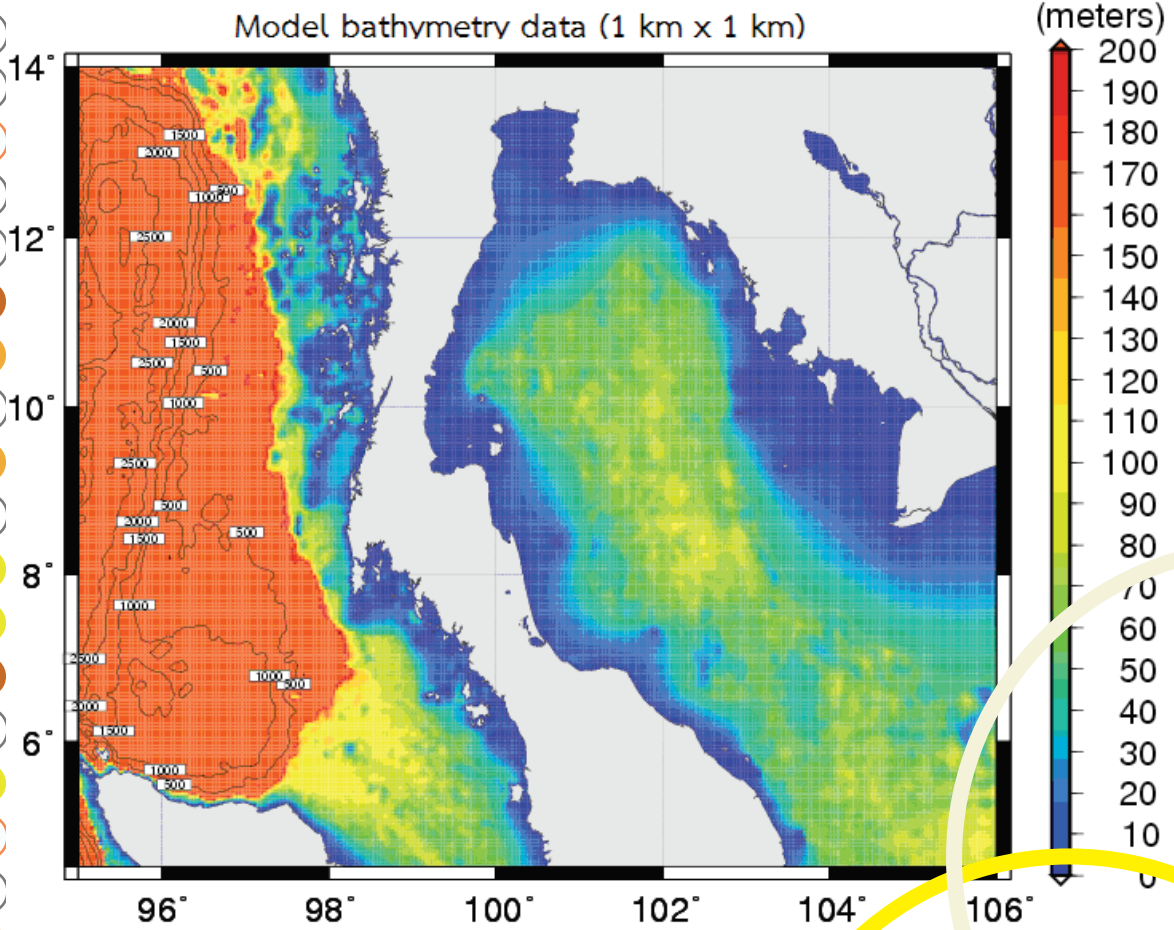


Figure 1 : The bathymetry of the Gulf of Thailand and the Andaman sea at the resolution of 1 km²

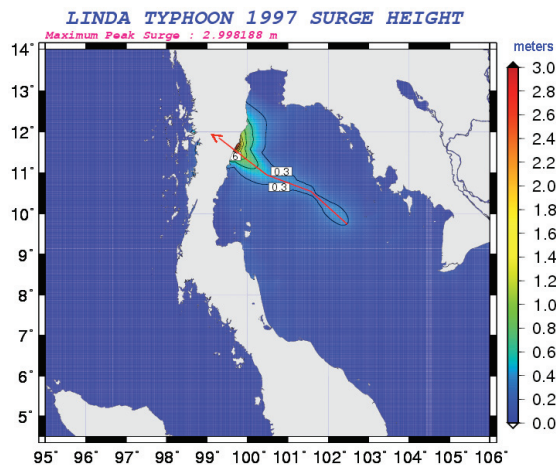


Figure 2 : The estimated storm surges induced by Typhoon Linda at thapsakae District, Prachuap Khiri Khan Province was displayed by the IIT Storm Surge Model with the height of 2.998 meters



Furthermore, 2 activities have been set to be accomplished in the future:

To prepare the IIT Storm Surge Model for storm surge forecasts and warnings in the Gulf of Thailand and the Andaman Sea

To design a website to display the study results as well as the forecasts obtained from the IIT Storm Surge Model

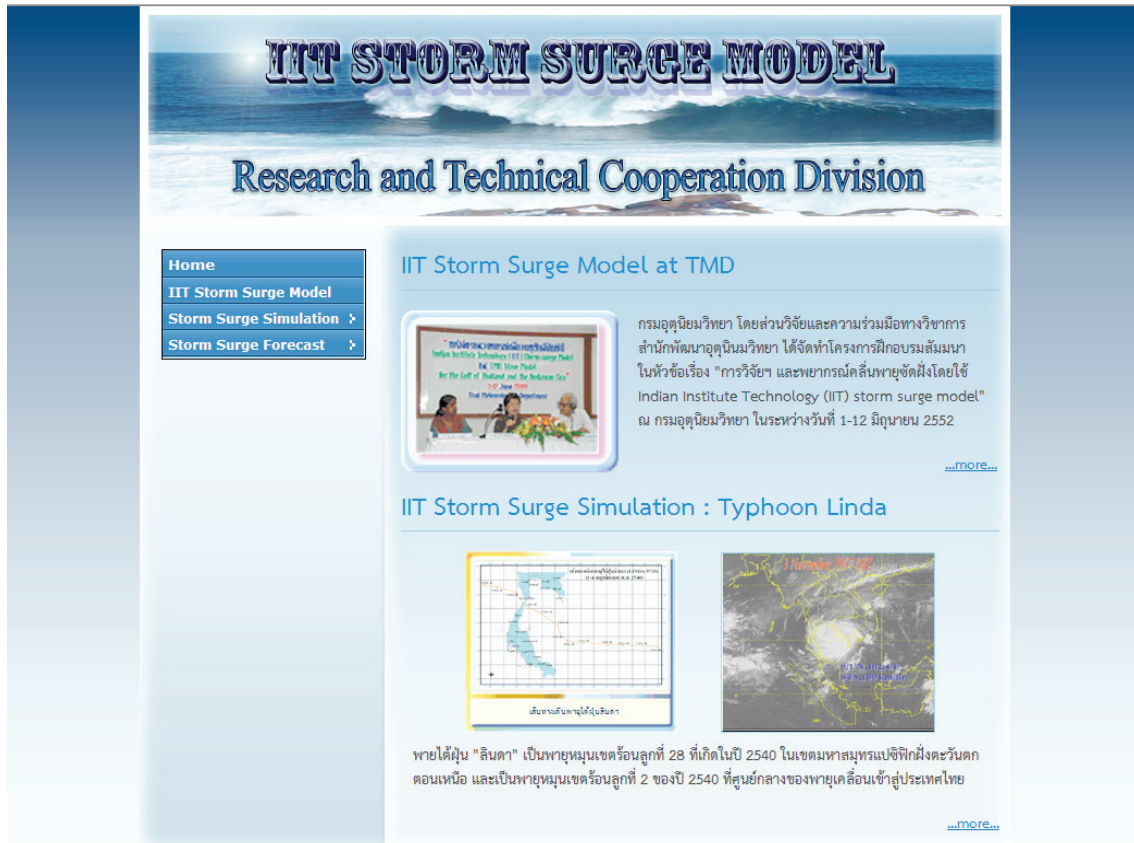


Figure 3 : An example of a website displaying the storm surge study results and forecasts

Typhoon Committee Publications



The ESCAP/WMO Typhoon Committee Newsletter is published in English by the Typhoon Committee Secretariat

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Mural on global warming painted by elementary students of Macao