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Typhoon Committee
Secretariat
Macao, China

ESCAP/ WMO
Typhoon Committee

UNITED NATIONS ESCAP
Economic and Social Commission for Asia and the Pacific
WMO

Newsletter

Editorial

The four-year cycle during which the Typhoon Committee Secretariat has been installed in Macao is coming to an end. Thanks to the offer of the Government of Macao and to a decision of 42nd TC Session this Secretariat will continue in Macao up to 2014.

In these last four years the Typhoon Committee has greatly strengthened its identity. The song "Typhoon! Typhoon!", a kind of anthem of the Committee, was composed; a symbol for the TC was designed; a brochure and a booklet were printed and distributed and a series of technical publications prepared by the Working Groups was initiated under the logo of the TC

The first words of the song, "*Typhoon, Typhoon, our friend and our foe...*", reflect the concerns of this Committee: "*our friend*" because it helps bring water to fill reservoirs and saving crops, but frequently it becomes a natural disaster with catastrophic consequences to life and property and then it is "*our foe*". The verses that follow, "*People warned early, fearless*

The Forty-Second Session of theTyphoon Committee

The Government of Singapore, in cooperation with ESCAP and WMO hosted the forty-second Session of the Typhoon Committee, which was held in Stamford Room, Parkroyal on Beach Road Hotel, Singapore, from 25 to 29 January 2010.

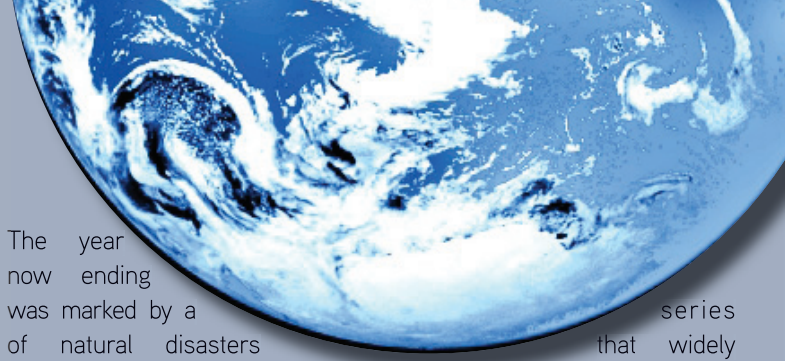
The Session was attended by 78 participants from 12 out of 14 Members of the Typhoon Committee, namely: Cambodia; China; Hong Kong, China; Japan; Macao, China; Malaysia; Philippines; Republic of Korea; Singapore; Thailand; the Socialist Republic of Viet Nam; and the United States of America (USA).

The Session was also attended by 5 observers from the Tokyo Polytechnic University International Association for Wind Engineering; Asian Disaster Reduction Center; Indonesian Agency for Meteorology Climatology and Geophysics (BMKG); Primorsky State Department of Hydrometeorology and Monitoring of Environment, Russia and International Civil Aviation Organization (ICAO).

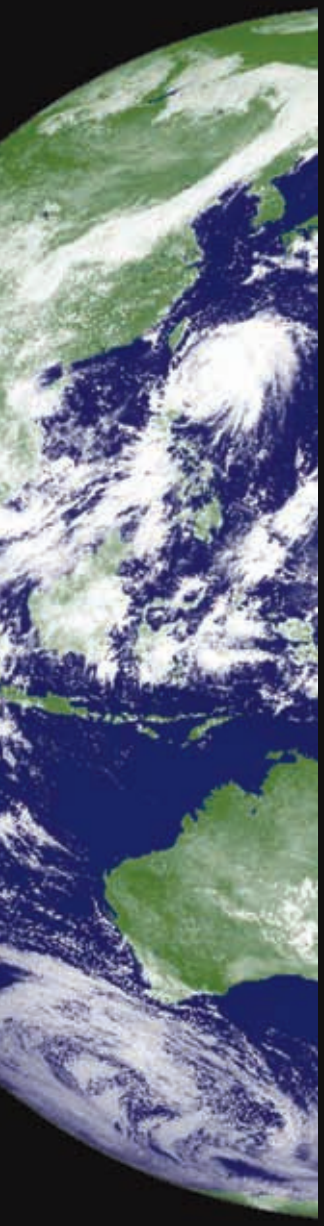
Representatives from the Economic and Social Commission for Asia and the Pacific (ESCAP), the World Meteorological Organization (WMO) and Typhoon Committee Secretariat (TCS) also attended the session.

The Session was declared open by his

Editorial cont'd.



we face the tempest / Planned and prepared, water good for the harvest" also reflect the concern and mission of this committee, particularly as regards early warning and management of water resources. Mr C.Y. Lam, former Director of Hong Kong Observatory, was really inspired when he has written the lyrics for the TC song.



Typhoon! Typhoon!

Lyrics: C.Y. Lam Music: F. Lam

Typhoon! Typhoon!
Our friend and our foe.
Wind and rain,
With them we live and grow.

People warned early,
Fearless we face the tempest.
Planned and prepared,
Water good for the harvest.

Countries coming together,
Always watching the sky;
Reading the signs of weather,
Sharing in spirit high

Asia and the Pacific,
Typhoon Committee does serve.
Marching forward,
From our duties never swerve.

Asia and the Pacific,
Typhoon Committee does serve.
Marching forward,
From our duties never swerve.

Countries coming together,
Always watching the sky;
Reading the signs of weather,
Sharing in spirit high

Countries coming together,
Always watching the sky;
Reading the signs of weather,
Sharing in spirit high.

The year now ending was marked by a series of natural disasters that widely affected different countries around the world. The most destructive natural disaster in 2010 that caused more fatalities was undoubtedly the magnitude 7 earthquake that occurred in Haiti. The number of victims (about 230,000 dead and 300,000 wounded) reached proportions similar to that caused by the tsunami in the Indian Ocean in 2004.Another natural disaster of major proportions has stricken Pakistan in late July and early August. Intense monsoon rains, coupled with an atmospheric anomaly that consisted of the simultaneous occurrence of a blocking high pressure system and unusual location of the jet stream over Pakistan caused about one thousand and six hundred fatalities, around twenty million people affected due to loss of livelihoods and property, and nearly one million damaged or destroyed houses. Some TC Members were also deeply affected by natural disasters. Regions of central and southern China, after several years of one of the most intense droughts of the last decades, suffered the consequences of floods which led to the evacuation of thousands of people. Other TC Member's populations suffered the consequences of floods which have caused the collapse of dykes and other structures, landslides and flashfloods. Particularly Viet Nam, Philippines, Thailand and others also had huge damage caused by hydrometeorological disasters.

In the Western Pacific one of the most intense tropical cyclones of the last years, the typhoon Megi, was formed. Classified as super-typhoon by some Members, its pressure at the center reached values below 890 hPa, a very rare occurrence. It was formed to the west of Guam as a tropical depression that developed into typhoon in a few days, passing through Luzon, the Philippines. After Luzon, it abruptly changed its direction of motion from WSW to the north, contrary to the statistical behavior of the tropical cyclones for that region, making landfall in Fujian province, China.

Thanks to early warnings and to the close collaboration among meteorological, hydrological and DRR services, a huge number of people was evacuated in 2010 due to typhoon and monsoon-related related disasters and numerous lives were saved. Even though, it was not possible to prevent the death of many people.

In 2010 the TC continued endeavoring to accomplish its mission, congregating efforts to struggle against the consequences of the typhoon-related disasters. Workshops, training courses, seminars have been organized or coordinated by TC in collaboration with ESCAP, WMO, IDI, NEMA, and organizations such as Macao Foundation, ICHARM and JAXA. The foreseen activities stated at the Annual Operating Plan approved at the 42nd TC Session was nearly completely achieved, namely in what refers to the crosscutting project on Urban Flood Risk Management, which is progress satisfactorily. The activities foreseen in the Annual Operating Plan approved at the 42nd Session was almost fully achieved, in particular as regards the crosscutting project on Urban Flood Risk Management, which is progressing according to what was planned. Other important step was the preparation and discussion of the Strategic Plan for the period 2011-2015.

All the progress achieved was surely due to the effort of the Members and also the harmonious collaboration among the Working Groups on Meteorology, Hydrology, DRR and to the Training and Research Coordination Group, all working under the advice of the Advisory Working Group, ESCAP and WMO.

Excellency, Dr. Yaacob Ibrahim, Minister for the Environment and Water Resources, at 9:25 am on Monday, 25 January 2010 in the Stamford Room, Parkroyal on Beach Road Hotel, in Singapore in the presence of the Members' representatives.

At the opening ceremony statements were delivered by Mr Foong Chee Leong, Director-General of Meteorological Services Division, National Environment Agency, Singapore; Mr. Olavo Rasquinho, Secretary of Typhoon Committee in representation of the Chairman of Typhoon Committee; Dr. Tokiyoshi Toya, representative of the WMO Secretariat; Dr. Wu Guoxiang, representative of ESCAP secretariat and His Excellency Dr. Yaacob Ibrahim, Minister for the Environment and Water Resources of Singapore.

Dr. Roman L. Kintanar Award-2009 for Typhoon related Disaster Mitigation was presented to the Hong Kong Observatory.

Mr. Foong Chee Leong, Director General, Meteorological Services Division, National Environment Agency of Singapore was elected Chairperson and Mr. Jin Gee-Beom, Director General of Forecast Bureau, Korea Meteorological Administration (KMA), was elected Vice-Chairperson of the Committee; Mr. Jeffrey LaDouce, Director of National Weather Service, NOAA-Pacific Region of USA 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 morning of 25 January 2010 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 were reported to the plenary session.

The Typhoon Committee discussed in detail the activities carried out by its members, including important achievements, major issues and future directions by each Member related to the Meteorological, Hydrological, and Disaster Risk Reduction components. It also reviewed the activities undertaken on Training and Research component.

The Committee also discussed the information provided by the Members and the findings of the parallel sessions of the Working Group on Meteorology (WGM), Working Group on Hydrology (WGH) and Working Group on Disaster Risk Reduction (WGDRR). The Committee re-established the WGM, WGH, WGDRR and the Advisory Working Group (AWG). The major outcomes of the parallel sessions of the three Working Groups are described in detail in the Report of the Forty-second Session of Typhoon Committee.

Main Activities of the TC Secretariat in 2010

PARTICIPATION OF TCS REPRESENTATIVES IN INTERNATIONAL MEETINGS

Since the 42nd Session of TC, held in Singapore, 25-29 January 2010, the Typhoon Committee Secretariat was represented in the following events:

- **66th Session of ESCAP - Senior Officials segment - Incheon, Republic of Korea, 13-19 May 2010**

The Secretary of TC, Mr. Olavo Rasquinho, attended the Senior Officials segment, from 13 up to 15 May, of the 66th Session of ESCAP which was held in Incheon, Republic of Korea, on 13-19 May. The Secretary informed the Commission about the recent activities covering meteorology, hydrology and disaster risk reduction, including those to reduce urban flood risk in a changing climate.

- **Meeting on Urban Flood Risk Management (UFRM) Project, in Bangkok, 19-20 July 2010**

The Secretary, the Hydrologist (Mr. Jinping Liu) and the Meteorologist (Mr. Leong Kai Hong, Derek) of TCS participated in a meeting on Urban Flood Risk Management (UFRM) Project, in Bangkok, 19-20 July. More than 30 participants took part in the meeting, including representatives from TC Members, ICHARM, JAXA, UNDP, UN/ISDR, UNOCHA, ADPC, ESCAP, WMO and TCS.

- **Asia-Pacific Water Minister's Forum (APWMF) and Singapore International Water Week (SIWW) – Singapore, 28 June - 1 July 2010**

Mr. Liu Jinping participated, on 28 June, in the Asia-Pacific Water Minister's Forum (APWMF) and in the Singapore International Water Week (SIWW) from June 29 to July 1.

- **Expert Group Meeting and Stakeholder Meeting on Mechanism on Drought Monitoring and Early Warning - Nanjing, China, 14-16 September 2010**

The Secretary participated in the Expert Group Meeting on Mechanism on Drought Monitoring and Early Warning, (Nanjing, China – 14-15 September) and in the Stakeholder Meeting on the same issue (Nanjing, 16 September). The Executive Secretary of ESCAP, Dr. Noeleen Heyzer officially launched the Regional Cooperative Mechanism on Disaster Monitoring and Early Warning, Particularly Drought (the Mechanism) at the meeting, with the statement read by Mr. Xuan Zengpei, Chief of the Information and Communications Technology and Disaster Risk Reduction Division of ESCAP. The Secretary of TC, corresponding to a request from ESCAP to the representatives of countries and international organizations, offered the services of TCS to facilitate the first steps of the Secretariat of the Mechanism, upon authorization by the Committee.

- **Regional Workshop on ICT Applications for Disaster Risk Reduction and Sustainable Economic Development – Astana, Kazakhstan, 28-30 September 2010**

Mr. Jinping LIU, hydrologist of TCS participated in the Regional Workshop on ICT Application for Disaster Risk Reduction and Sustainable Economic Development which was held in Astana, Kazakhstan from 28-30 September 2010. At the Workshop, Mr. Liu introduced the TC Strategy on Flood Disaster Risk Reduction.

- **First Anniversary and Workshop of AHMRI of NUIST - Nanjing, China, 15-16 October 2010**

Mr. Jinping LIU, participated in the celebration of the first anniversary and attended a workshop of the Applied Hydrometeorological Research Institute (AHMRI) of the Nanjing University of Information Science & Technology (NUIST), on 15-16 October 2010.

3rd WMO International Conference on QPE/PQF and Hydrology, Nanjing, China, 18-22 October 2010

The Meteorologist and Hydrologist of TCS, respectively Mr. Leong Kai Hong (Derek) and Mr. Jinping LIU, participated at the "Third WMO International Conference on Quantitative Precipitation Estimation (QPE) and Quantitative Precipitation Forecasting (QPF) and Hydrology" which was held in Nanjing, China, 18-22 October 2010.

- **5th WGDRR Working Group Meeting, Incheon, Republic of Korea, 24-25 October 2010**

Mr. Olavo Rasquinho, Mr. Leong Kai Hong (Derek), Mr. Jinping Liu and Ms. Denise Lau, senior administrative secretary of TCS, participated at the 5th DRR Working Group meeting, which was held in Incheon, Republic of Korea, on 24-25 October 2010, under invitation and support of NIDP-NEMA. The representatives of TCS also attended the opening ceremony of 4th AMCDRR.

- **Regional High-Level Expert Group Meeting to Reduce Flood Disaster Risks in Pakistan - Islamabad, Pakistan, 9 -10 November 2010**

The Secretary participated in the Regional High-Level Expert Group Meeting to Reduce Flood Disaster Risks in Pakistan, which was jointly organized by ESCAP, United Nations Country Team (UNCT) and the Government of Pakistan, on 9 and 10 November 2010, in Islamabad, Pakistan. Some participants were invited to visit the headquarters of the Pakistan Meteorological Department.

Visit to the Pakistan Meteorological Department – 10 November 2010

- **Seventh WMO International Workshop On Tropical Cyclones-IWTC-VII, La Réunion, France, 15-20 November 2010**

Mr. Jinping LIU participated in the Seventh International Workshop on Tropical Cyclones (IWTC-VII) which was held in La Réunion, France, on 15 - 20 November 2010.

- **Meeting of WMO RA-II (Asia) Working Group on Hydrology (WGH), Seoul, Republic of Korea, 23-26 November 2010**

Mr. Jinping LIU participated in the meeting of WMO RA-II (Asia) Working Group on Hydrology (WGH), held in Seoul, Republic of Korea, from 23 to 26 November 2010.

- **Workshop on Space Application to Reduce Water-related Disaster Risk in Asia Bangkok, Thailand, 7-9 December 2010**

The Secretary, the Meteorologist and the Hydrologist of TCS participated in the Workshop on Space Application to Reduce Water-related Disaster Risk in Asia, held in Bangkok, Thailand, on 7-9 December 2010, which was co-organized by ESCAP and the International Centre for Water Hazard and Risk Management (ICHARM), in partnership with the WMO and Typhoon Committee. It was supported by the Japan Aerospace Exploration Agency (JAXA) and the Asian Development Bank (ADB). The workshop was attended by experts not only from the TC Members but also from Bangladesh, Indonesia and Pakistan.

- **Expert group meeting on Regional Cooperation Mechanisms on Space Applications for Disaster Management and Sustainable Development - Manila, Philippines, 15-16 December 2010.**

The Secretary of TC has taken part of this meeting by invitation of ESCAP. The main objectives consisted of reviewing and developing strategies for building regional cooperative mechanisms on effective access to and applications of space-based products and services for disaster management and sustainable development in the region and reviewing the terms of reference of the Mechanism (TOR).

- **14th Session of the Intergovernmental Consultative Committee (ICC) on the Regional Space Applications Programme for Sustainable Development (RESAP), Manila, Philippines, 16-17 December**

The Intergovernmental Consultative Committee (ICC) on the Regional Space Applications Programme for Sustainable Development (RESAP) approved the Terms of Reference of the "Regional Cooperative Mechanism on Disaster Monitoring and Early Warning, Particularly Drought" ("the Mechanism") and discussed the hosting of the Secretariat of the Mechanism. There were the following offers from the participants for hosting the Secretariat: Asia Pacific Space

Cooperation Organization (APSCO); Bangladesh; Philippines; Macao, China; Space & Upper Atmosphere Research Commission (SUPARCO) and Pacific Islands Telecommunications Association (PITA). APSCO was selected for hosting the Secretariat of the Mechanism.

- **Visit to Pilot Cities of the UFRM Project (Hat Yai, Manila, Hanoi), 12-19 December 2010**

Mr. Jinping LIU, as representative of TC Task Force (TF) of the cross cutting Project on Urban Flood Risk Management (UFRM), participated in the TF Mission from December 12 to 19, 2010 with the project consultant Prof. Xiaotao CHENG contracted by UN ESCAP. The TF Mission had discussions with representatives from departments of meteorology, hydrology and disaster risk reduction (DRR) at various levels and conducted field surveys in 3 pilot cities: Hat Yai, Thailand; Manila, Philippines and Hanoi, Vietnam.

Pilot City: Manila, Philippines

Pilot city: Hanoi, VietNam

Pilot city: Hat Yai, Thailand

- Meeting on Best Track Consolidation, Hong Kong, China, 13-14 December 2010

The Meteorologist of TCS, Mr. Leong Kai Hong (Derek), participated at the meeting on Best Track Consolidation, in Hong Kong, China, on 13-14 December, which was also attended by representatives from HKO, RSMC Tokyo, JTWC, Shanghai Typhoon Institute and WMO.

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

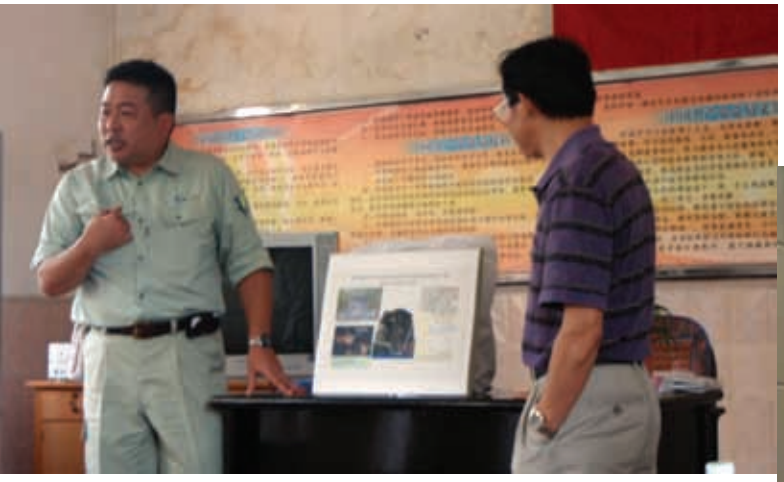
TCS, together with the Working Groups, ESCAP and WMO, coordinated the preparation of the following events:

- **Forth On-the-job Training of Flood Forecasting - Kuala Lumpur, Malaysia, 12 July- 6 August 2010**

The 4th On-the-Job training on Flood Forecasting with the title "Configuring an Operational Flood Forecasting System based on the Tank Model", was held in Kuala Lumpur, Malaysia from 12 July to 6 August 2010.

- **Field Training on Hazard mapping of Sediment-Related Disasters - Zhuhai, China - 5 September 2010**

The TCS has coordinated, together with SMG, the realization of the field training in Zhuhai, Chinese neighbor city of Macao, under the project "Hazard Mapping of Sediment-Related Disasters**.** The Hydrologist of TCS participated in this field training.



- ESCAP/WMO Typhoon Committee Integrated Workshop on "Urban Flood Risk Management in a Changing Climate: Sustainable and Adaptation Challenges" - Macao, China, 06-10 September 2010

- TRCG Roving Seminar 2010 - Ubon Ratchathani, Thailand, 30 November - 3 December 2010

Integrated Workshop 2010, Photo Group

The workshop was held in Macao, China, on 6-10 September 2010, in cooperation with ESCAP, WMO, Macao Meteorological and Geophysical Bureau (SMG), KICT and IDI and was attended by 78 participants: 67 from Typhoon Committee Members, 2 representatives from ESCAP, 1 from WMO, 1 from JAXA, 1 from Kyoto University, 1 from University of Philippines and 5 from TCS. All the TC Members were represented.

Roving Seminar 2010

The Roving Seminar 2010 was held in Ubon Ratchathani, Thailand on 30 Nov - 3 Dec, with the support of the Thai Meteorological Department and the Typhoon Committee Trust Fund, and It was attended, besides 15 local participants from Thailand, by 10 participants from Cambodia; Hong Kong, China; Lao PDR; Macao, China; Malaysia, Philippines, Singapore and Viet Nam. The general theme was on tropical cyclone genesis and large scale interaction.

COORDINATION OF FELLOWSHIP SCHEME

For the year 2010, Typhoon Committee received three research fellowships offered by China Meteorological Administration, Hong Kong Observatory and Korea Meteorological Administration with the duration of the research activities ranged from 2 months to 3 months in the second half of the year. One meteorologist from Viet Nam and one from Thailand were accepted by CMA with the research topic on "TIPS Development". One meteorologist from CMA attended the fellowship offered by HKO with the research topic on "Can the extreme rainfall associated with Typhoon Morakot (0908) happen in Hong Kong?" and one meteorologist from Viet Nam and other one from Thailand were accepted by KMA with the research topic on "Improvement of typhoon analysis and forecast system with KMA's typhoon analysis and prediction system (TAPS)".

TV & Newspaper

RAEM SÓ "AGUENTA" TEMPORAIS COM NÍVEIS REGULARES

Sem arcaboiço para tufão violento

Macau está preparada para resistir a grandes tufões, mas se voltasse a ser atingida por um tufão com a dimensão e violência daquele que devastou o território em Setembro de 1874 "não havia nada a fazer", concordaram os intervenientes de um colóquio organizado no Clube C&C

OLGA PEREIRA

Há sempre possibilidade do território ser atingido por um tufão excepcional mas esperemos que não venha tão depressa", disse ontem o engenheiro Henrique Novais Ferreira no final do seminário "riscos e protecção contra catástrofes naturais em Macau", que foi organizado por Jorge Morbey no Clube Recreativo, Cultural, Desportivo e de Apoio Social do C&C.

O seminário partiu do exemplo do maior tufão que já atingiu Macau. De 22 para 23 de Setembro de 1874, as inundações de vários metros, rajadas e consequentes incêndios provocados pelo violento temporal deixaram mais de 1.700 casas de famílias chinesas destruídas e um número elevado de mortes.

O também chefe do Departamento de Coordenação e Assessoria do Laboratório de Engenharia Civil acredita que não haveria "nada a fazer" num caso semelhante, opinião corroborada pelo painel de intervenientes.

Segundo o engenheiro, no plano ideal poderia "fazer-se uma construção que pudesse resistir a uma catástrofe destas", mas isso seria "economicamente inviável".

No entanto, Henrique Novais Ferreira ressalvou que "Macau está preparada para resistir a tufões dentro das condições de cálculo", isto é, "grandes tufões". "A situação é de segurança, porque os códigos de construção são suficientes para garantir a boa estabilidade dos edifícios", apontou, acrescentando que com a actual regulamentação não tem "medo de viver em Macau".

Porém, questionado, durante a sua intervenção, se os edifícios antigos teriam a mesma segurança, a resposta não foi tão positiva. "Aí não ponho as mãos no fogo". Em situações de [illegible] – acrescentou Henrique Novais – quando é dado o alerta por parte dos serviços de Meteorologia "não se pode fazer nada de especial, só ter cuidado".

Um dos cuidados que se deve ter nestes casos é colocar fitas nas janelas de vidro, caso não estejam colocados, enumeros.

O engenheiro também realçou a "questão extremamente delicada da zona do Porto Interior". "O nível de arruamento é muito baixo e não é possível evitar as inundações [mesmo em caso de tufão regular]. Para resolver a situação era necessário um estudo alargado e uma despesa muito grande".

Portanto, a seu ver, restam apenas algumas medidas de prevenção como o cálculo do risco na construção dos edifícios, na execução de aterros, na modernização do sistema de esgotos, entre outras coisas.

Por seu turno, Clavio Basquinha, secretário do Comité dos Tufões, defendeu uma coordenação nas áreas da meteorologia, hidrologia e protecção civil, recorrendo a exemplos de alguns países.

O responsável salientou ainda que não é certo dizer-se que um tufão com as dimensões do sentido em 1874 tenha um período de retorno de cerca de 100 anos. "No

Não há motivos para alarmismo, segundo especialistas

Território preparado para grandes tufões

Se forem cumpridos, os regulamentos de construção vigentes em Macau garantem que os edifícios estarão preparados para tufões violentos. Uma calamidade como a ocorrida em 1874 teria menos consequências fatais, até devido à eficácia dos avisos meteorológicos.

ESCAP/WMO Typhoon Committee Integrated Workshop on the theme of Urban Flood Risk Management in a Changing Climate held in Macau

2010-09-03

Since the first ESCAP/WMO Typhoon Committee (TC) Integrated Workshop held in Macao, China hosted by Macao Meteorological and Geophysical Bureau (MMGB) in the year 2006, MMGB will once again host this important annual event of the Typhoon Committee together with the Typhoon Committee Secretariat and support from Economic and Social Commission for Asia and the Pacific (ESCAP), World Meteorological Organization (WMO), Macao Foundation, Ministry of Land, Transport and Maritime Affairs of Korea (MLTM) and Ministry of Land, Infrastructure, Transport and Tourism of Japan (MLIT).

The Workshop will be held at the Convention Center of the Macao Science Center on 6 -10 September 2010 with the attendance of more than 70 experts from 14 TC Members: China; Cambodia; Hong Kong, China; Japan; Lao People's Democratic Republic; Republic of Korea; Malaysia; the Philippines; Thailand; Viet Nam; Democratic People's Republic of Korea; Macao, China; Singapore and the United States of America.

The Asia and pacific Region is one of the most vulnerable areas to natural disasters. From 1950 to 2005, 54 percent (approximately 3 million people) of the worldwide deaths produced by natural disasters occurred in this region and many of these deaths are due to typhoon-related impacts. Besides this, the wind storms and floods associated with typhoon-related impacts account for 57 percent (approximately US$33.5 billion) of the economic losses in this region in the same period. Recent example of flooding disasters in urban cities such as Manila in 2009 makes the issue of urban flooding as one of the main challenges of TC.

Subsequently, The ESCAP/WMO TC at its 42nd Session held in Singapore decided to convene again the Integrated Workshop and adopted "Urban Flood Risk Management in a Changing Climate: Sustainable and Adaption Challenges" as the title of the Workshop in response to this challenge.

The Workshop is intended to provide the opportunity not only for the exchange of ideas among experts from the various fields covered by the Committee, but also to assess the progress in the various activities endorsed by the Committee at its 42nd Annual Session. Specialists in all three fields: Meteorology, Hydrology and Disaster Risk Reduction will join together to develop strategies to mitigate the devastating impacts of Urban Flooding in the context of changing climate. Moreover, the experts will take this opportunity to discuss the issues on: Climate Change and the Committee Activities; benefits of typhoons and to review the TC Strategic plan 2007-2011 in view to prepare a draft of Strategic Plan for the period of 2012-2016. The Quantitative Precipitation Estimation (QPE) and the Quantitative Precipitation Forecast (QPF), as one of the important technique to estimate the amount of precipitation, will also be addressed.

TC News from Members

Hong Kong, China

1. Storm surge alert system

With the successful implementation of a localized alert system on storm surge flooding for a small rural village community in 2009, similar early alert system was implemented for five more vulnerable areas in Hong Kong in 2010. Early alerts would be communicated to key operational personnel using the Short Message Service (SMS). Super Typhoon Megi (1013) posed severe threats to countries along its path in October 2010. In Hong Kong, localized storm surge alerts were activated during the approach of Megi. Necessary precautions were taken in time for preventing flooding caused by possible storm surge.

Figure 1. Precautions taken at one of the flood-prone locations in Hong Kong during the passage of Megi. (Photo courtesy of Information Services Department)

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

The SWIC website, operated by Hong Kong, China for WMO, continues to serve as a major and authoritative channel for dissemination of real-time tropical cyclone warnings and information worldwide. It received the "Dr. Roman L. Kintanar Award 2009" of the Typhoon Committees in 2010. In the latest 12-month period from October 2009 to September 2010, the total page view exceeded 13 million.

The Hong Kong Observatory launched a "weather wizard" electronic widget in 2008 to enable the local public to retrieve automatically the latest weather warnings from the Observatory's website and display them on the user PC. A pilot project under ESCAP/Typhoon Committee was started in 2009 to adapt this widget for warning dissemination in the region through the SWIC platform. In June 2010, the project was successfully launched by the Observatory with a new service known as SWIdget on the SWIC platform. With this new SWIdget service, local as well as international users can obtain severe weather warnings issued by participating official weather services in near real-time. Up to October 2010, warnings of the three participating weather services, namely, Hong Kong, China; Macao, China; and Guam, the USA, are available. Two Typhoon Committee members, viz Singapore and Republic of Korea, expressed interest in joining the project. Plans are in hand to invite more official weather services to participate.

3. Disseminating tropical cyclone information and warnings via smartphones

With the rapid increasing popularity of smartphones in the market, the Observatory developed an iPhone application, named as MyObservatory, in 2010 to provide individuals with a comprehensive and personalized weather service any time and anywhere. MyObservatory automatically provides the latest location-specific information, e.g. temperature, wind and weather photos from the weather stations closest to the user. In addition, the application also provides the latest tropical cyclone warnings as well as a tropical cyclone track, which is implemented on Google map with rich geographical information. "MyObservatory" has been well received by the public, and its visit figures exceeded 100 million in the space of just three months. Plan is underway for this popular application to be extended to other mobile platforms.

Figure 2 Sample displays of "MyObservatory" showing the current weather, 7-day forecasts and tropical cyclone forecast track.

4. Disseminating tropical cyclone warnings using Twitter

To reach out to the younger generation, the Observatory started experimenting with the use of social networking services for the dissemination of weather warnings and information. The Hong Kong Observatory Twitter service was launched on a trial basis in September 2010. Tropical cyclone warnings, in a form of 'tweets', are published on the Observatory's Twitter profile "HKObservatory" and distributed to all 'followers', viz. users subscribing to the tweets of HKObservatory. The advantages of using these popular social networking platforms include its cost-effectiveness for implementation and maintenance as well as the ability to reach out to international travelers to Hong Kong.

5. Satellite-based tropical cyclone rainfall forecasting tool

A tropical cyclone rainfall forecasting tool by advecting the satellite rain rate features associated with tropical cyclones along subjective tropical cyclone forecast tracks was launched in the Observatory in 2009. Here, the rain rate estimates are extracted from the QMORPH precipitation analysis produced by the Climate Prediction Center of NOAA in near real time. The predicted hourly rainfall for the Observatory, as well as 24-hour accumulated rainfall up to the next 3 days are computed. In 2010, the tool was further enhanced to generate probabilistic rainfall predictions based on the tropical cyclone tracks provided by the European Centre for Medium Range Weather Forecasts (ECMWF) Ensemble Prediction System. A forecast during the passage

Figure 3 Sample display of "HKObservatory" Twitter website.

of Severe Typhoon Fanapi (1011) in September 2010 is given in Figure 4.

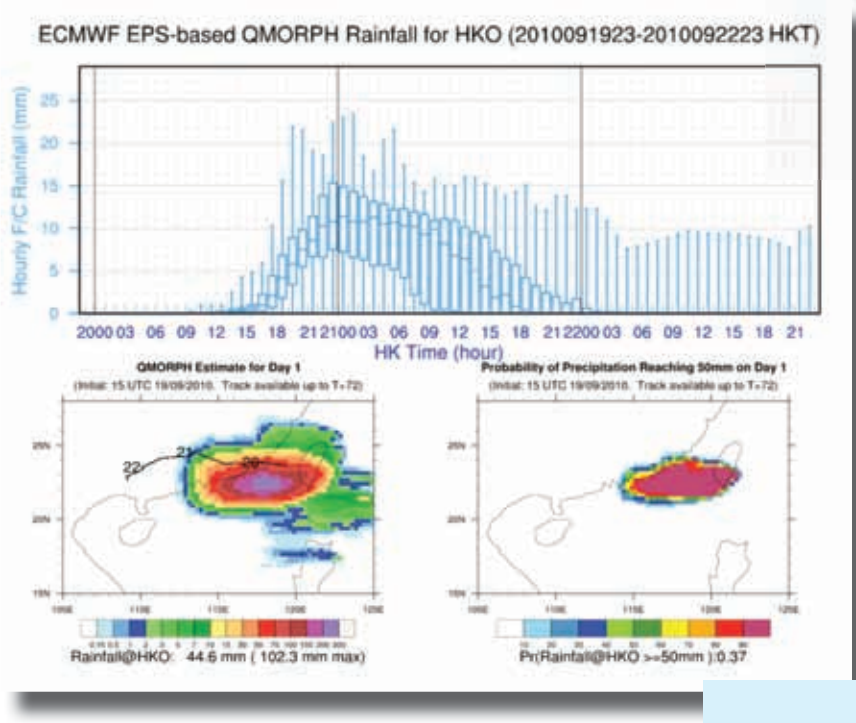


Figure 4 Predictions of rainfall associated with Severe Typhoon Fanapi (1011).

As part of the Observatory's contribution to the WMO Landfall Typhoon Forecast Demonstration Project (WMO-LTFDP), the satellite-based tropical cyclone rainfall forecasts driven by tropical cyclone forecast tracks from China Meteorological Administration have been generated for the eastern China region and supplied to the Shanghai Typhoon Institute of China Meteorological Administration in real-time since September 2010.

6. Enhanced tropical cyclone track webpage

To enable the public to identify more easily the areas which may be affected by tropical cyclones, the Observatory launched a new tropical cyclone track information webpage based on a geographic information platform (Figure 5) in addition to the existing fixed-area map version. Users can display tropical cyclone positions and tracks over a detailed map, an aerial imagery or a terrain map. They can also zoom in or out the map and pan to their area of interest. In addition, detailed information of the tropical cyclone, including its position, classification and maximum sustained wind, can be displayed simply by placing the mouse cursor over its analysed or forecast positions. Multiple tropical cyclones can also be displayed on the same map.

Figure 5 New tropical cyclone track information webpage for the public.

7. Operation of a new generation Numerical Weather Prediction System to support

tropical cyclone forecasting at the Observatory

The new generation numerical weather prediction system of the Observatory has been put into operation since June 2010. The system, named as the Atmospheric Integrated Rapid cycle (AIR) forecast model, provides 72 hours and 15 hours of forecasts at horizontal resolution of 10 km and 2 km respectively. With improved model physics, higher horizontal resolution and the use of 3-dimensional variational data assimilation method to ingest more satellite observations, AIR forecast model shows improvement in the weather forecasts on both surface and upper levels. To support the prediction of high-impact weather due to tropical cyclones, new products like distribution of surface wind and gusts have been developed for reference by forecasters (Figure 6).

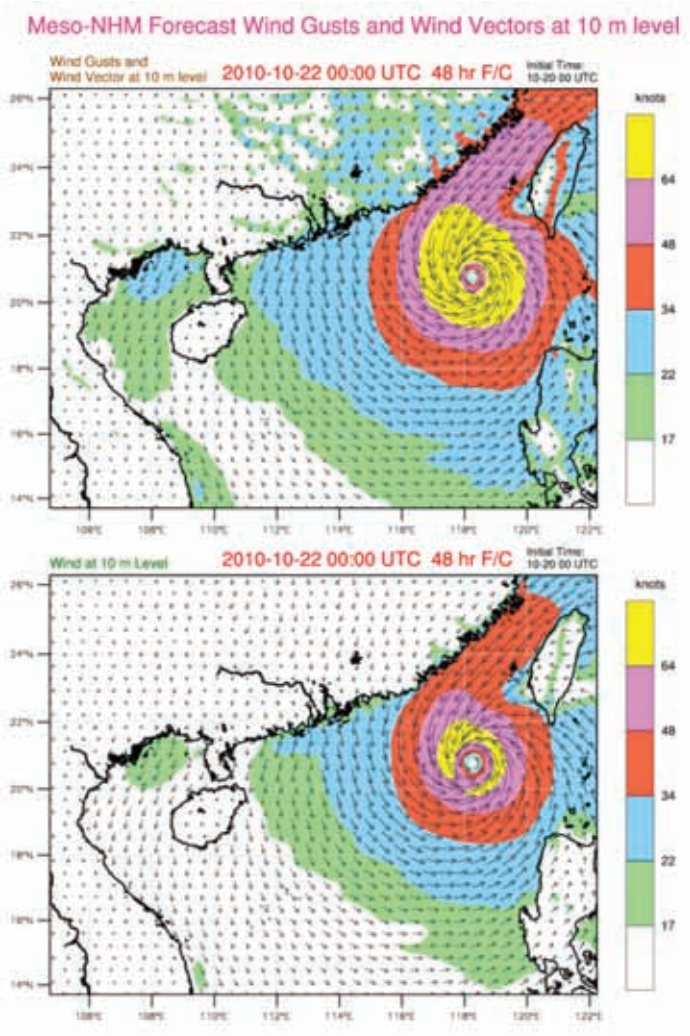


Figure 6. 48 hr forecast of surface wind gusts (upper panel) and winds at 10 m level (lower panel) from 10 km NHM for Severe Typhoon Megi (1013) at 00 UTC, 22 October 2010. Wind speeds (in knots) are represented by color shading and areas of strong force wind (blue) are forecast to cover the coastal waters in vicinity of Hong Kong.

8. Objective wind probabilistic forecasts for the Hong Kong International Airport (HKIA)

Crosswind is one of the major causes of significant flight delay and cancellation at the HKIA during tropical cyclone situations. To assist aviation forecasters in assessing the possibility of high winds and crosswinds during the approach of tropical cyclones, the Observatory developed objective wind speed and crosswind probabilistic forecasts based on the ECMWF Ensemble Prediction System outputs. The 36-hour probabilistic forecasts are made available to aviation users twice a day on a trial basis.

A sample crosswind probabilistic product during the passage of Tropical Storm Mujigae in September 2009 is given in Figure 7. The ECMWF deterministic model forecast (denoted by yellow line) is also displayed on the time series plot for user reference. To facilitate near real-time verification, 10-minute mean wind observations ending on the hour from the six anemometers on the runways of the airport are overlaid and denoted by vertical black segments spanning the range of wind speed observations from various anemometers. The wind observation in METAR reports are marked with a cross in the figure.

To facilitate users' understanding of the spread in the probabilistic wind forecasts, more new products including the probabilistic forecast of tropical cyclone distance from HKIA are planned for trial in 2011.

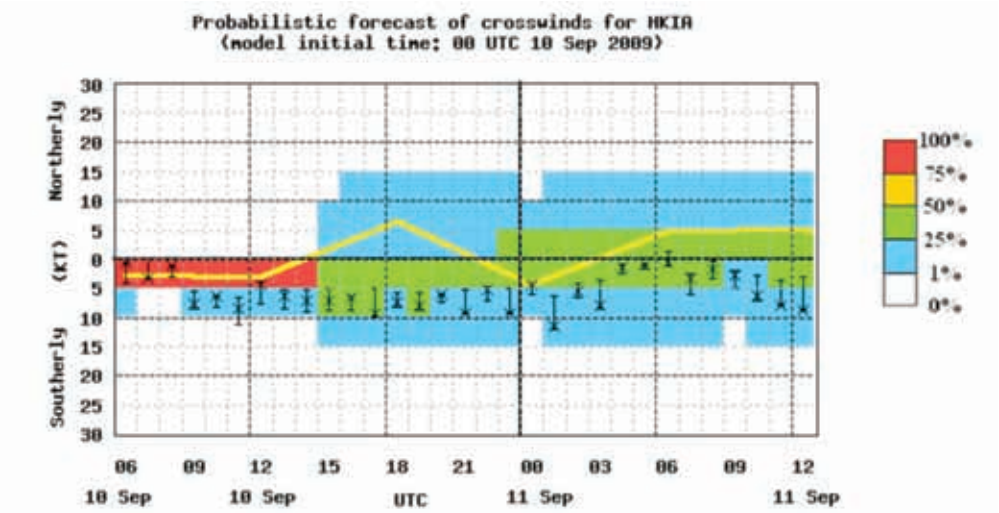


Figure 7 Objective probabilistic forecast of crosswinds for Hong Kong International Airport during Tropical Storm Mujigae in September 2009.

9. Benefit of typhoons

Although tropical cyclones usually cause casualties, damages and economical losses, they may also have positive implications in some circumstances, particularly in summers with prolonged dry and hot spells. The Observatory recently made an attempt to assess the benefits of typhoons in Hong Kong. The rainfall associated with tropical cyclones, which accounts for about 30% of Hong Kong's annual total rainfall (Figure 8), can help alleviate the prevailing drought and hot weather. A distinct example in Hong Kong was Typhoon Viola in May 1964 which brought about 300 mm of rainfall to Hong Kong during its passage and ended the most significant drought in Hong Kong on record which started in May 1963. Furthermore, an analysis of the cooling effect of the 21 tropical cyclones over the South China Sea in 2007 to 2009 revealed that the rainy and cloudy weather associated with these tropical cyclones brought a net cooling effect of about 0.17°C per day during their passages which altogether lasted 93 days. This amount of cooling helped relieve the prevailing hot weather in summertime. Moreover, the windy weather brought by some tropical cyclones could also contribute as a potential source of wind energy. The mean wind power density available during tropical cyclone days is estimated to be more than double the annual mean wind power density at a potential site.

10. Typhoon Committee Research Fellowship

The Typhoon Committee Research Fellowship offered by the Observatory in 2010 was awarded to Mr. Huang Yiwu, a typhoon forecaster from the National Meteorological Centre of China Meteorological Administration. Mr. Huang embarked on a two-month attachment to the Forecast Development Division of the Observatory from late October 2010 to work on the research topic "Can the extreme rainfall associated with Typhoon Morakot (0908) happen in Hong Kong?". The study involved the conduct of numerical experiments by transplanting the storm vortex of Morakot and the associated environmental conditions to the South China Sea in order to estimate the amount of rainfall that could possibly fall in Hong Kong.

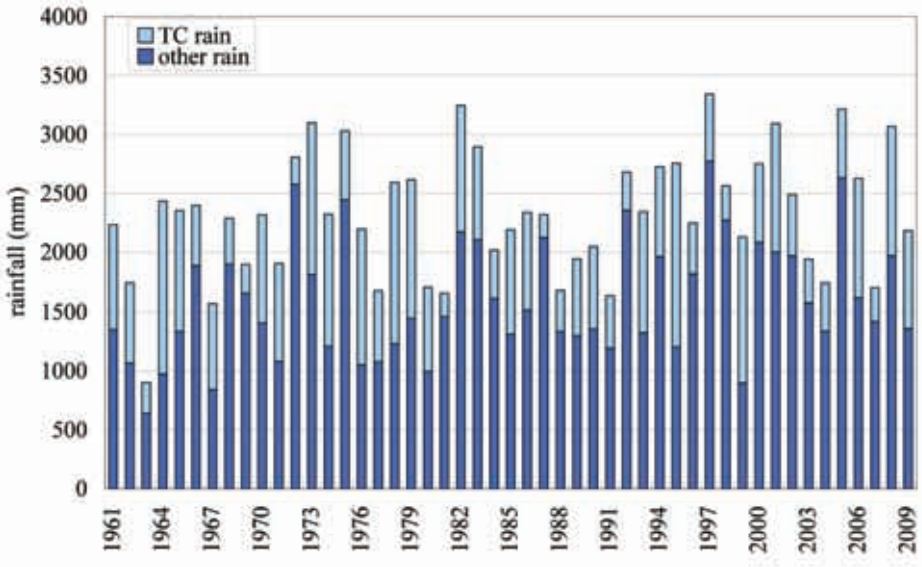


Figure 8. Histogram showing the contribution of tropical cyclones (marked in light blue) to the total rainfall every year.

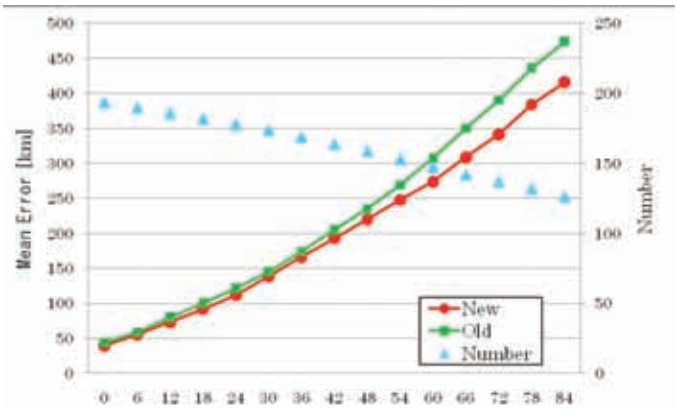
Japan

1. Improvement of the Initialization Scheme for Tropical Cyclones in JMA's NWP

In JMA's global and meso-scale NWP systems, a typhoon-bogus scheme is applied to initialization for tropical cyclones (TCs) over the western North Pacific. In this scheme, a typical TC structure is generated based on real-time TC analysis at RSMC Tokyo, and pseudo-observation data (i.e., bogus data) extracted from this structure are deployed around the TC. The bogus data are assimilated operationally in each NWP system.

Because of recent improvements of the accuracy of the first-guess fields in operational analysis stemming from satellite data assimilation and the introduction of a sophisticated data assimilation system, a bogus data adjustment function has also been introduced. With this function, the number of bogus data is adjusted according to the distance from the TC's central position in the TC analysis to one in the first guess. In many cases, the number of bogus data is greatly reduced as a result, and these data are deployed only in the vicinity of the TC center.

For the global NWP system, data assimilation and forecast experiments were conducted prior to actual operation. The level of TC track prediction error was clearly reduced as a result of using the modified typhoon-bogus scheme. The new scheme was incorporated into the operational global NWP system in April 2010, and an almost identical scheme was also incorporated into the operational meso-scale NWP system in September 2010.



Mean track forecast error (km) of TCs within the RSMC Tokyo's area of responsibility from 25 September to 25 October 2009 by the global NWP system. Red line shows the error of TC track prediction with the improved Typhoon-Bogus scheme and green line shows that with the old Typhoon-Bogus scheme, respectively. The improved scheme has reduced the forecast errors, especially at longer forecast time. The blue triangle dots denote the number of samples for verification.

2. Improvements to the Initial Perturbation of JMA's Typhoon Ensemble Prediction System

Since February 2008, JMA has operated the Typhoon Ensemble Prediction System (TEPS) with the aim of contributing to operational five-day TC forecasts at the RSMC Tokyo - Typhoon Center. The initial perturbations of TEPS are created using the singular vector (SV) method. Two types of SV spatial target area are defined to capture the uncertainty of TC track forecasts. One is the Northwestern Pacific (20°N – 60°N, 100°E – 180°E), and the other is around the center positions of TC forecasts (three at maximum: TC target area).

To further improve the performance of TEPS, JMA revised the method used to make initial perturbations. First, TC target areas are set as circular regions with a 750-km radius from the TC's central position. Second, the amplitude of the initial perturbation is normalized using the moist total energy value. These improvements contribute to the appropriate distribution of initial perturbations and increase in the reliability of TC track forecasts. The revisions were implemented in TEPS in May 2010.

3. Masashi Kunitsugu Appointed as NTC-JMA Head

Masashi Kunitsugu, 49, was appointed as the new head of the National Typhoon Center at the Japan Meteorological Agency (JMA) on 1 April, 2010, succeeding Kiichi Sasaki. Mr. Kunitsugu graduated from the Meteorological College (JMA's training institute) in 1985, and started his career as a scientific officer at the Matsue Local Meteorological Observatory.

From 1998 to 2004, he was in charge of developing quantitative precipitation

estimation and forecasting (QPE/QPF) at the Forecast Department's Forecast Division. In 2005, he transferred to the same department's Administration Division, where he worked in international affairs including activities related to WMO and the Typhoon Committee. In 2007, he worked toward the improvement of aviation weather services in his role as Deputy Head of the Office of Aviation Weather Forecast. From 2008 to 2009, he was Chief of the Application Section in the Forecast Department's Numerical Prediction Division.

4. Tenth Typhoon Committee Training Seminar at the RSMC Tokyo - Typhoon Center

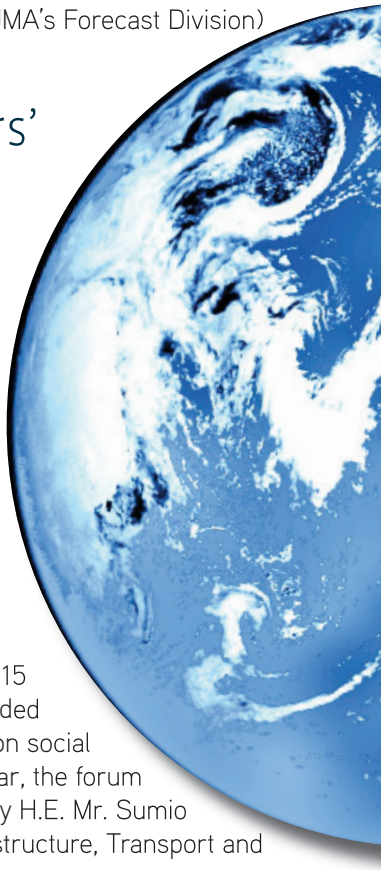
One responsibility of the RSMC Tokyo - Typhoon Center is to assist members of the ESCAP/WMO Typhoon Committee in typhoon forecasting services. A related activity of the Center is to hold on-the-job training in typhoon operations for forecasters in the region with the aim of improving analysis and forecast skills by exchanging views and sharing experiences in the field.

Two forecasters – Ms. Wong Sau Ha (Hong Kong Observatory) and Ms. Hu Yihong (National Environment Agency of Singapore) – visited the Japan Meteorological Agency (JMA) from 21 to 30 July, 2010, to participate in the tenth Typhoon Committee Training Seminar. On the course, the two forecasters learned about tropical cyclone analysis and forecasting, and in particular analysis using SATAID software (a satellite viewer program). The sessions provided were intended to give detailed information on RSMC products, including JMA's operational tropical cyclone forecast. The course also featured practical training to estimate tropical cyclone center location and intensity using the Dvorak and the early-stage Dvorak techniques.

Ms. Hu Yihong (left), Mr. Kunio Sakurai (middle), Director-General of JMA, and Ms. Wong Sau Ha (right), with staff members from the National Typhoon Center (JMA's Director-General's Office)

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

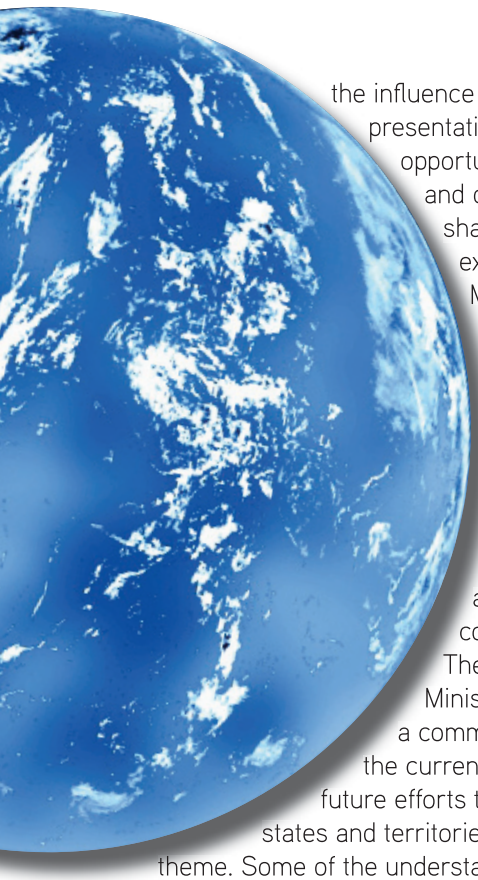
5. The 8th Ministers' Forum on Infrastructure Development in the Asia-Pacific Region



The 8th Ministers' Forum on Infrastructure Development in the Asia-Pacific Region was held in Tokyo, Japan, on Saturday 9 October, 2010. Ministers in charge of infrastructure development from 15 member states and territories attended the forum for a high-level meeting on social infrastructure in the region. This year, the forum was hosted by Japan and chaired by H.E. Mr. Sumio Mabuchi, the Minister of Land Infrastructure, Transport and Tourism (MLIT).

The general meeting of the forum started with a keynote address entitled An End-to-End Approach for Climate Change by Dr. Toshio Koike, who is a professor at Tokyo University's Civil Engineering Department and chair of the Steering Group on Water and Climate Change of the Asia-Pacific Water Forum. The speech was followed by a series of presentations by the heads of the participating delegations reporting on issues they currently face and efforts to solve them along the line of the forum's theme – the adaptation of infrastructure to increasing water-related risks under

The ministers pose for photos at the 8th Ministers□Forum on Infrastructure Development in the Asia-Pacific Region



the influence of climate change. The presentations provided a great opportunity for the ministers and other participants to share local knowledge and experience. MLIT Vice-Minister Mr. Wakio Mitsui spoke on behalf of the Japanese delegation and introduced water-related efforts made in Japan, such as flood control, water resource development, adaptation to climate change and other international contributions.

The forum finally adopted a Ministers' Declaration stating a common understanding of the current situations and outlining future efforts to be made by the member states and territories regarding the forum's theme. Some of the understandings shared were as follows:

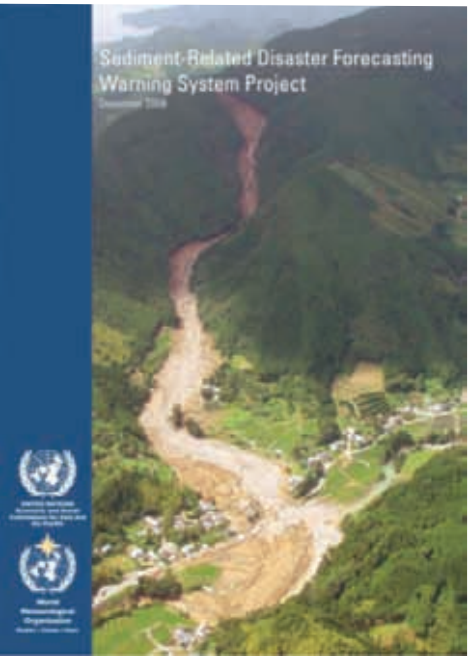
- Resolving water-related issues, such as floods, droughts and water quality deterioration, is essential for sustainable development and preservation of the environment and the ecosystem.
- It is important that the governments of the member states and territories acknowledge and promote the implementation of appropriate measures for water-related risks as a political priority issue through cooperation at all levels.

Based on these and other common understandings, the forum issued a joint statement on future efforts, including the following:

- The member states and territories will strongly promote mitigation and adaptation measures for water-related risks, which are expected to increase due to the effects of climate change.
- The member states and territories will promote integrated adaptation measures combining physical and non-physical action.
- The member states and territories will strengthen their network and promote international cooperation toward the resolution of water issues around the world.

6. The final report of the Sediment-related Disaster Forecasting Warning System Project and Field Training for the Hazard Mapping for Sediment-related Disasters Project

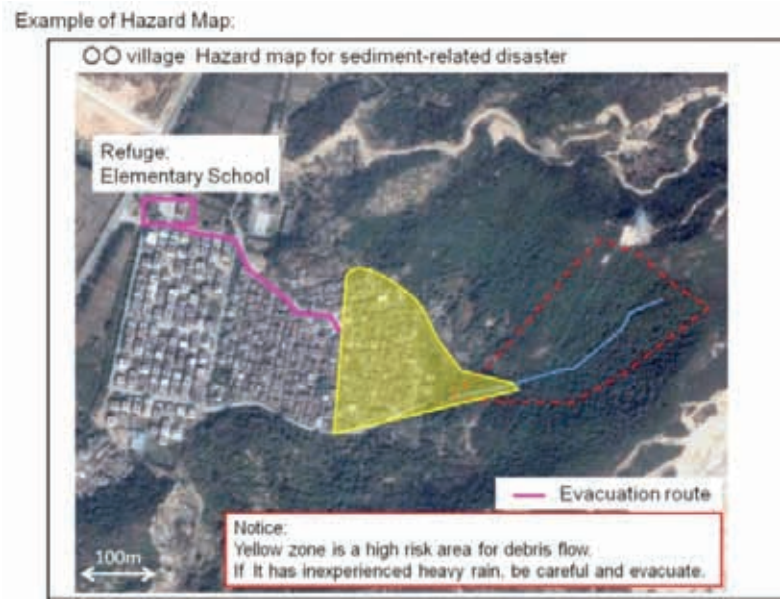
From 2002 to 2008, the Sediment-related Disaster Forecasting Warning System Project was executed with the aim of sharing the Japanese method of setting the critical rainfall levels that trigger warnings and evacuation in the event of sediment-related disasters from the viewpoint of identifying dangerous situations. The project involved eight TC members (China, Malaysia, Vietnam, the Philippines,



Thailand, the United States and Japan), and its final report was published in the form of technical guidelines and case studies for the 42nd TC session in Singapore. (http://www.typhooncommittee.org/docs/publications/book2_SEDIMENT.pdf). Currently, the Hazard Mapping for Sediment-related Disasters Project, led by the Sabo Department of MLIT and NILIM, is being executed by six TC members (China, Hong Kong, the Philippines, Thailand, the United States and Japan) to share Japanese methods of setting hazardous areas, making hazard maps for warning/evacuation and land use restriction from the viewpoint of identifying dangerous areas.

On Sept. 4 and 5, before the TC 5th Integrated Workshop in Macao, a collaboration meeting between WGDRR and WGH and field training for the Hazard Mapping for Sediment-related Disasters Project was held. On Sept. 4, an indoor lecture was given at the Macao Science Center to explain the Japanese method of setting hazardous areas and how to make and use hazard maps. On Sept. 5, field training was held for TC members and locals (engineers and residents) on setting hazardous areas and improving local awareness of risk for sediment-related disasters at a model site in Zhuhai City, China. The meeting and field training were attended by 20 people from nine TC member countries (Cambodia, China, D.P.R. Korea, Hong Kong China, the Republic of Korea, Macao China, Thailand, the Philippines and Japan) and 15 local staff from Zhuhai City Office and local residents

Field training for the Hazard Mapping for Sediment-related Disasters Project in Zhuhai City, China



Example of a hazard map for sediment-related disasters

Macau, China

1. "Together We Reduce Emission and Save Energy" Family Hiking Activity

06 Dec 2009, Macao

This hiking activity, being one of the series programs of the "Application of the Kyoto Protocol in Macao" organized by the Macao Geophysical & Meteorological Bureau together with The Women's General Association of Macau, was held at 10a.m. on the 6th December 2009 at the Guia Hill Fitness Trail with over a hundred parents bringing their children making a total of over 500 participants. Along the trail were game booths and exhibition panels regarding climate change and environmental protection. This aims at promoting family joy and harmony while arousing the next generation to concern about global warming and noticing the importance of conserving resources.

The purpose of organizing this activity is to enhance environmental awareness of every citizen and to love our earth as global warming is getting more and more serious. Besides, family participation also helps in promoting relationship and to educate children at an early stage so as to nurture them with a correct attitude regarding environmental protection, hoping to play a role in the mitigation of climate change while leading to an environmental life.

2. Attending the 15th Conference for Meteorological Operational Cooperation as well as the 23rd Seminar for Meteorological Scientific Techniques between Guangdong, Hong Kong and Macao

20 Jan 2010, Macao

Staffs of meteorological departments from these three regions gathered together at Shenzhen between the 20th and 22nd of January to attend the 15th Conference for Meteorological Operational Cooperation as well as the 23rd Seminar for Meteorological Scientific Techniques between Guangdong, Hong Kong and Macao. Shen Xiaonong, the Deputy Administrator of the China Meteorological Administration, also participated in this meeting exchanging

development and analytical achievements between the fore-said regions.

A total of 27 papers were presented during the seminar covering a wide range of different topics, including climate change, tropical cyclones, forecast techniques, radar application technology, GPS water vapor information application, public services, etc. Meteorological experts from Guangdong, Hong Kong and Macao carried out active discussions on all of these topics.

Over the past years, meteorological departments from these three regions had already established a very close and extensive cooperation relationship. The Macao Meteorological and Geophysical Bureau will strengthen cooperation with meteorological departments of both Guangdong Province and Hong Kong so as to provide a more comprehensive meteorological service for the prosperous development of the Pearl River Delta Region.

3. Attending the Commission for Aeronautical Meteorology of the World Meteorological Organization

03 Feb 2010, Macao

Over a hundred aeronautical meteorological experts from all over the world gathered in Hong Kong to attend the 14th Session of the Commission for Aeronautical Meteorology of the World Meteorological Organization. This was the very first time that such kind of large-scale international aeronautical meteorological conference to be held in Asia. Macao being a member of the World Meteorological Organization, also attended the meeting represented by the Sub-director of the Macao Meteorological and Geophysical Bureau Mr Antonio Viseu together with the head of the Aeronautic Meteorological Office. Through participating international conferences and exchanging technology with experts from all over the world, application of meteorology will be promoted to the aviation field creating a more effective protection for aviation safety.

Aeronautical Meteorology is always one of the most important elements for aviation safety. The Macao Meteorological and Geophysical Bureau, acting as an aeronautical meteorological service unit of the Macao International airport, has committed to provide high quality aeronautical meteorological services. Besides providing accurate weather forecast and warning, the bureau had always been enhancing its scientific level in order to ensure aviation safety.

4. Celebrating the 23/March - World Meteorological Day, Introduction of "Temperature Index" by the Macao Meteorological and Geophysical Bureau

23 Mar 2010, Macao

The theme of this year's World Meteorological Day is "World Meteorological Organization - Sixty Years of Service Committed to Mankind Safety and Well-being". Our bureau had organized a series of activities including an exhibition held at the Friendship Square:

Roving lectures of Climate Change were being held between March and June in many colleges in Macao encouraging

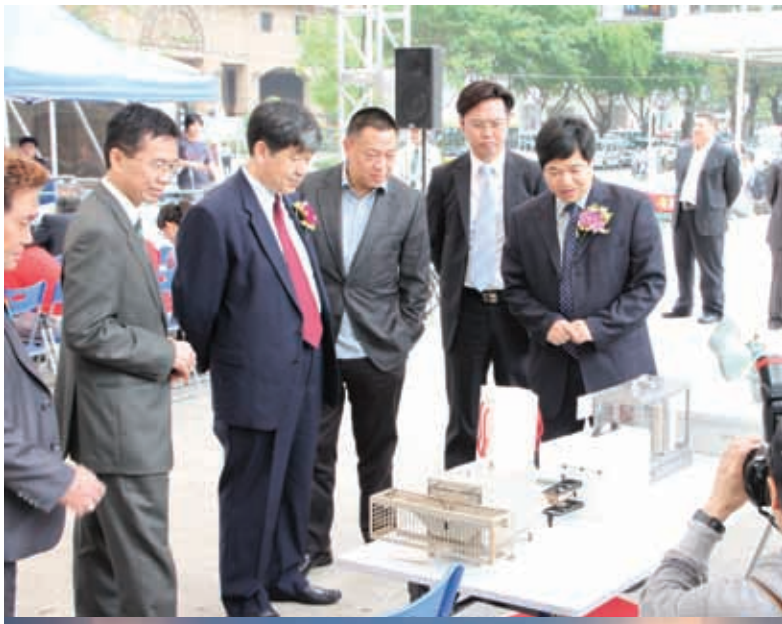
lives of low-carbon and energy saving.

The newly established "Temperature Index" was officially launched so as to let all citizens understand temperature change more easily and take appropriate precautions.

In order to remind the public of developing an environmental attitude for fighting against climate change, the Macao Meteorological and Geophysical Bureau together with the General Association of Chinese Students – Macau organized a student drawing competition named "Together We Fight Against Climate Change" between February and March. The award ceremony and the exhibition of those awarded pieces were both held on the day of the 23rd.

Meteorological instruments, being in service at the meteorological bureau since decades, were displayed at the exhibition venue. There were also panels showing the history and development of the bureau under the theme of "Review and Development of the Meteorological Bureau" so as to promote public knowledge of the development of the meteorological field in Macao.

Celebration dinner was held for those present and retired meteorological professionals, as well as organizations possessing close relationship with the meteorological bureau to promote friendship. During the dinner, commendation medals were also awarded to staffs of the meteorological

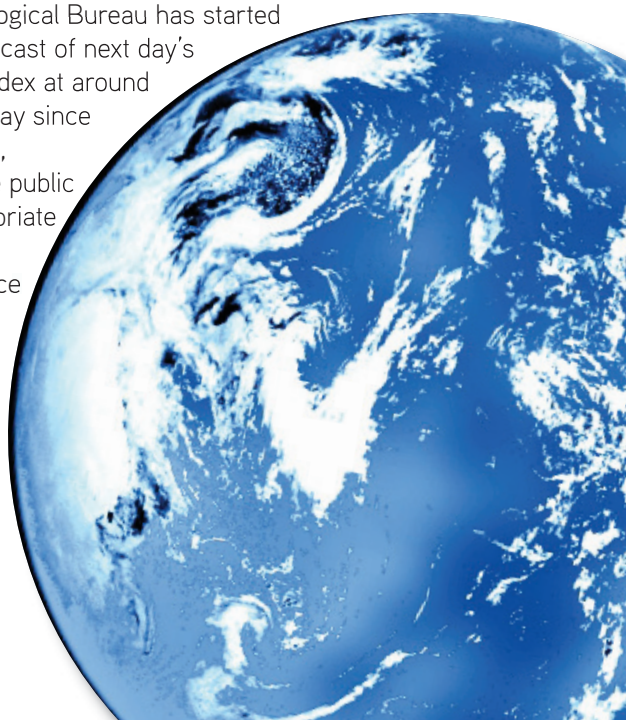


bureau providing up to 20, 25 and 30 years of services.

5. Public Weather Service

"UV Index"

The Meteorological Bureau has started releasing forecast of next day's highest UV index at around 5p.m. every day since October 2010, reminding the public to take appropriate precaution in order to reduce harming effects to human health from the UV rays. "UV Index" has been classified into 5 levels, citizens can



choose to take appropriate sun-block measures referring to the bureau's forecast.

Extension of Trial Range for the Flooding Alert SMS Service

The bureau first introduced Flooding Alert SMS Service in August 2010 to alert shops affected by flooding through sending SMS. The SMS mainly provides forecast of the flooding situation caused by rainstorm. Whenever an hourly rain rate reaching over 20mm had been recorded or if the rainstorm signal is in force, the bureau will send SMS to the registered shops, providing real time flooding situation and the forecast trend of the rain for them to make early preparation. After 3 times of testing alert SMS service, the bureau had evaluated the effectiveness of this project and collected different opinion for improving the relevant service. Starting from October, the second phase of this trial project will be extended to all shops being affected by flooding throughout Macao.

Enhancing Communications with the Terminal Operators

In December 2009, the bureau introduced the "Weather Information System" to the operators working in the Macao Maritime Ferry Terminal. Each terminal operator is granted an individual user ID and password to access the system.

The "Weather Information System" was tailor-made for the terminal operators, through which they can achieve the latest meteorological information for use in planning their work and making necessary adjustment especially during bad weathers.

Every half year the Bureau will meet with the terminal operators for discussion about the system. By listening to the comments and ideas from the end-users, the bureau is able to better meet their needs as well as to improve their weather services to the public.

Typhoon Bogussing Scheme on the Operational MM5 Model at the Malaysian Meteorological Department

The Shanghai Typhoon Institute's Bogus Data Assimilation (BDA) Typhoon Bogussing Scheme has been successfully implemented on operational basis at the Malaysian Meteorological Department (MMD) since December 2009. The bogussing scheme was implemented in order to improve the Tropical Cyclone (TC) representation in the MM5 model at MMD. Currently, the bogussing scheme has been configured for the South East Asian domain bordering 90°E to 130°E and 0N° to 20°N. The operational MM5 model would activate the bogussing scheme once there is a tropical cyclone within this domain with a central pressure of less than 1000 hPa.

There were 13 TCs in the Western North Pacific region from July to October 2010. Out of which 7 TCs originated from or made its way in the South China Sea. This includes TC Consun, Chantu, Dianmu, Mindulle, Lionrock, Meranti and Megi. The MM5 with the BDA Typhoon Bogussing Scheme for a forecast range of 72 hours was used to forecast the tracks for these TCs at an interval of 12 hours from the initial forecast time. The forecast track up to 48 hours was close to the TC's actual track. However beyond the 48 hours forecast, the track begins to deviate from the actual track and this is mainly due to the intricacies involved in forecasting the track upon landfall or decay. However, the track forecast during TC Megi performed rather well up to 72 hours. This was primarily due to the fact that TC Megi was a very intense TC and was active for almost 10 days and travelled along longitude 118°E from 16°N to 25°N in almost a straight path. In general, the track forecast of these tropical cyclones was better compared to the MM5 model without the typhoon bogussing scheme as depicted in Figure 1.

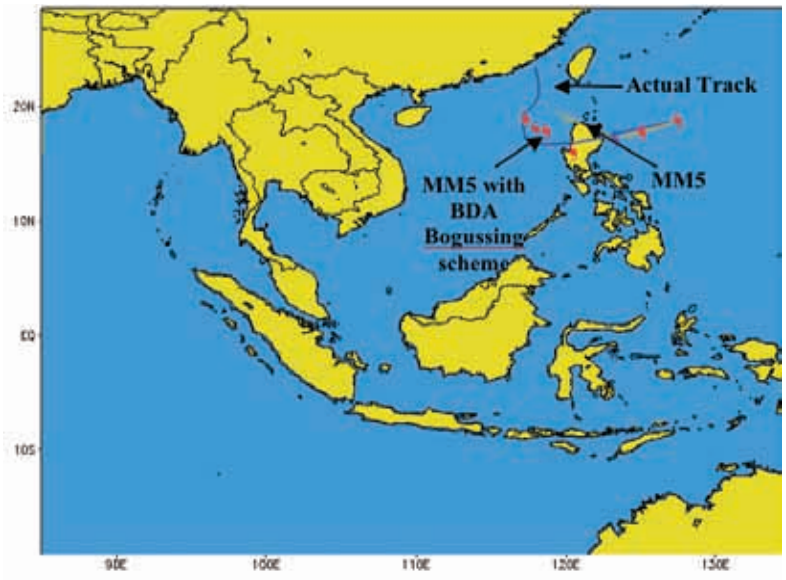


Figure 1: TC Megi 12-hour interval track forecast for 72 hours in comparison with the actual track

For the intensity forecast as shown in Figure 2, the BDA typhoon bogussing scheme initialization has improved the intensity forecast of TC Megi. The MM5 model without the BDA typhoon bogussing scheme has shown the peak in intensity at the 36th hour compared to the actual intensity peak which occurred at the 24th hour.

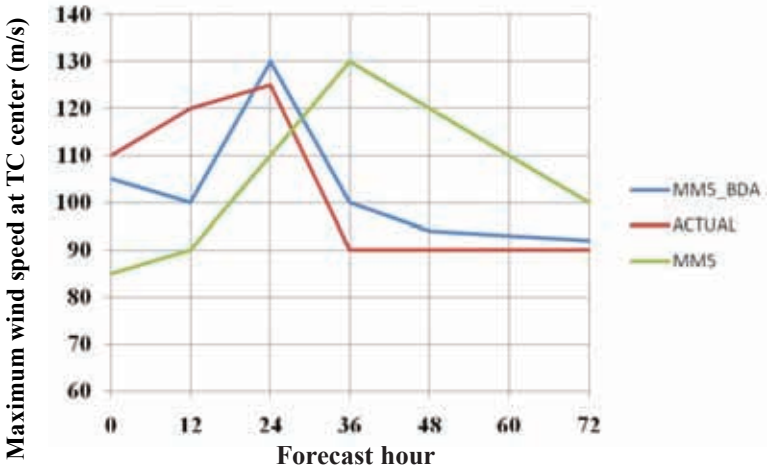


Figure 2: TC Megi 72-hour intensity forecasts

Currently verification of storm track forecasts is being conducted and further research in TC intensity, structure change, landfall process, ensemble prediction technique of tropical cyclone track and assimilation of the non-conventional data (radar and satellite) has been ear-marked for the near future to improve the TC bogussing scheme's performance.

Under working Group of Hydrology,Typhoon Committee Under Regional Cooperation Project Implementation Plan (RCPIP) Working Group of Hydrology, Department of Irrigation and Drainage Malaysia (DID) was conducted 4th **On the Job Training (OJT)** Configuring an Operational Flood Forecasting System based on the Tank Model from July 12 to August 6, 2010 in Kuala Lumpur. Three Participant from TC country members was selected to join the training along with DID officer for about 1 month. Mr. Chen Hong Yu from China,Ms. Nguyen ThuyThi from Vietnam and Mr. SengduangduanPhouthanoxay from Laos and 15 DID officer were trained to developed a operational flood forecasting model using tank model for river basin from their respective country.

Throughout the 5 weeks, several lectures on hydrological

modeling and programming in Microsoft Excel's macro language (VBA) were conducted. Participants were also involved inconfiguring a Tank model for their selected catchment, hands-on development of the modeland coding the model in VBA.Beside classes and computer hands on, the participant have a chance to visit Central Forecast Office in Malaysian Meteorological DepartmentPetalingJaya.Storm water Management and Road Tunnel (SMART) Operation Office, Putrajaya and DID hydrological station.
At the end of the training, the participants not only gained knowledge of the tank model but wereexposed to development of MSExcel Macros using Visual Basic for Applications (VBA). This allowsflexibility in changing the way Tank model is adopted in the various river basins. As a result most participants were able to simulate the flood events for their selected catchments successfully.

The certificate of participation was given during farewell lunch by Deputy Director of Water Resources Management and Water Resource Division. Tn. Haji Azmi to the foreign participant and DID officer who successful finish their training.

Picture 1: Lecturer and hands on at classroom

Picture 2: Visit to Malaysian Meteorological Department by foreign participant and DID officer

Picture 3: Site Visit to SMART

Picture 4: Site visit to DID Hydrological station.

Picture 5: Farewell lunch organizes by DID at the end of the training.

Republic of Korea

Fig.1. Participant of the expert meeting on the typhoon activity and disaster prevention 2010 held on April 5-6, 2010, Jeju, Korea.

1. Expert Meeting on the Typhoon Activity and Disaster Prevention 2010

National Typhoon Center (NTC) of Korea Meteorological Administration (KMA) held an expert meeting to establish the prevention measures of typhoon-related disaster for this year on April 5-6, 2010 in Jeju, Korea. Over 40 experts in the typhoon research and forecast and the policy decision from the Ministry of Public Administration and Security, National Institute for Disaster Prevention, Korea Water Resources Corporation, Seoul National University, Jeju Special Self-governing Province and so on were participated in this meeting, and discussed their outlooks on the typhoon this year. There had been no injuries or damage from the typhoon for the last two years. However, some studies showed that two or three typhoons would be possible to land the Korea Peninsula this year (In fact, three typhoons (Dianmu(1004), Kompasu(1007) and Malou(1009)) affected Korea). They also introduced methods to prepare for typhoon and minimize losses by organization. Most participants agreed to reinforce their mutual cooperation and KMA explained the plan on the expansion of the typhoon forecast time length to 5 days.

2. Workshop on the Seasonal Prediction of Typhoon Activity

A workshop on the seasonal prediction of typhoon activity hosted by NTC/KMA was held on August 23-24, 2010, at Seogwipo KAL Hotel in Jeju, Korea. The main theme was “the current and near-future condition of typhoon in 2010.” Experts from several fields such as meteorology, oceanography, hydrology, disaster prevention, and journalism were participated in this workshop and presented their research results about the frequency, track, strength, activity of typhoon and typhoon-related phenomena such as La Nina, Madden–Julian oscillation (MJO) and Arctic Oscillation (AO). Most participants noted that typhoon generation frequency in the Northwest Pacific would be small in number and stronger than normal year in the intensity. And especially they expected that Korea would be directly affected by at least one or two typhoons for the rest of this year.

Fig 2. Group photo of the workshop participant on August 23-24, 2010, Jeju, Korea

meteorological Forecasting of NHMS, were performed well their own missions in NTC/KMA. They raised standard of understanding on the experiences such as user-practice and operational work from learning of Typhoon Analysis and Prediction System-2 (TAPS-2) for September. After completion of forecasting training for one month, they also carried out a joint research for the development of statistical model for the seasonal prediction of typhoon genesis frequency, and the function improvement of TAPS-2 from October to November with NTC forecasters. The research results are supposed to submit to local journal or to print as a research paper.

Fig. 3. Presentation of research fellowship student (left) and with NTC staff at the NTC front door on Nov. 19, 2010 (right)

3. KMA's Typhoon Research Fellowship of TC-TRCG

KMA invited two typhoon experts from the Thai Meteorological Department (TMD), Thailand, and the National Hydro-Meteorological Service (NHMS) of Viet Nam from September to November in 2010. The invited experts received the training course about typhoon forecast and carried out the joint research. This activity was implemented as a part of the Typhoon Committee Research Fellowship and was to give a training opportunity of typhoon forecasting to typhoon committee members and contribute to the development of typhoon forecast field. Mr. Kamol Promasakha na Sakolnakhon, who is a model expert from the Numerical Weather Prediction Subdivision, Weather Prediction Bureau, TMD, and Mr. Tran Quang Nang, who is a forecaster from the Short range Meteorological Forecasting Division, National Center for Hydro-

4. 5-Day Typhoon Forecast (Experimental and Domestic version)

NTC/KMA tried to extend the typhoon forecast period from 3 days to 5 days in 2010, which is even for domestic service and experimental version. This extension of forecasting time was expected to be helpful to prepare for the typhoon approaching Korea, and to make a valuable contribution towards reducing the damage caused by typhoon. This 5-day forecast in KMA was possible due to the increase of the numerical model predictability and also intensified monitoring ability using the satellite-based observed data. Even this forecast system ran under the experimental version in 2010, it has planned to make official forecasting system from 2011 after serious evaluation to this year's forecast results.

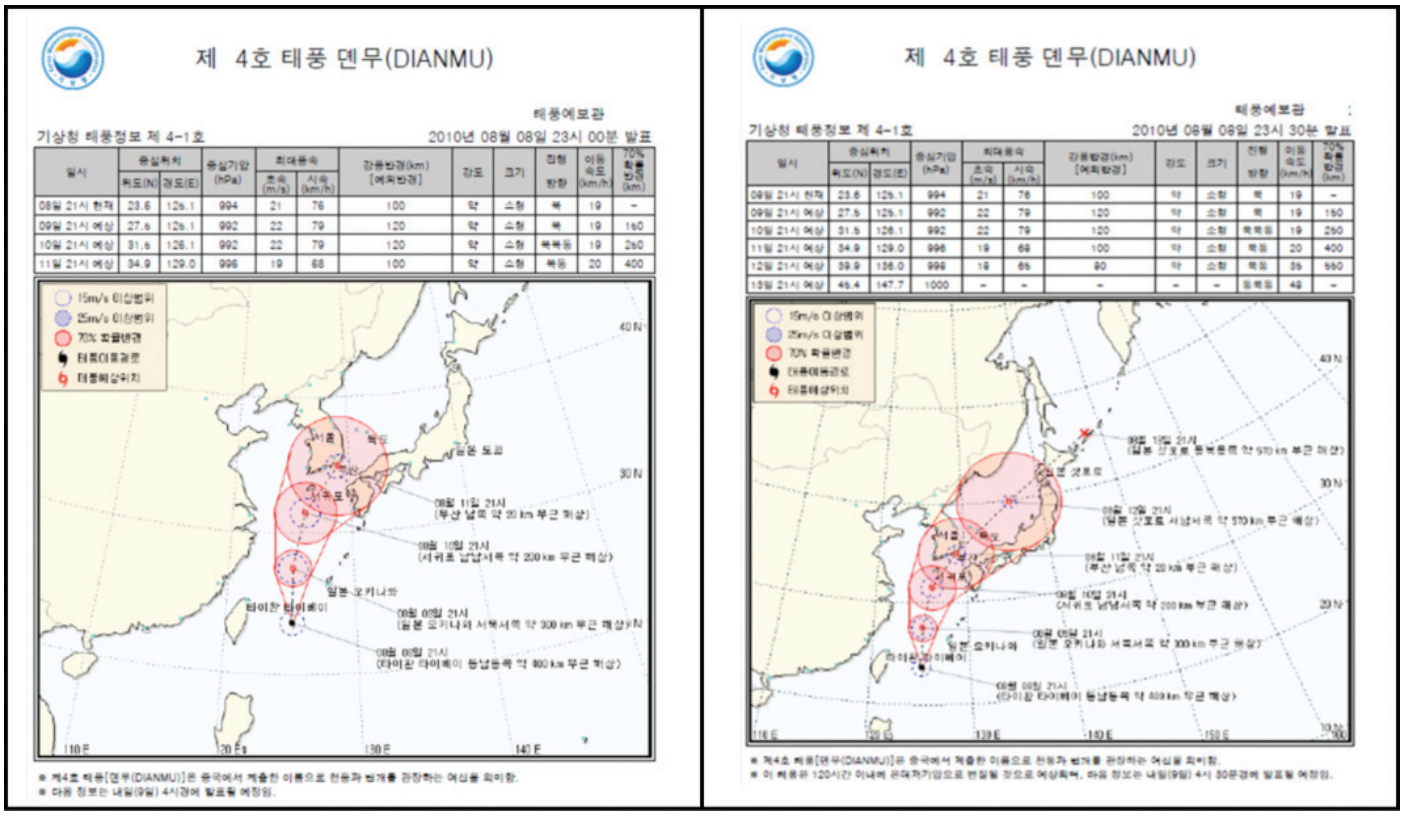


Fig. 4. An example of 3-day (left) and 5-day (right) forecast of typhoon information

5. KMA run the Joint Research Program with the NHMS of Viet Nam

The objective of this project is to directly establish the KMA's typhoon analysis and prediction system into the NHMS of Viet Nam. Because of many differences between Korean and Vietnamese Meteorological forecast in general and tropical cyclone forecast in particular. And it must exist difficulties to install and apply the TAPS-2 in Viet Nam if they don't have a detail plan for this. KMA invited two Viet Nam forecasters to NTC, Jeju, to give them opportunity to setup a plan of how to install it in the Viet Nam system in the future. The invited forecasters stayed at NTC of KMA during 3 months, and they also experienced the TAPS-2 system and learned the real forecasting skill under the direction of NTC forecaster through operational working.

4th Asian Ministerial Conference on Disaster Risk Reduction

4th AMCDRR

Disaster Risk Reduction through Climate Change Adaptation

Oct. 25-28, 2010 Incheon, Korea

1) Key questions or issues raised, main challenges or constraints identified (say, max 5):
If possible, record who raised these.

Because of global climate change, the trend in the intensity and frequency of typhoons is changing. We will likely have stronger typhoons that would bring more severe damages caused by floods, higher waves, storm surges, debris flows, landslides, and strong winds.

Accordingly, we need to develop a new disaster risk reduction strategy to prepare better for such hazards.

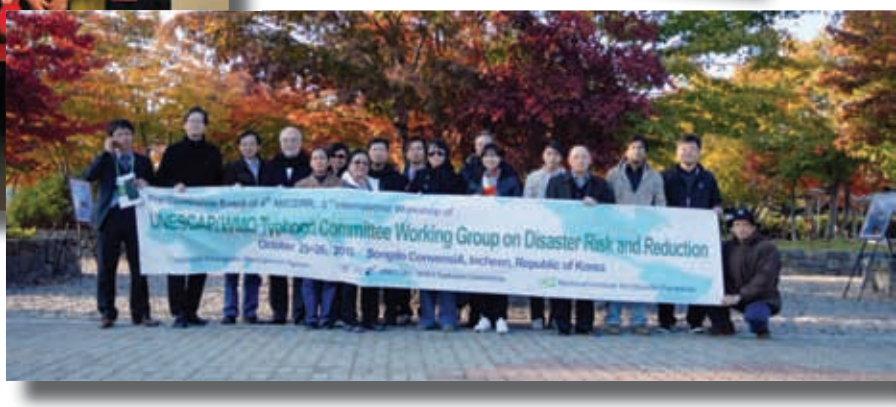
The current design of flood control measures might not be applicable in the future because of the uncertainty caused by strengthening typhoons with the ongoing climate change. The traditional flood control approach might not work.

2) Principal proposed solutions, messages or recommendations:
If possible, record who offered these.

Strengthen our existing capacity in DRR

Enhance end-to-end early warning systems, including risk assessment, monitoring, forecasting and warning, and dissemination of early warnings to people at the community level

Risk assessment: Identification of the impacts of the social and economic damages caused by typhoon-related disasters and more accurate and reliable information on future typhoons at the national and regional levels



Monitoring: Application of advanced technology, including satellite and radar technology, to monitor hazards more accurately with longer lead times
Forecasting and warning: Application of the multiple-model ensemble prediction system that narrows the uncertainty of forecasting and pin-point forecasting, and gives warnings longer lead times
Dissemination: Clear, understandable warning messages to the public with advanced information communications technology, preparation of an alternative communication system, and good networking with media and national and local authorities

Need for research on the frequency and intensity of past and future typhoons based on an advanced model

Networking with relevant regional hazard/disaster monitoring mechanisms such as the regional flood and drought monitoring mechanism, using space information and the Regional Integrated Multi-Hazard Early Warning System (RIMES)

New solutions:

Instead of the flood control approach, flexible adaptive measures should be mainstreamed with innovative holistic approaches.

A new typhoon disaster web-GIS-based data information management system, the Typhoon Committee Disaster Information System (TCDIS), was developed to standardize climate and disaster information and to build a disaster management and early warning system that can reduce damages from extreme events via information sharing and research.

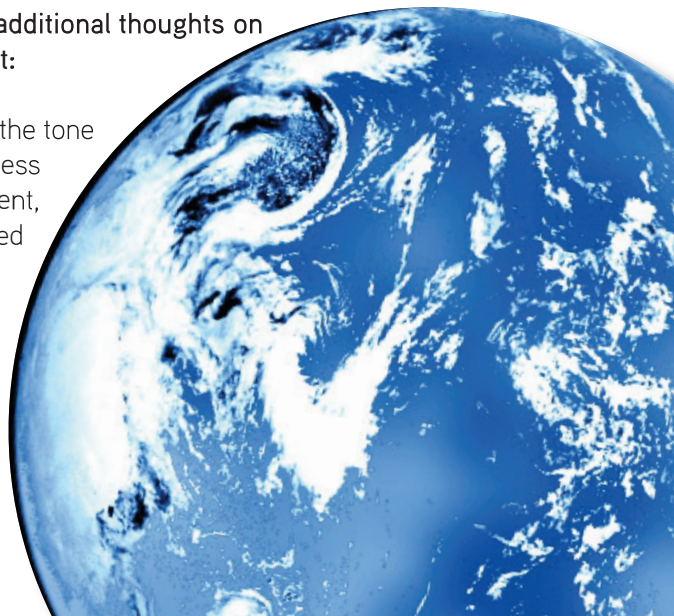
A new Typhoon Committee project, the Urban Flood Risk Management Project, was launched with three goals: (1) to exchange and share experiences on urban flood management among the Typhoon Committee members, including technologies on urban flood monitoring, forecasting and warning, 2) to enhance capacity of urban flood risk management, and 3) to strengthen regional cooperation towards flood resilient cities considering climate change.

3) Conclusions by the Chair of the event:

The aforementioned recommendations were generated to reduce typhoon-related disaster risks linked to climate change adaptation, through presentations and discussions by experts and representatives from the member states.

4) Your additional thoughts on the event:

(E.g., on the tone and success of the event, unresolved issues,

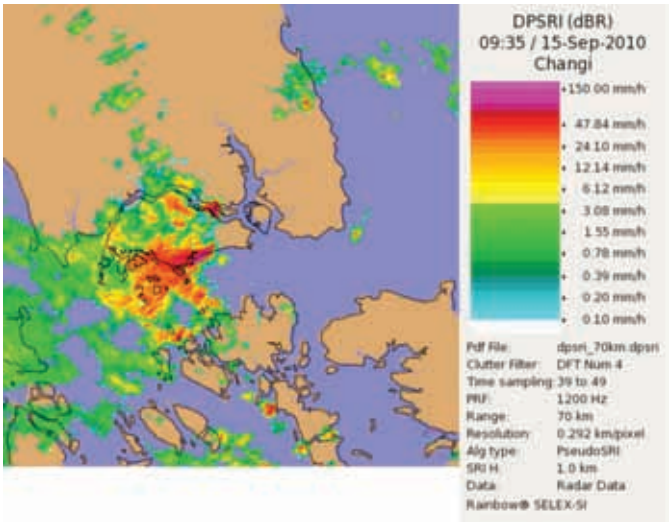


Singapore

Installation of a S-band Dual Polarisation Weather Radar

In 2010, the Meteorological Services Division (MSD) replaced its Meteorological Doppler Weather Radar (MDWR) with a new S-band Dual Polarisation Weather Radar (DPWR) from Selex-Gematronik. Located near the Changi International Airport, the new weather radar system provides continuous weather surveillance as well as the detection of wind shear in the vicinity of the aerodrome. Sited on the same location as the earlier MDWR, the removal of the old MDWR and installation of the DPWR posed the biggest challenge in the radar replacement project. Several factors had to be taken into consideration during each stage of the project, from the planning and implementation stages to commissioning of the new radar. To minimise any disruption to our normal operations, the replacement process had to be completed in the shortest possible time. Hence the replacement started in February which is climatologically the driest month of the year in Singapore. The weather was on our side and within 3 months, the system was installed, tested and ready for operational use.

One of the more prominent differences between the earlier MDWR and the new DPWR lies in the radar software. The new DPWR uses the Rainbow® 5 software from Selex-Gematronik. Apart from the standard weather radar products such as Plan Position Indicator (PPI), Constant Altitude PPI (CAPPI) and Maximum Display (MAX), the software comes with products that are derived from dual polarization moments like Hail Size Estimation and Echo Classification. Echo Classification differentiates meteorological echoes from non-meteorological ones. The product can further classify meteorological echoes into different hydrometeor types such as stratiform rain, convective rain and rain-hail mixture. Basic nowcasting products based on the tracking of echoes are included as part of the suite of software products. Also integrated into the system is an Ensemble Nowcasting component (RainEncast), based on the Short Term Ensemble Prediction System (STEPS) from the Australian Bureau of Meteorology and the UK Met Office. RainEncast produces an ensemble of precipitation forecasts that are analyzed and summarized to generate the following forecasts:



1. Average rain rate at each forecast time step
2. Probability of the total rainfall within the forecast period exceeding a particular threshold.

The system has the additional ability to perform real time adjustment of the rainfall measurement from the radar with rain gauge data. This adjustment is done with data from MSD's new Online Weather Monitoring Network, which when fully implemented by early 2011, will consist of 65 rain gauges across Singapore. The performance and accuracy of the rainfall accumulation product from such an adjustment is being evaluated and assessed. It is envisaged that with Singapore's dense network of rain gauges and the new DPWR, a better estimate of the accumulated precipitation can be achieved in tropical Singapore where convective weather systems are often short-lived and the temporal and spatial variation of the associated rain rate can be large. Such a product will be useful to support water resource and flood management efforts in Singapore.

Building up Climate Science Capability

A new Climate Science Department (CSD) was set up in July 2010 to address the growing concern on climate change and its impact on Singapore and the region. This is in line with the plan announced by Singapore's Minister for the Environment and Water Resources, Dr Yaacob Ibrahim, during the 42nd TC session held in Singapore in January 2010. In his opening speech, he highlighted that no country, including Singapore, will be spared from the impact of climate change. Therefore, there is a need to build up the capabilities of the Meteorological Services Division (MSD) to undertake Climate Science studies and research to help Singapore prepare for the potential impacts of climate change.

Dr Yaacob Ibrahim, Minister for the Environment and Water Resources, Singapore, at his opening speech during the 42nd TC session held in Singapore in January 2010.

Prior to July 2010, climate related activities and meteorological research and development were undertaken by different areas in MSD. These different areas are now centralised within CSD. The focus areas of CSD are climate modelling and prediction, climatology and climate studies, and weather and environmental prediction. Under the area of climate modelling and prediction, the ongoing activities include the production of monthly climate forecasts over Singapore and the region using US NOAA statistical Climate Prediction Toolkit (CPT) and developing long-term climate assessments using the UK Hadley Centre's PRECIS climate modelling system.

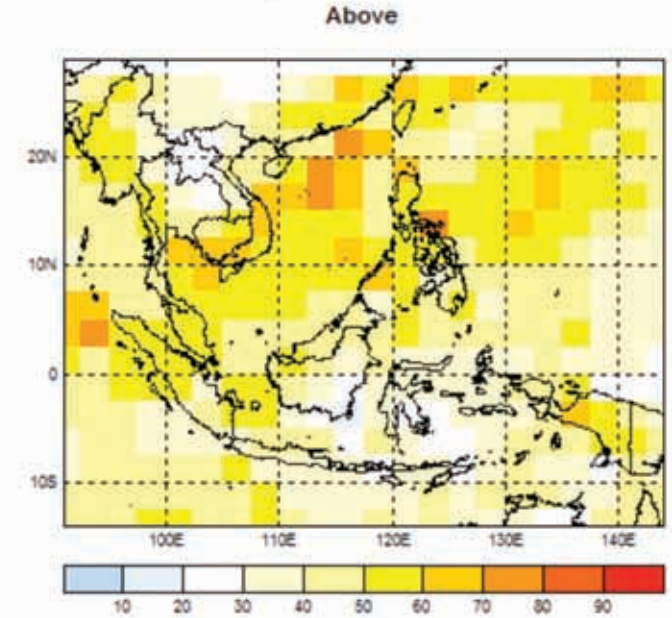
With the establishment of CSD, MSD aims to strengthen its capabilities in climate modelling and research so as to produce sound climate predictions and assessments to assist government agencies and policymakers in the formulation of climate change mitigation and adaptation strategies. One of the areas of concern is the potential changes in Singapore's long term rainfall patterns which could have critical impacts on water resource and flood management .

To look into the long-term effects of climate change on Singapore's physical environment, the National Environment Agency of Singapore commissioned the first nationwide Climate Change Vulnerability study in 2007. The study was led by a local university in collaboration with international experts. MSD also supported the study by providing historical data and the relevant technical expertise.

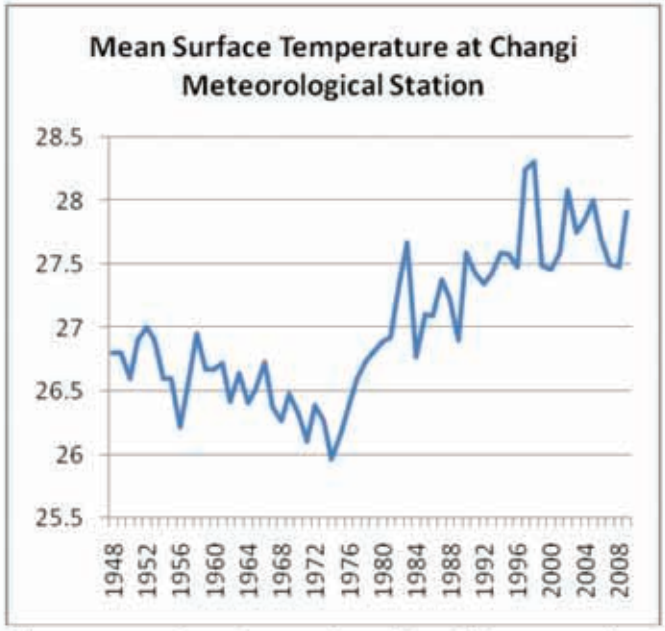
Moving forward, CSD will actively explore partnerships with leading global climate centres to strengthen its knowledge base and technical expertise in Climate Science. Currently, CSD has ongoing collaborative

projects with the local universities and research institutes to conduct regional climate studies and to improve understanding of climate phenomena such as ENSO and the Indian Ocean Dipole and their impacts in the region. CSD also plans to hire experienced climate scientists and researchers to bolster its expertise and research capabilities to deliver the relevant climate services and products.

Probabilistic forecasts for the (average daily) rainfall rates of the ASEAN region for the NDJ 2010 season.



A seasonal forecast produced from the International Research Institue for Climate and Society CPT software



The mean surface temperature data of Singapore from 1948 - 2009 shows a rising trend since the 80s.

In 2010, there were two tropical cyclones over the Pacific Ocean and the Andaman Sea that posed severe effects to Thailand as seen in figure 1 below.

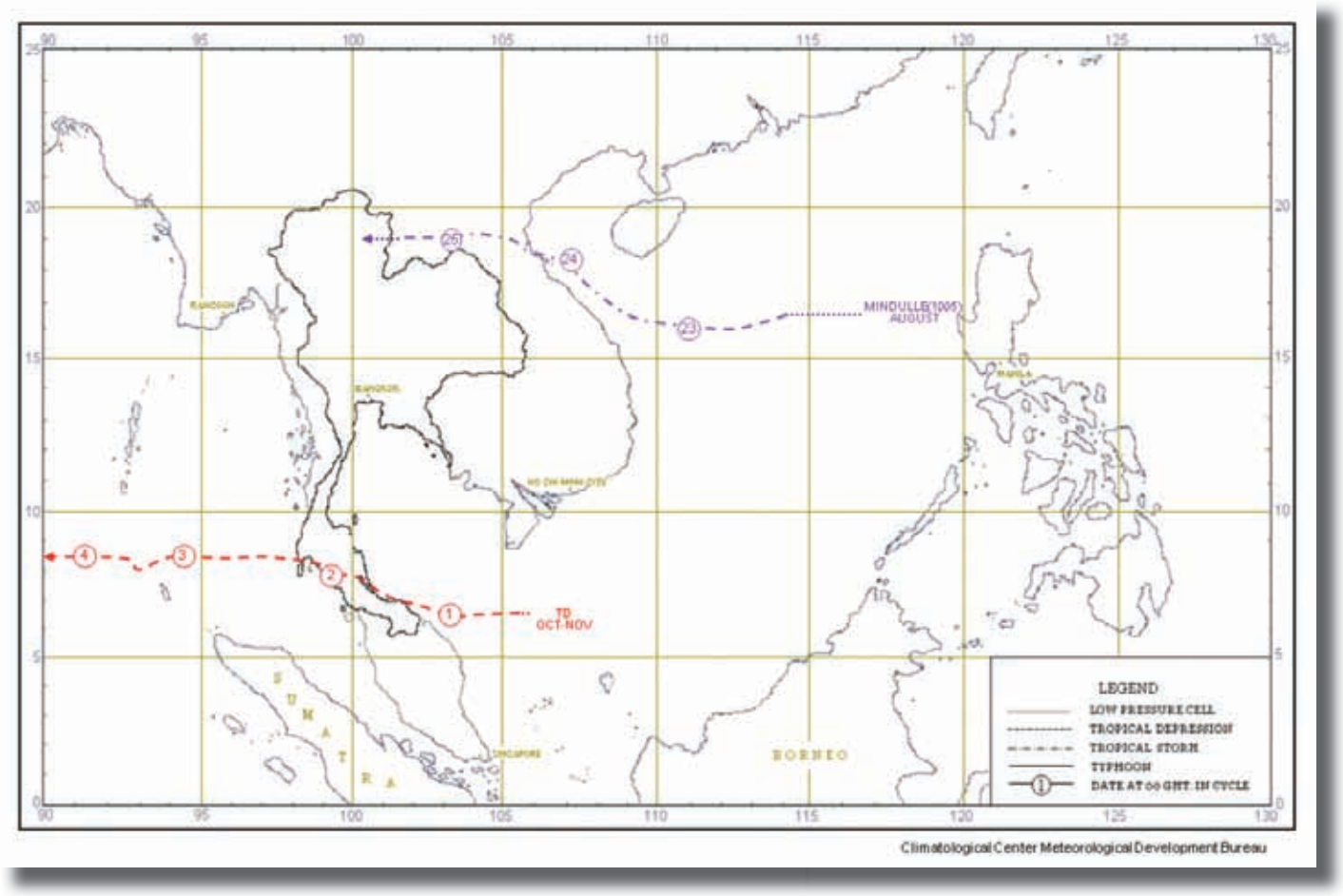


Figure 1: Tracks of Tropical Storm MINDULLE (1005) and a Tropical Depression, 2010

Tropical Storm "MINDULLE" (1005)

A tropical depression developed over the middle part of the South China Sea (16.5 °N, 114.5 °E) at 0600 UTC on 22nd August 2010. This depression had moved westwards on the first day before its movement changed into the west-northwest direction on the following day. In addition, it intensified into a tropical storm named ***Mindulle*** at 0000 UTC of the same day. Afterward, it turned into a severe tropical storm and reached its peak intensity with the maximum winds of 50 knots near its centre. ***Mindulle*** moved northwestwards and made landfall over northern Vietnam that evening. It subsequently dissipated over Laos close to upper northern Thailand on 25th August 2010. It intensified the monsoon trough, lying across upper Thailand, and produced torrential rain with several floods in upper Thailand, especially in the Northern and the Northeastern Regions. Flash floods occurred in many provinces: Kalasin (on 21st August), Chiang Rai; Lampang; Lamphun; Chaiyaphum; and Prachin Buri (on 22nd August), Nakhon Sawan and Chanthaburi (on 23rd August), Sukhothai and Sakon Nakhon (on 24th August), Phayao and Uttaradit (on 25th August), Nan (on 26th August), and Mae Hong Son; Phrae; Phetchabun; Phichit; Ubon Ratchathani; Saraburi; and Phra Nakhon Si Ayutthaya (on 28th August). The highest daily rainfall was found to be 220.0 mm in Muang Sam Sip District, Ubon Ratchathani Province on 28th August.

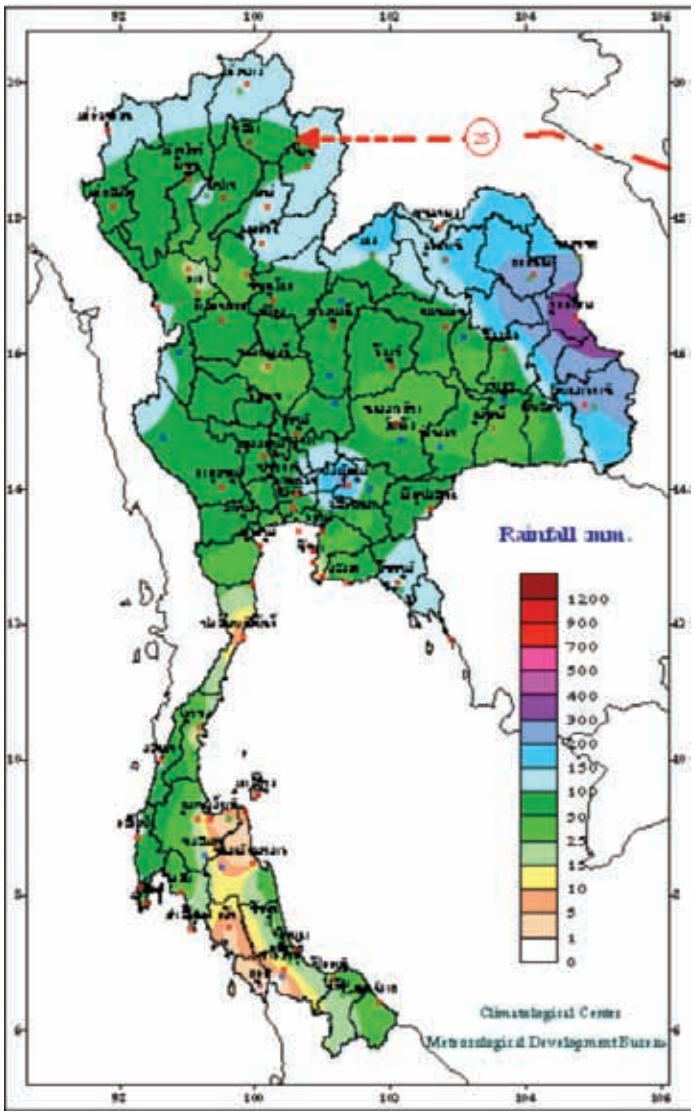


Figure 2 : Accumulated amount of rainfalls since 22nd August until 28th August 2010

Tropical Depression

A low pressure cell in the lower part of the South China Sea intensified into a tropical depression at 0600 UTC on 31st October 2010 with its center on latitude 6.5 °N and longitude 105.5 °E. It moved in the west-northwest direction toward the lower part of the Gulf of Thailand and made landfall at Sathing Phra District, Songkhla Province in the Southern Region of Thailand at 1630 UTC on 1st November 2010. Then, it moved past Phatthalung, Trang, Krabi, and Phang-nga Provinces before entering the Andaman Sea in the evening of 2nd November 2010. It continued moving further in the Andaman Sea in the west-northwest direction before intensifying into the tropical cyclone ***JAL*** (05B) on 5th November 2010.

As a tropical depression, it had caused both heavy and very heavy rainfalls over southern Thailand since 31st October until 2nd November 2010. As the result, serious floods were reported in 12 provinces: Songkhla, Satun, Trang, Narathiwat, Yala, Pattani, Phatthalung, Surat Thani, Nakhon Si Thammarat, Krabi, Chumphon, and Ranong. 1,833,277 people in 570,317 families were affected by these floods and 60 people were reported dead from these disasters. The highest daily rainfall was recorded to be 396.0 mm in Don Sak District, Surat Thani Province on 2nd November 2010.

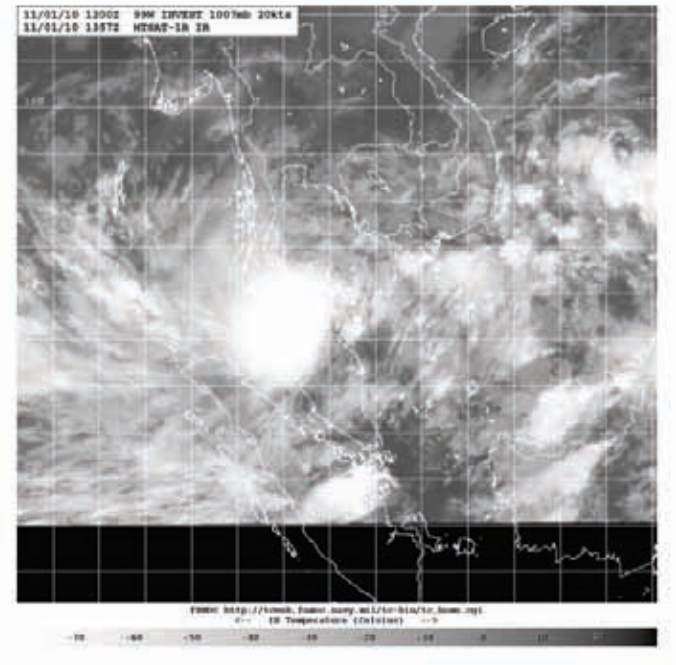


Figure 3 : The Satellite Image of a Tropical Depression in Southern Thailand at 1357 UTC

on 1st November 2010 (source: http://tcweb.fnmoc.navy.mil)

Breaking Records of Daily Rainfalls in Southern Thailand

Stations [Provinces]	New Records in 2010		Previous Records		Start since
	mm.	DD/MM	mm.	DD/MM/ Year	
Songkhla (Hatyai District)	208.0	31/10	111.0	11/10/1980	1973
Songkhla (Kor Hong District)	174.0	31/10	141.4	28/10/2009	1969
Yala	139.0	31/10	128.9	31/10/2007	1982
Songkhla (Sadao District)	174.7	01/11	91.4	5/11/2009	1999
Surat Thani (Phrasaeng District)	79.0	01/11	73.7	24/11/2000	1998
Pattani	274.3	01/11	266.2	18/11/1974	1964
Trang	144.5	01/11	130.1	12/11/1995	1951
Satun	116.8	01/11	113.3	20/11/1988	1978

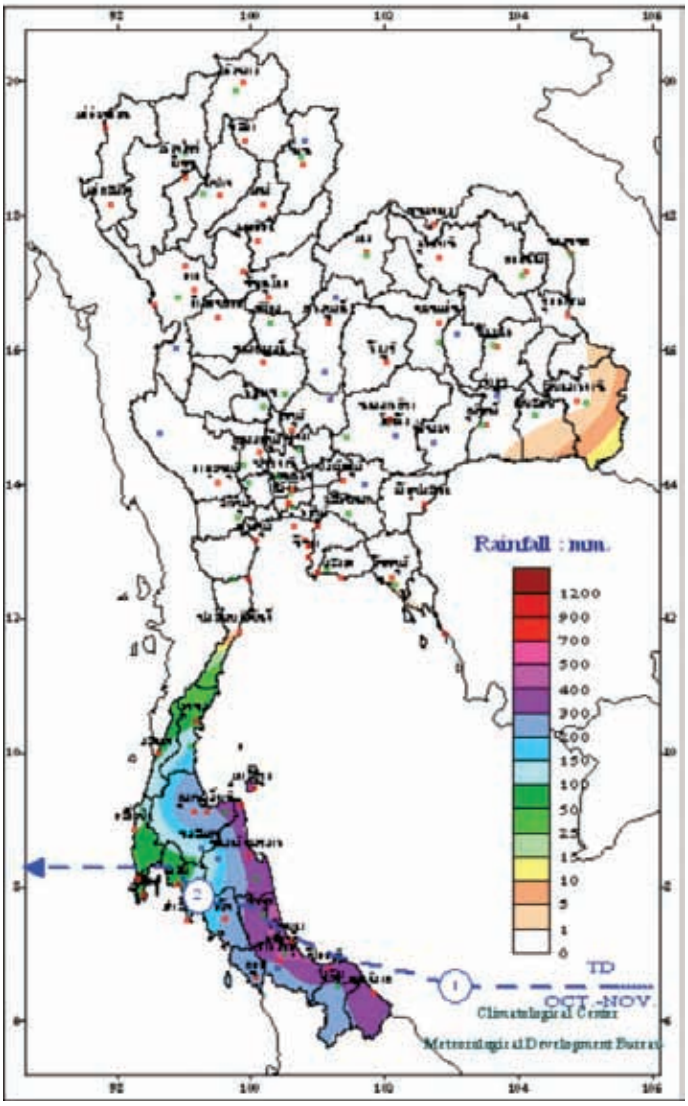


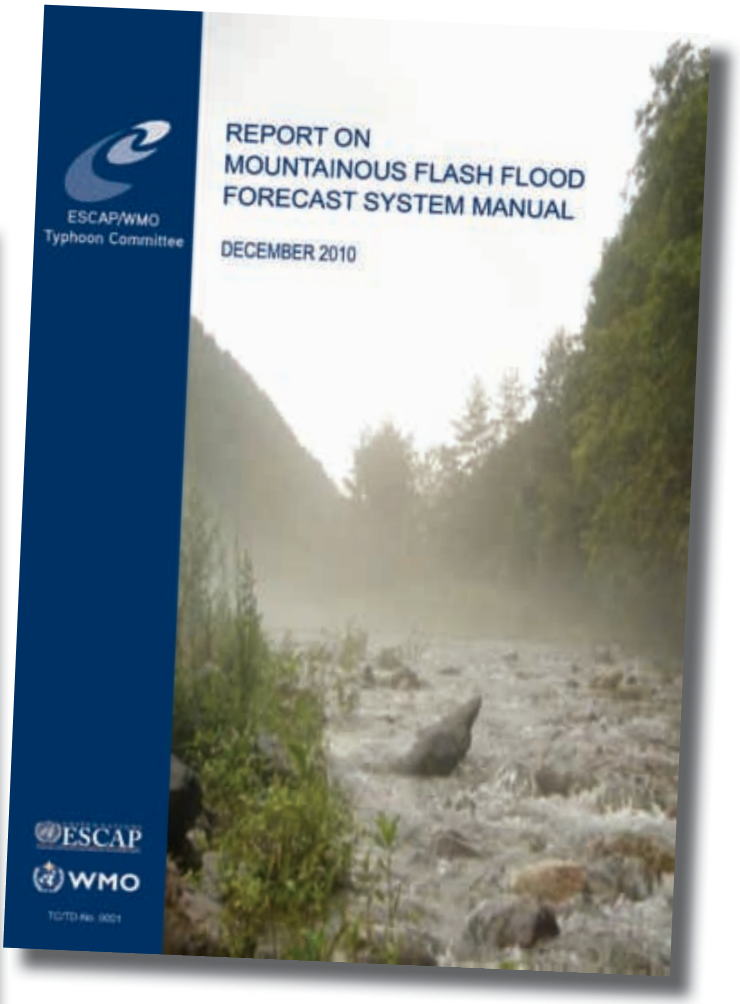
Figure 4 : Accumulated amount of rainfalls since 31st October until 2nd November 2010

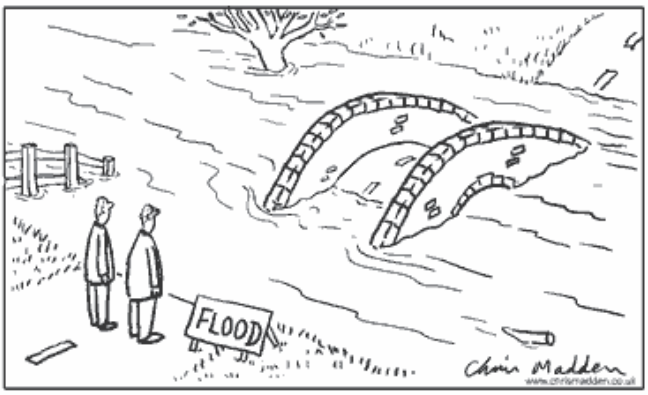
Figure 5 : A Flash Flood in Hat Yai District, Songkhla Province, November 2010
(Source: www.gunsandgames.com)

Figure 6 : Damages in Sathing Phra District, Songkhla Province caused by a Tropical Depression, November 2010 (Source: www.oknation.net/blog/chutitim/2010/11/16/entry-1)

Note : Rainfalls and natural disasters in this report were updated up to 15th November, 2010.
Climatological Center
Meteorological Development Bureau
Meteorological Department

Typhoon Committee Publications





Humour Corner

The ESCAP/WMO Typhoon Committee Newsletter
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