UNITED NATIONS
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World Meteorological
Organization

UNITED NATIONS ECONOMIC AND SOCIAL COMMISSION FOR ASIA AND THE PACIFIC

AND

WORLD METEOROLOGICAL ORGANIZATION

ESCAP/WMO TYPHOON COMMITTEE

THIRTY-NINTH SESSION

4-9 December 2006

(Manila, Philippines)

FINAL REPORT

C O N T E N T S

GENERAL SUMMARY OF THE WORK OF THE SESSION

I. ORGANIZATION OF THE SESSION (Agenda item 1)

1. The Thirty-ninth Session of the ESCAP/WMO Typhoon Committee was held in the Manila Hotel, Manila, Philippines, from 4 to 9 December 2006.

2. The Session was attended by 72 participants from eleven 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).

3. The Session was also attended by five observers, one from United Nations International Strategy for Disaster Reduction Secretariat (UN/ISDR), two from Indonesia, one from the Asian Disaster Preparedness Center (ADPC) and one from the Asian Disaster Reduction Center (ADRC). 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 list of participants is given in Appendix I.

1.1 Opening of the session (agenda item 1.1)

4. The Session was declared open by Honourable Dr Estrella F. Alabastro, Secretary of the Department of Science and Technology of the Philippines, at 0900 hrs on Monday, 4 December 2006 in the Manila Hotel.

5. The following statements were delivered at the opening ceremony:

- The address of Honourable Mr Jose Lito L. Atienza, Jr. Mayor of the City of Manila;
- The address of Dr Prisco D. Nilo, Officer-in-Charge, Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA);
- The address of Dr Tokiyoshi Toya, the representative of the WMO Secretariat on behalf of Mr Michel Jarraud, Secretary-General of WMO;
- The message of Mr Kim Hak-Su, Under Secretary-General of the United Nations and Executive Secretary of UNESCAP, read by Mr Le-Huu Ti, the representative of UNESCAP Secretariat; and
- The welcome and opening address by Honourable Dr Estrella F. Alabastro, Secretary of the Department of Science and Technology.

The above-mentioned statements are given in Appendices II.A, II.B, II.C, II.D and II.E.

II. ELECTION OF OFFICERS (Agenda item 2)

6. Dr Prisco D. Nilo, Officer-in-Charge, Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) and Dr Yap Kok Seng, Director General of Malaysian Meteorological Department were elected Chairman and Vice-Chairman of the Typhoon Committee, respectively. Mr James C. Weyman (United States of America) was elected Chairman of the Drafting Committee.

III. ADOPTION OF THE AGENDA (Agenda item 3)

7. The Committee adopted the agenda as shown in Appendix III.

IV. WORKING SESSION OF METEOROLOGICAL, HYDROLOGICAL AND DISASTER PREVENTION AND PREPAREDNESS WORKING GROUPS (Agenda item 4)

8. Prior to the plenary session for the Committee, three parallel sessions on meteorology, hydrology and disaster prevention and preparedness (DPP) were convened on the morning of 4 December 2006 in three separate meeting areas to review progress of work during the past year, to identify priorities for cooperation and to recommend points to the Committee for consideration.

9. The major outcomes of the working sessions of the three working groups were reported to the plenary session as given in the appendices.

V. THE COMMITTEE'S ACTIVITIES DURING 2006 (Agenda item 5)

10. The Committee was informed of activities carried out in 2006, including important achievements, key issues and future directions by each Member, TCS, WMO and ESCAP on meteorology, hydrology and disaster prevention and preparedness.

(a) Meteorological Component (agenda item 5.1)

11. The Committee reviewed the activities of Members during the past year, details of which are presented in Appendix IV.

12. The Committee took note of the report of the parallel session of the Working Group on Meteorology (WGM) which met on Monday, 4 December 2006 (Appendix V)

13. The Committee was informed by the representative of China that during the typhoon season in 2006 CMA switched FY-2C intensive observation mode to every half an hour again. CMA also has developed a microwave TC analysis system in 2006.

14. The Committee noted with appreciation that China successfully launched the stationary meteorological satellite FY-2D on 8 December 2006, which is expected to be operational in 2007. FY-2D and FY-2C will contribute together to better data support for Members during the typhoon season in 2007 and onward.

15. The Committee was informed by the representative of Japan that the Multi-functional Transport Satellite-1R (MTSAT-1R) launched last year has been in stable operation. The MTSAT-2 launched in February 2006 has been on standby and will become operational from around 2010 to succeed MTSAT-1R. With regard to the current four kinds of MTSAT's imagery products (HRIT, HiRID, LRIT and WEFAX) broadcasting services of HiRID and WEFAX will be discontinued at the end of 2007. As a backup service to the direct broadcast, the hourly full-disk imagery of infrared channel 1 has also been provided for registered users through the Internet. JMA plans to start providing satellite imagery of all the channels for registered users through the Internet in March 2007. The latest information on MTSAT series is available on JMA's Website.

16. At RTH Beijing, the GTS link to New Delhi has been upgraded by a FR link with a symmetric CIR of 8/8kbps in December, 2005. RTH Beijing also upgraded the CIR for the incoming PVC of Beijing-Tokyo link from 48kbps to 96kbps for collecting ATOVS 1B data from RTH Tokyo in July 2006.

17. The Committee was informed by the representative of Hong Kong, China that the page view of the Severe Weather Information Centre (SWIC) website operated by the Hong Kong Observatory on behalf of WMO amounted to 13 million in the last 12 months, representing a 50% growth compared with the year before.

18. The Committee noted that WMO is now implementing the migration from Traditional Alphanumeric Codes (TACs) to Table Driven Code Forms (TDCFs). Since the plan calls for migration of SAREP and RADOB by 2006 and 2008, respectively, RSMC Tokyo is supposed to discontinue disseminating those bulletins in TACs format by the respective deadlines.

19. The Committee was informed that ten Members have already sent their observational data to RSMC Tokyo for inclusion in the Expanded Best Track Data (EBT) of 1996-2005. The Committee urged the four Members who still have not done so, especially those frequently affected by tropical cyclones, to send the data to RSMC Tokyo. It was also informed that the RSMC Tokyo will offer a proposal to the EBT contact persons by the end of 2006 for adding the data of averaging time of sustained-wind to the EBT format.

20. The Committee expressed its gratitude to JMA, to Regional Specialized Meteorological Center (RSMC) Tokyo - Typhoon Center in particular, for the continued provision of tropical cyclone advisories/warnings as well as maintenance of the Numerical Typhoon Prediction Website. The activities of RSMC-Tokyo in 2006 and implementation plan for the period of 2006 to 2010 are presented in Appendix VI.

21. The Committee was informed by the representative from Korea that the Training Course on Information and Communication Technologies for Meteorological Services was conducted by the KMA sponsored by the KOICA from 2 to 29 April 2006. The Course was attended by 14 participants from 12 countries, including two Members – Viet Nam and the Philippines.

22. The Committee took note of the primary assessment of the current status of GTS and communication system in the Typhoon Committee region, based on the Members' reports. The problems are that NMC Phnom Penh is isolated from the GTS and that 4 circuits are still running on X.25 or ASYNC protocol. The Committee noted that Bangkok – Phnom Penh GTS is expected to be completed by the end of December 2006.

23. The Committee was informed by the representative from US that since the beginning of the WMO Regional Association (RA) V Pacific Desk Internship program in 2001 hosted by RSMC Honolulu, the Pacific Desk has trained 32 students from 14 different countries in the south Pacific and Southeast Asia. Since 2001, four students of Members (Malaysia, Philippines and Viet Nam) had training in this programme together with countries in the south Pacific.

- Terms of Reference of the Working Group on Meteorology is given at Appendix VII.

Conclusion:

24. On the basis of the information provided by Members and finds of the Working Group Session on Meteorology, the following conclusions were reached:

- The Committee expressed its appreciation to the Chair of WGM, Mr Wang Bangzhong (China), and Vice Chair of WGM, Ms Duong Lien Chau (Viet Nam), for their contribution during the past year.

- The Committee took note of important progress made in the implementation of the RCPIP under Meteorology by Members.

- The Committee noted with satisfaction that WGM/RSMC initiated the process for consideration TD naming, that is, WGM to explore options in naming/labelling of TD:

  (1) use names from existing names;

(2) label by number or alphabets;

(3) separate name list for book-keeping and referencing purpose to be assigned after the TD has dissipated;

(4) no change, based on the discussion of the Workshop in Macao, China in September 2006.

- The Committee noted that WGM began to consider classification of typhoons taking into account its significance for disaster management.

- The Committee also noted that the outcomes from the "Third International Conference on Early Warning" (Bonn, Germany, 27-29 March 2006), the "Workshop on Integrating Activities of the Hydrology, Meteorology and DPP components of the Typhoon Committee into the Related International Frameworks for Disaster Risk Management for Better Impacts and Visibility" (Macao, China, 4-8 September 2006) and the "Sixth International Workshop on Tropical Cyclones" (San Jose, Costa Rica, 21-30 November 2006). These were considered by WGM for revision and addition of Strategic Plan and Annual Operating Plan.

- The Committee expressed its concern that some Members of the Typhoon Committee would not be able to meet WMO's deadline on the migration of TACs to TDCFs of SAREP and RADOB.

- The Committee was satisfied with the three project-concepts of the WGM, which include the "Improvement of Information Processing Systems of Members", "Improvement of Precipitation Forecasting Related to Interaction between Monsoon and Tropical Cyclone" and "GTS and DVBS Data Sharing".

Decisions:

25. On the basis of the information provided by Members and the findings of the WGM pre-session, the following decisions were reached:

- To request the WGM to further develop three project-concepts, "Improvement of Information Processing System among Members", "Improvement of Precipitation Forecasting related to Interaction between Monsoon and Tropical Cyclone" and "GTS and DVBS Data Sharing", considering that these projects may be implemented by using pilot approach.

- To continue the process to address the issues of naming tropical depressions and to request WGM to give further consideration to the necessity of classification of typhoons with a view to reviewing these work at the future sessions. In this regard, collaboration with WGDPP is considered necessary.

- To initiate the assessment process on the change of frequency and intensity of tropical cyclone in order to provide the latest information on this matter for the policymaker and the public

- To further assess the requirement on the GTS and communication system in the Cambodia, DPR of Korea and Lao PDR with an aim to seek the support for these Members by implementing GTS and DVBS Data Sharing Project and others

- To encourage the participation of Committee Members in the ASIA/THORPEX, especially on the issues of EPS/NWP and enhanced observation, and to join the Asian THORPEX Regional Committee (ARC).

- To reconfirm to organize a workshop, namely, “Inter-comparison of Typhoon Monitoring, Forecasting and Information System in the Typhoon Committee Region” in 2007, with an aim to exchange good practice among Members and improve the Members’ typhoon forecaster platforms. The workshop will include all members, with or without such systems, to exchange experience, generate new ideas, and identify essential key features

- To request from TCS to contact the WMO/CBS expert team concerned by the end of December 2006 to extend the deadlines for the migration of SAREP and SATOB, while TCS conducts a survey of the current progress of each Member for the migration and their possible time to be prepared. Results of the survey should be sent to the expert team by the end of February 2007.

- To request WMO to publish as early as possible the 2007 edition of the Typhoon Committee Operation Manual (TOM) as submitted by the Rapporteur, Mr Nobutaka Mannoji (Japan) with the amendments given in Appendix VIII.

- To request Members to report on the status of implementation of the TOM performance measures, and the Rapporteur to submit the report to the next session of the Committee, considering that some of the performance measures described in TOM have not been reviewed in recent years.

- To request WMO to upload the updated TOM on the TCP Website and distribute the 2007 edition in CD ROM format to Members by March 2007.

- To request Japan to continue the services of Mr Mannoji as TOM Rapporteur.

- To replace the TC names - Matsa, Nabi and Longwang by Pakhar, Doksuri and Haikui, respectively, effective on 1 January 2007.

- To request the relevant Members to propose new TC names before at least two months before the 40th session with their meaning and pronunciation for consideration of the replacement of Chanchu, Bilis, Saomai, Xangsane and Durian at the session.

- To reappoint Mr Wang Bangzhong (China) as Chair and Ms Duong Lien Chau (Viet Nam) as Vice-chair, respectively.

(b) Hydrological component (agenda item 5.2)

26. The session reviewed the activities of the Members during the past year, details of which are presented in Appendix IX. Priority activities within the hydrological component among the Members include the following:

- Activities that have been addressed: Most of Members have been addressing several traditionally important activities, with which high priority needs to be attached continuously:

  - Improvement of real-time meteorological/hydrological data collection networks and timely disaster warning dissemination;
  - Extension of flood forecasting systems to more river basins;
  - Improvement of flood forecasting model accuracy/performance.

- Activities that have been taken by some of Members and will need to be taken by more Members:

- Preparation of Flood Hazard Maps;
- Dissemination of more user-friendly warning system;
- Development of debris flow/landslide forecasting and warning system;
- Dissemination of outputs and raising visibility of TC through various means, such as publication of manuals/guidelines and attendance of international conferences.

- Activities that several Members have expressed interest in undertaking in the coming years include the following:

  - Improvement of the methodology of assessment of socio-economic impact of typhoon-related disasters;
  - Improvement in assessment of risk of debris flow/landslides and warning methodologies;
  - Public awareness activities such as education/training of local people on typhoon-related disaster risks.

27. The Committee also noted the importance of the following activities in some Members:

- China continued to take active part in the cooperation with the international hydrology organizations, bordering countries and Members of TC. China has being exchanging and sharing the hydrologic data with other countries and organizations including Russia, Democratic People's Republic of Korea, Viet Nam, India, Kazakhstan and Mekong River Commission in 2006.

- Viet Nam continued its cooperation through its existing agreements with China and the Mekong River Commission for exchanging the hydrological data with the neighbouring countries.

28. The Committee took note of the report of the parallel session of the Working Group on Hydrology (WGH) which met on Monday, 4 December 2006 (Appendix X).

29. The Committee was pleased to note the increase of interest of the WGH in the application of the findings of the project of UNESCAP on assessment of socio-economic impacts of flood-related disasters, especially on the application of the UNESCAP Disaster Impact Calculator for routine assessment. It encouraged UNESCAP to further support TC Members in this respect.

30. The Committee noted with appreciation the active collaboration among the members of the hydrologic working group and DPP experts and meteorologists of the Committee during 2006 and in the past few years. It also expressed its deep appreciation to the Governments of China, Japan, Malaysia, Philippines and Republic of Korea for the active support in the implementation of the nine ongoing projects and the financial contribution of the Ministry of Land, Infrastructure and Transport of Japan (through the Infrastructure Development Institute Japan and the National Institute of Land, Infrastructure and Transport) and the Ministry of Construction and Transportation of Republic of Korea (through the Korea Institute of Construction Technology and the Korea Water Resources Corporation – K-Water) for the implementation of these projects by the WGH.

- Project on Flood Hazard Mapping;
- Project on Flash Flood Warning including Debris Flow and Landslides;

- Project on Evaluation and Improvement of Operational Flood Forecasting System focusing on Model Performance;
- Project on the Development of Guidelines for Reservoir Operation;
- Project on Extension of Flood Forecasting Systems to Selected River Basins;
- Project on Evaluation and Improvement of Hydrological Instruments and Telecommunication Equipment;
- Project on the Establishment of Community-based Flood Forecasting System;
- Project on Improvement of Hydrological Products in response to User's Needs;
- On-the-job Training on Flood Forecasting between TC members;
- Terms of Reference of the Working Group on Hydrology is given at Appendix XI.

Conclusions:

31. The Committee also expressed its deep appreciation to MLIT for the intention to extend the first two projects till 2009 in order to enable more Members to benefit from these joint activities and also to the Governments of China, Malaysia, and Republic of Korea for their plans to provide in-kind contribution to enable training of experts from other TC Members in their countries.

32. The Committee also endorsed the proposal of WGH to undertake the following two new projects and encourage Members to support in their implementation:

- Project on Socio-economic Impact Assessment of Typhoon-related Disasters (to be launched and led by the Philippines);
- Project on the Management of Floods in Urban Areas (to be launched and led by China)

Decisions:

33. On the basis of the information provided by the Members and deliberations, the Committee made the following decisions:

- To re-establish the Working Group on Hydrology (WGH) responsible for the planning and promotion of cooperation among the TC Members in the implementation of the Strategic Plan and the Annual Operating Plan and appoint Mr Katsuhito Miyake, Japan, Chair and Dr Hong Ilpyo, Republic of Korea and Mr Liu Jin-ping as Vice Chairs of WGH. In addition, it also endorsed the proposal of the Working Group to appoint Dr Liu Zhi-yu, China as Secretary of WGH in order to cope with the increasing work load faced by the WGH.
- In appreciating the generous in-kind contribution of China (estimated at US$25,000) for the training on "Operational flood forecasting system and its application" in China and the on-the-job training in Malaysia of TC experts, to allocate US$5,000 to support international travel of 6 experts to participate in the training in China and US$2,000 for international travel of two experts for on-the-job training on flood forecasting in Malaysia. In order to ensure effective use of the limited resources of the TC Trust Fund, it requested that criteria for selection of candidates be established so as maximize the benefits of the application of training to the follow-up activities after the training. The Project Team Leader and WGH Chair are requested to report to the Committee findings of the training at the 40th Session.

- To authorize WGH in cooperation with UNESCAP, WMO and TCS to mobilize resources to enable TC experts to participate in the Asia-Pacific Water Forum (APWF) in preparation for the Asia-Pacific Water Summit, scheduled to be held in Japan in 2007.
- To encourage the International Centre for Water Hazards and Risk Management (ICHARM) of UNESCO in association with UNESCAP, WMO and TCS to mobilize participation of TC experts in the implementation of the Theme B of Asia-Pacific Water Summit on Disaster Management.
- To invite Dr Hong Il-pyo, Vice Chair of WGH and concurrently Secretary General of the Korea Water Forum, a regular participant of the APWF to be the focal point for the Typhoon Committee at the Forum and present its activities at various meetings of the Forum, including those of the Governing Council of APWF.

(c) Disaster prevention and preparedness component (agenda item 5.3)

34. The session reviewed the activities of the Members during the past year, details of which are presented in Appendix XII. Priority activities within the DPP component among the Members include the followings:

- Typhoon Committee database set up as the first RCPIP project of DPP
- The 1st DPP meeting in Seoul and Workshop in Macao, China
- Collaboration for the formulation of the committee's Strategic Plans 2007-2011

35. The Committee noted with interest that the Hong Kong Observatory conducted several courses on weather and geophysics, including courses on tropical cyclones, for members of the public in 2006 and that they were well received. The Committee also noted that the year-long public education campaign "Safer Living - Reducing Natural Disasters" held in Hong Kong, China ended in April 2006 with a one-month exhibition and rescue drill demonstrations, and requested Hong Kong, China to share its experience with other Members.

36. The Committee took note of the report of the Parallel Session of the Working Group on DPP as shown in Appendix XIII and recognized the need of establishment of an efficient data sharing or data management tools for various disasters for TC Members pursuing an accurate, rapid, and economic system which can be expanded to include damage prediction, damage survey, and recovery support functions. For this reason, among the 6 items to be implemented as DPP projects decided in the 38th Session, as described in Paragraph 36, 'database setup' has been selected as the first project. The final objective of the database is to establish disaster-related data sharing system among the Members and in the region.

37. At the invitation of Dr Suvit Yodmani, Executive Director of Asian Disaster Preparedness Center, Dr Roh Sam-Kew participated in the Joint Meeting of the Four Committee with AWG Chair, Dr Xu Xiaofeng from 23 to 24 February 2006 in Bangkok.

38. The first DPP meeting was held in Seoul, Republic of Korea from May 25 to 26, 2006. Sixteen experts from 10 Members: China; Hong Kong, China; Japan; Lao PDR; Macao, China; Philippines; Malaysia; Republic of Korea; Thailand and USA, and four delegates from international and regional organizations: WMO; UNESCAP; UN/ISDR and ADRC, discussed about the database project and future activities of DPP.

- There were presentations about 'Vision of DPP', 'EWS in Hong Kong', 'Last miles of EWS', 'Introduction of Macao civil protection' and specific presentations regarding database setup project as 'TC Database setup for EWS', 'Remarks on TC Database set up for EWS' and 'Database of EWS in the TC region'.

- The participants discussed vision and future activities of DPP, purpose of the database, items to be included, database construction process and methodology, and who will be doing what in the future. During the meeting, the WGDPP formulized 'TC DPP Database Work Plan'.

- The Committee expressed its appreciation to the Republic of Korea and Hong Kong, China for various efforts to promote visibility of the Committee and for resources mobilization including the 1st DPP meeting in Seoul and the TCDIS project. The Committee also expressed its appreciation to UN/ISDR and ADRC for the support it provided to the Working Group on DPP during the past year and especially to the TCDIS project.

39. The Committee noted with appreciation the enhanced coordination and interaction among all the Working Groups during the past year especially in the Macao Workshop. During the Macao Workshop, the WGDPP discussed contents of database and strategic plans of DPP.

- The Committee named the database as TCDIS (Typhoon Committee Disaster Information System) and reviewed TCDIS draft formats.

- For the 7 Key Result Areas, Strategic Goals and Associated Activities were proposed for DPP by the Members for the formulation of the Typhoon Committee Strategic Plan 2007-2011.

40. The Committee noted the need to have enhanced interaction not only among WGDPP Members but also with other Working Groups to establish and operate TCDIS effectively. For this purpose, focal points for TCDIS would be required.

- Terms of Reference of the Working Group on DPP is given at Appendix XIV.

Conclusions:

41. On the basis of the information provided by the Members and findings of the parallel session on WGDPP, the following conclusions were reached:

- The Committee requested WGDPP to make plans for TCDIS in two phases. The Committee agreed to set up TCDIS using database equipment for disaster status analysis and response, to enter disaster information of the Members, and to support the decision-making process and status judgment through database construction using various disaster information in phase 1. The Committee agreed to expand TCDIS in phase 2 and to make network with other organizations and related systems.

- The Committee recognized the need to implement activities of the DPP component of the Strategic Plan in close collaboration with WGM and WGH.

Decisions:

42. On the basis of the information provided by the Members and deliberations, the Committee made the following decisions:

- To conduct Coordination Meeting to finalize the TCDIS concept, design layout, application method, and enter statistics from 2005 and 2006 in the first and second quarter of 2007.

- To invite the Members' experts to the National Institute for Disaster Prevention (NIDP) of the National Emergency Management Agency (NEMA), Republic of Korea to help develop TCDIS.
- To begin collecting and compiling disaster management information from the Members, especially focusing on the early warning systems, then develop and implement pilot web site.
- To implement Expert Mission by dispatching 2-3 experts to help 2-3 Members' to set up TCDIS, after the Coordination Meeting and before 40th Session in 2007.
- To participate in a focused, integrated WGM, WGH, WGDPP, TRCG, and AWG Workshop with specific deliverables defined and to review progress of TCDIS project to determine future actions and timeline.
- To make presentation on TCDIS project, including the launching of the web site, to the 40th Session of the Typhoon Committee.

(d) Activities on training and research (agenda item 5.4)

43. In view of the decision by Dr Woo-jin Lee (Republic of Korea) to step down as TRCG Chair, the Committee would like to put on record its appreciation of Dr Woo-jin Lee's excellent leadership and dedicated effort in developing the work of TRCG. The Committee would also like to thank TRCG members for their contribution and input.

44. The Committee took note of the report made by the Chairman of the Typhoon Research Coordination Group (TRCG). The latest roving seminar was held in Hanoi, Viet Nam on 4 to 7 September 2006 on tropical cyclone intensification, movement, and associated heavy rainfall and/or other local impacts. Over 70 participants took part and the following topics were recommended for future seminars:

(a) use of microwave data, QuikScat, TRMM with more practice or tutorial sessions;

(b) QPF techniques;

(c) methodology to develop MOS; and

(d) consensus forecasting.

45. Other ideas and suggestions from the Hanoi seminar included:

(a) hands-on practice should be an important training element;

(b) more funding opportunities for forecasters from other Members to attend;

(c) visit by a small team of experts to audit warning system, including forecasters' expertise and resources;

(d) forecasters exchange programmes - visit to major operational centres during a live event;

(e) more online training options, such as COMET, with more extension and focus on NW Pacific component; and

(f) competency guidelines for forecasters to be regularly maintained to improve skill and expertise.

46. Two research fellowships were awarded in 2006: by the Hong Kong Observatory (to Shanghai Typhoon Institute, China) and by the Korea Meteorological Administration (to Viet Nam Hydro-meteorological Service). The following research priorities were proposed for future initiatives:

Meteorology:

- conduct an intensive observing experiment and its application;
- improve application of Dvorak technique, extending to blend microwave imagery;
- utilize ensembles of guidance from dynamical models, conceptual models, and statistical models;
- conduct data assimilation experiments with high resolution numerical models;
- investigate intensity problem associated with storm-surge, heavy rainfall and interaction with monsoon and extra-tropical transition, and relation with ENSO.

Meteorology and Hydrology:

- apply Ensemble Prediction System methods on flood forecasting;
- conduct experiments with hydrological model coupled with land surface model;
- apply soil water index.

Meteorology and DPP:

- develop technical procedures to convert probabilistic information into deterministic guidance;
- conduct disaster impact study;
- integrate GIS information into forecasts and warnings.

47. On proposed activities in 2007, the Committee noted the proposal for the roving seminar in 2007, with focus on topics as proposed from the Hanoi roving seminar. It was also noted the Research fellowship scheme would continue in the current format.

48. The Committee was informed by the representative of the USA on potential training opportunities in connection with the International Pacific Desk Training Internship, and possibilities for future training initiatives for Typhoon Committee Members in this program.

Conclusions:

49. On the basis of the information provided by the TRCG report (Appendix XV) the following conclusions were reached:

- The Committee encouraged Members to participate in the roving seminars and to promote research under the research fellowship scheme on the proposed priority topics with an extended scope covering hydrology and DPP components.
- The Committee encouraged TRCG to initiate surveys to measure performance or effectiveness of workshops or seminars supported by the Committee.

Decisions:

50. On the basis of the conclusions reached by the deliberation of Members, the Committee made the following decisions:

- To change the name of “Typhoon Research Coordination Group” to “Training & Research Coordination Group” (with the same acronym TRCG) and to update the TRCG Terms of Reference (Appendix XVI) to reflect its extended scope of activities towards knowledge transfer and capacity building aspects, and towards a more integrated approach in the incorporation of hydrological and DPP applications;

- To establish TRCG with the appointments of Mr Edwin S.T. Lai (Hong Kong, China) and Mr. Mitsuru Ueno (Japan) as Chair and Vice Chair of TRCG respectively; and the TRCG Terms of Reference to be updated accordingly;
- To request Members to re-confirm their respective focal points as members of TRCG, and to update the list of resource persons as appropriate;
- To continue the Typhoon Committee Research Fellowship Scheme in 2007 and to request TRCG and TCS to make necessary arrangement to implement the scheme in 2007;
- To hold the next roving seminar, provisionally in the Philippines, in 2007 under the support of Typhoon Committee Trust Fund and with surveys to measure performance and effectiveness;
- To explore the possibility of organizing an EPS Workshop in conjunction with the roving seminar, subject to logistic feasibility and funding availability; and
- To oversee in future the attachment of women forecasters to RSMC Tokyo and Members' attendance of the WMO AREP Storm Surge and Wave Forecasting Workshop.
- To request the TRCG to explore options of establishing web-based training courses or material.

VI. REVIEW OF THE 2006 TYPHOON SEASON AND PUBLICATIONS (Agenda item 6)

51. The Committee noted that as of 6 November 2006, 19 tropical cyclones of tropical storm intensity (TS) or higher formed in the western North Pacific in 2006. The total number is less than the 30-year average frequency of 23.0 from January through the end of October. Out of 19, 12 tropical cyclones reached typhoon (TY) intensity, three severe tropical storms (STS) intensity, and four TS intensity.

52. The tropical cyclone season of this year began in May with the formation of CHANCHU (0601). While convective activity was slightly inactive around the Philippines mostly in June, it turned active over the sea east of the Philippines from late June to early August. In addition the subtropical high was more enhanced than normal over the south of Japan from May to early August. Consequently, most tropical cyclones formed over the sea east of Philippines after late June, and many of them moved westward to China. CHANCHU, (0601), BILIS (0604), KAEMI (0605), PRAPIROON (0606) and SAOMAI (0608) brought damage to China, the Philippines and Viet Nam. On other hand, EWINIAR (0603) moved northwards and hit the Republic of Korea, causing damage to the country.

53. From late August to early September, convective activity was temporarily inactive over the sea east of the Philippines. However it turned active again after late September. Subtropical high was weak over the south of Japan after late August. Therefore, most tropical cyclones formed over the sea of the Philippines and moved northwards. WUKONG (0610) and SHANSHAN (0613) hit Japan to bring damage to the country. On the other hand XANGSANE (0615) and CIMARON (0619) moved westwards in the South China Sea, causing damage to the Philippines, Thailand and Viet Nam. In addition, IOKE (0612) was the first named cyclone formed in the central North Pacific and moved westwards across longitude 180 degrees east after HUKO (0224).

54. In 2006 (as of 6 November), the mean formation latitude and longitude, calculating excluding IOKE (0612), was 16.4^{o} N and 136.5^{o} E, almost the same as the 30-years average of 16.2^{o} N and 136.9^{o} E, respectively.

55. The Committee took note with appreciation the review of the 2006 typhoon season provided by the RSMC Tokyo-Typhoon Center as given in Appendix XVII.

Publications

56. The Committee took note that the TCS published the 18th issue of the Typhoon Committee Newsletter in October 2006 and the 2005 Typhoon Committee Annual Review (TCAR) in October 2006 which were disseminated to the Members, ESCAP and WMO in electronic (CD-ROM) format. The Committee appointed the Typhoon Committee Secretary as the Chief Editor.

57. The Committee noted with appreciation that the RSMC Tokyo – Typhoon Center published the "Report on Activities of the RSMC Tokyo – Typhoon Center in 2006" in the form of CD-ROM with printed matters. The report is also available on the Web page of JMA/RSMC Tokyo – Typhoon Center http://www.jma.go.jp/jma/jma-eng/jma-center/rsmc-hp-pub-eg/annualreport.html.

VII. COORDINATION WITH OTHER ACTIVITIES OF THE WMO TROPICAL CYCLONE PROGRAMME (Agenda item 7)

58. The Committee was informed by the representative of the WMO Secretariat that, at the "Third International Conference on Early Warning" held in Bonn, Germany from 27 to 29 March 2006, Dr Nilo, Deputy Director of PAGASA made a presentation of the project "Development of an Advanced Tropical Cyclone Early Warning System for the Philippines".

59. The Committee noted with satisfaction that two woman forecasters from the Lao PDR and Viet Nam had successfully undertaken the sixth on-the-job training in typhoon operations at the RSMC Tokyo – Typhoon Center from 19 to 28 July 2006. It also noted with appreciation that JMA would organize the attachment of two woman forecasters (one each from Cambodia and the Philippines) at the RSMC Tokyo for 10 days in July 2007.

60. The Committee was informed that the Fourth Workshop on Storm Surge and Wave Forecasting was held at PAGASA from 11 to 15 September 2006 with 29 participants from 12 countries including three Members: Malaysia, Philippines and Viet Nam. The fifth Workshop will be held in Australia in 2008.

61. The Committee was informed that WMO held the Sixth International Workshop on Tropical Cyclones in San Jose, Costa Rica from 21 to 30 November 2006. The Workshop was attended by 125 delegates from 34 countries and regions, including 6 Members of the Committee.

VIII. PROGRAMME FOR 2007 AND BEYOND (Agenda item 8)

Advisory Working Group

62. The Committee took note of the proposed Typhoon Committee Strategic Plan, which replaces the RCPIP, and discussed the various features, especially the Key Results Areas (KRAs), the Strategic Goals, and the Associated Activities. The Committee then adopted the Typhoon Committee Strategic Plan 2007-2011 (Appendix XVIII).

63. The Committee then took note of the proposed Annual Operating Plan (AOP). After a thorough review by the Committee, minor changes were recommended regarding some Members participation in some actions and an adjustment to a Success Indicator and quarter for completion for actions. With these minor changes, the Committee adopted the Typhoon Committee's Integrated Annual Operating Plan for 2007 (Appendix XIX).

64. The Committee then took note of the proposed Typhoon Committee's budget for 2007 of $100,000. The Committee was informed that at past Sessions, the Committee had adopted the policy that the TC budget from the TCTF would not exceed $100,000 so the TC Trust Fund would increase in value and provide greater future benefits. After much discussion, the Committee agreed to:

- Remove the $500 for the printing and publication of the TC Annual Report and also remove $500 for the printing and publication of the TC Newsletter.
- The cost for the printing and distribution of documents for the 40th Session was reduced to $300 from $500.
- The $1200 savings which resulted from these actions were approved to be used for the "support to Improvement of the TC Web page" by the TCS with the advice of the Hong Kong Observatory.
- WMO informed the Committee that the storm surge and wave forecasting workshop originally planned for 2007 would now be held in 2008. So the Committee approved using the $4,500 allocated for this workshop plus an additional $500 to support six TC Members to attend a flood forecasting training course to be hosted by China.
- The Committee also approved an additional $2,000 to support two people from TC Members to attend on-the-job training on flood forecasting conducted by Malaysia.
- Thus the TC approved a total budget of $102,500 from the TCTF.
- It was also agreed that the AWG should propose a budget for 2008 at the 40th Session of no more than $100,000, but also present to the Committee other high priority items proposed for possible funding for the Committee to consider.

65. The Committee expressed its sincere appreciation to the AWG Chair, Vice-Chair, and AWG members for their work in formulating and coordinating the Strategic Plan, Annual Operation Plan, and the 2007 budget.

66. The Committee made the following decisions:

- To request the TCS to develop a detailed implementation plan for the Roman L. Kintanar Award for Typhoon-related disaster mitigation.
- To invite the Republic of Korea and Japan to nominate the Chair and Vice Chair respectively for the RMG.
- To re-establish the Advisory Working Group and appointed Dr Bui Van Duc and Mr James Weyman as the Chair and Vice Chair, respectively, of the AWG (see Terms of Reference at Appendix XX).
- To request the AWG and TCS in coordination with the chairs of the RMG, TRCG, and the three working groups to prepare a results-oriented Annual Operating Plan for 2008 and a proposed budget for 2008, both focused on achieving the KRAs and Strategic Goals in the Typhoon Committee's Strategic Plan.
- To monitor, review, and evaluate the Strategic Plan's Key Results Areas, Strategic Goals, and Activities; the objectives/action of the Annual Operating Plan; and Annual Budget and make proposals concerning these documents and the evaluation of the results achieved to the Committee.
- To provide overall direction and oversight for the Integrated Activities listed in the Strategic Plan.

- Develop, review and propose the format of the Members' written reports and Members' oral reports at the Typhoon Committee Sessions to focus on the results achieved on the Strategic Plan and Annual Operating Plan.
- To evaluate proposals for Typhoon Committee's Members attendance at international meetings such as the Asia/THORPEX meeting as a participant funded by the AWG allocation from TCTF and to undertake efforts and allocate resources to further the accomplishment of the Action in the AOP and the KRAs and Strategic Goals in the strategic Plan 2007-2011.
- Perform missions as required on strategic planning and project/grant proposals to selected Members.
- To assist in mobilizing resources to achieve the goals and objectives as determined by the Typhoon Committee in the Strategic Plan and Annual Operating Plan at its Thirty-Ninth Session.
- To implement the budgetary process adopted at the 38th Session to improve the effectiveness and efficiency of the Committee's operations.
- To focus the integrated workshop in 2007 on "Social-economic impacts of extreme typhoon-related events.
- To request the TC Chairperson to send an official request to WMO to seek the most appropriate way to effect the transfer, as soon as possible, of the budget of US$102,500 for 2007 to TCS to enable TCS to build up its capacity on project financial management according to the rules and procedures established by WMO.
- To authorize the expenditure in 2007 of the balance of allocation for AWG activities in 2006 to enable AWG to carry out activities which had been planned in 2006 in support of training on application of the strategic planning and management to selected Members to be conducted by the Vice Chairperson of AWG in order to enhance capability of these selected Members in the planning and implementation of the TC Strategic Plan in the coming years.

IX. SUPPORT REQUIRED FOR THE COMMITTEE'S PROGRAMME (Agenda item 9)

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

67. The Committee expressed its gratitude to the Government of the Philippines for hosting the TCS and for providing a full-time meteorologist, a part time hydrologist as well as office space with office facilities and supplies. The Committee also expressed its gratefulness for the dedication and continuous services extended by Dr Roman L. Kintanar in his capacity as the Interim Secretary of the Committee for the intersession between the 38th and 39th sessions.

68. Representatives of Macao, China and the staff of the current TCS met twice, in Macao and Manila, respectively in March and June 2006, in order to ensure a smooth transition of the TC Secretariat. Quarterly reports were submitted to the TC Chairman.

69. The representative of Macao, China made a presentation on the new premises of the TCS in Macao. He also explained the different steps to reach an agreement between the host country, People's Republic of China and the Typhoon Committee.

70. The signing ceremony of the "Host Country Agreement Between the Government of People's Republic of China and the Typhoon Committee Regarding the Typhoon Committee Secretariat" took place in the Manila Hotel, Manila, at 10:30 of 7 December 2006. The Agreement was signed by His Excellency, Mr Li Jinjun, Extraordinary and Plenipotentiary Ambassador of the People's Republic of China to the Philippines and the Chairman of the Typhoon Committee Dr Prisco D. Nilo, Officer-in-Charge, Philippine Atmospheric, Geophysical and Astronomical Services Administration. The statements delivered by Ambassador Li Jinjun and Dr Prisco D. Nilo at the signing ceremony are given in Appendices XXI and XXII.

71. Another document has been already elaborated, the "Agreement between the Macao Government of Special Administrative Region of People's Republic of China and the Typhoon Committee Regarding Administrative, Financial and Related Matters Arrangements for the Secretariat of the Typhoon Committee", which will be signed, in a near future, by a representative of the Government of the Macao SAR and the Chairman of the TC, in order to complement the previously mentioned Agreement.

72. The representative of Macao, China nominated Mr Olavo Rasquinho, former director of the Meteorological and Geophysical Bureau of Macao, China, for Secretary of the Typhoon Committee. Mr Olavo Rasquinho was confirmed by the Committee as Secretary of the TC for four years from 2007-2010.

73. Mr Olavo Rasquinho also informed the TC that the collaboration of a full time meteorologist to integrate the TCS staff has already been assured by the Meteorological and Geophysical Bureau of Macao, China, and that a local administrative secretary is also being recruited. In his address, the new Secretary expressed his will of having the collaboration of a seconded hydrologist, preferably with experience in the TCS activities, in order contribute for the continuity, without disruption, of the TCS mission.

74. At the request of the Committee, the Hong Kong Observatory agreed to host the documents for the 40th Session.

75. The Committee noted with appreciation the proposal of Macao, China to name the Library of the new premises of the TCS as "the Roman L. Kintanar Library" in recognition of the long and devoted services rendered by Dr Roman L. Kintanar to the Committee during the past 39 years.

76. These activities were supported by resources allocated by the Committee for this purpose.

(b) Technical Cooperation

77. The Committee was informed of the technical cooperation activities of WMO and ESCAP in support of the programmes of the Typhoon Committee carried out in 2006, including the Voluntary Cooperation Programme (VCP), Emergency Assistance Fund scheme and Technical Cooperation among Developing Countries (TCDC) activities, and expressed its appreciation to ESCAP, WMO and collaborating partners for providing assistance to Members of TC.

78. The Committee noted that, in 2006, China; Japan; and the Republic of Korea made cash contributions to the VCP (F), and China; Hong Kong, China; Japan; the Republic of Korea; and the USA provided equipment, expert services and fellowships. Four VCP project requests were submitted by three Members of the Committee. The Democratic People's Republic of Korea (DPRK) received support from China with the provision of an upper-air system and consumables and for upgrading the GTS communication between Pyongyang and Beijing. China also supported Cambodia and DPRK with the provision of a Meteorological Information Comprehensive Analysis Process System and a receiving system for FY-2 satellites. In view of the VCP potential in support of activities of the Typhoon Committee, the Committee encouraged Members to further actively participate in the VCP activities. The Committee was informed that bilateral assistance is being provided by Japan to Cambodia and Lao PDR to connect NMC Phnom Penh and Vientiane with RTH Bangkok.

79. The Committee also noted the recent emergency assistance provided under the Emergency assistance Fund scheme to WMO Members affected by natural disasters, including DPRK and Viet Nam, and those emerging from conflict. Affected Members who need emergency assistance were advised to utilize this scheme, and all Members were requested to consider possible support to the affected NMHSs. The Committee was further informed on the planned expert mission to Timor-Leste in early 2007 for the establishment of its Meteorological Service with the participation of Australia; Indonesia; Macao, China; and WMO which could be combined with IOC/ISDR/WMO tsunami early warning system assessment mission.

80. Within the framework of the TCDC, China organized the WMO Symposium on Strengthening Cooperation among NMHSs and WMO followed by the 2006 Study Tour in China from 4 to 13 September 2006 for 22 participants, mainly International Advisors, from 21 Members of WMO. Six Members (China, Japan, Malaysia, Republic of Korea, Singapore and the United States) of the Committee participated in the Symposium and Study Tour.

81. Noting the positive outcomes of a series of national and regional workshops on social and economic benefits of weather, climate and water services, carried out in 2005-2006 towards the Madrid International Conference (March 2007) and the usefulness of the evaluation of socio-economic benefits, the Committee agreed that, in addition to the lectures planned during the RA II Technical Conference (5-9 February 2007) and the RA V Regional Seminar (early April 2007), scientific lectures on socio-economic benefits evaluation and impacts analysis be delivered in the Integrated TC Workshop on Implementation of Strategic Plan scheduled for late-August or September 2007 and in the future TC sessions.

82. The Committee noted with pleasure that various measures were/are being taken to enhance the functions of the Regional Office for Asia and the South-West Pacific, including the establishment of WMO Office for West Asia in Bahrain and development of the WMO country profile database, to ensure efficient delivery of technical cooperation and regional activities for providing better services to Members. The TC Members were encouraged to contribute to the country profile database which will include the information on the DPP capability and requirements of Members, and the TC Resource Mobilization Group was urged to collaborate closely with the WMO Regional Office in developing the resource mobilization database and implementing resource mobilization activities.

(c) Typhoon Committee Trust Fund (TCTF)

83. The Committee reviewed the interim statement of account of TCTF submitted by WMO which covered the period from 01 January 2006 to 30 September 2006 as shown in Appendix XXIII.

84. The Committee urged its Members and collaborating partners to continue to enhance their contributions to the Trust Fund.

85. The Advisory Working Group, after consulting the three Working Groups (WGM, WGH and WGDPP) chairs, the Vice Chair of TRCG, and representatives of TCS on priority activities in 2007, recommended a proposed budget on the use of the Typhoon Committee Trust Fund (TCTF) for the Committee to consider for the period from 1 January to 31 December 2007. The Typhoon Committee approved the following budget:

1.	Support to TCS for resource mobilization，representation at international meetings and the launch of TCS	15,000
2.	Support the improvement of the Typhoon Committee's web site by TCS with the advice of Hong Kong Observatory.	1200
3.	Printing and distribution costs of documents for the fortieth session of the Committee (UNESCAP and TCS)	300
4.	Support for attachment of two (2) women forecasters to RSMC Tokyo – Typhoon Center (Tokyo, July 2007)	5000
5.	Support for an integrated TC Workshop on "Social-economic impacts of extreme typhoon-related events":organization of integrated workshop (US$3,000), allocation for each of the three WGs (3*US$13,000), allocation for TRCG and others (US$3,000);	45,000
6.	Support for the Roving seminar	14,000
7.	Support to AWG	15,000
8.	Support flood forecasting training course in China	5,000
9.	Support for on-the-job training in flood forecasting in Malaysia	2,000
10.	**TOTAL**	**102,500**

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

87. The Committee also requested AWG Chair and Vice Chair to advise TC Chair and the Secretary of TC on the selection of expert(s) to represent the Committee to attend international meetings as outlined above. This implies that the seeking of endorsement of Chair and Vice Chair of AWG is mandatory prior to the use of TCTF for any official representation of TC at international meetings.

88. The Committee decided that total actual expenditure for the year 2007 is not to exceed US$ 102,500; the support cost to be charged by WMO has not yet been included in the above budget.

89. In noting the exceptional circumstances of urgent activities required for its efforts to restructure its operations for better efficiency of work, the Committee recalled its previous decision to limit the total planned budget, including the support cost, within the limit of US$100,000 and decided to limit total planned budgets for the 2008 onwards to US$100,000.

X. DATE AND PLACE OF THE FORTIETH SESSION (agenda item 10)

90. The Committee welcomed the offer from Macao, China to host the fortieth session in November 2007. The exact date of the 40th session will be communicated to UNESCAP, WMO, TCS as well as the Chairperson of TC by January 2007. The meetings of TC Working Groups on meteorology, hydrology and DPP would be arranged by the WMO, UNESCAP and TCS in consultation with the Chairman and the host Member as an integral part of the Session.

XI. SCIENTIFIC LECTURES (agenda item 11)

91. The scientific lectures were presented as shown in Appendix XXIV. The Committee expressed its appreciation to all the lecturers and requested the TCS to disseminate all the lecture papers/PowerPoint presentation and to include them in the Typhoon Committee Annual Review for 2006.

XII. OTHER MATTERS

92. The Committee and all participants in the 39th Session expressed sadness upon learning of the untimely passing away of Dr. Kyung-Sup Shin, the former Administrator of the Korea Meteorological Administration and expressed their heartfelt condolences to the colleagues at KMA and the family of Dr Shin for this tragic loss. The Committee also wished to record the valuable contribution of Dr Shin to the Typhoon Committee since his direct involvement starting in 2003.

XIII. ADOPTION OF THE REPORT (agenda item 12)

93. The Committee adopted the report of the session at 16:15 hours, 9 December 2006.

XIV. CLOSURE OF THE SESSION AND HAND OVER CEREMONY

94. A hand-over ceremony for the transfer of the TCS from the Philippines to Macao, China was organized and presided over by Mr Noel Servigon, Director for ESCAP Affairs of Department of Foreign Affairs, representing His Excellency the Secretary of Foreign Affairs of the Philippines, and Mr Antonio Viseu, Head of the Delegation of Macao, China to the 39th Session of the Typhoon Committee at 1000 hrs, 9 December 2006 at the Mabuhay Conference Room of the Manila Hotel. The Hand-over ceremony was also attended by all the delegates of the 11 Members of the Committee, representatives of UNESCAP, WMO, TCS and observers from Indonesia, UN-ISDR, ADPC and ADRC. Dr Olavo Rasquinho, Incoming Secretary of the TC, received the archives on behalf of the new TCS from the outgoing Interim Secretary, Dr Roman L. Kintanar.

95. The delegates from the Members of the Typhoon Committee, observers, and representatives of UNESCAP, WMO and TCS expressed their thanks and appreciation to the Government of the Philippines, the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) for the successful hosting of the 39th session of the Typhoon Committee. They also expressed gratitude to Dr Prisco D. Nilo, Officer-in-Charge of PAGASA and his staff for the warm hospitality and excellent arrangements made and also for organizing a tour through the beautiful sites of Manila, Philippines. The Committee also expressed its sincere appreciation to the Honourable Dr Estrella F. Alabastro, Secretary of Department of Science and Technology of the Philippines, the Honourable Mr Manny Villar, President of the Senate of the Philippines, the Honourable the Mayor Jose Atienza of Manila City, the Honourable the Mayor of the Quezon City Mr Sonny Belmonte, and Dr Roman L. Kintanar for the hospitality extended to all the participants during their stay in the Philippines.

96. The Session was closed by the Chairman at 17:00 hours, 9 December 2006.

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LIST OF APPENDICES

APPENDIX I

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APPENDIX II.A

WELCOME REMARKS BY

THE HONORABLE JOSE L. ATIENZA

MAYOR, CITY OF MANILA

Mayor Atienza extended his warm welcome to the delegates and guests of the Typhoon Committee Session. At the outset, he congratulated the PAGASA Officer-in-Charge, Dr Prisco D. Nilo for the services he has rendered in the field of weather forecasting.

He extended his greetings to the PAGASA, to Secretary Alabastro of the Department of Science and Technology, Dr Le Huu Ti, representing the UNESCAP, Dr. Tokiyoshi Toya of the World Meteorological Organization, Dr Roman L. Kintanar, whom he described as one of the institutions in weather forecasting and meteorological studies in the countries whom he complimented for his continued service to the country and to the region.

He took cognizance of the difficulties and problems involved in weather forecasting, making mention of an occasion in Hong Kong when people rose in anger for the inaccurate forecasting of an extreme weather event. He wished he could have defended the forecasting people in Hong Kong.

This session comes at a time when a strong typhoon just wreaked havoc and destruction to many parts of the islands. But according to him, there were not much complaints from the people, which can be attributed to the accurate forecasts and timely warnings by PAGASA.

Today, the national leadership, the DOST, the National Disaster Coordinating Council, and local government units now work more closely; and together with media, have brought accurate weather information to the communications to ensure the safety and well-being of the population.

Even as the destructive effects of these extreme weather events cannot be totally eliminated, with accurate forecasting, the potential damages can be mitigated and minimized.

In the case of Typhoon “Reming”, damages would have been much, much more if not for the accurate and credible forecasting by PAGASA. But there are problems associated with people’s response to weather warnings. People do not take warnings very seriously. A classic example is the tsunami occurrence in Hawaii where the people’s complacency to the warnings posed problems, prompting disaster managers to forcibly compel people to prepare for the impending disaster.

He took cognizance of the national government’s efforts, through the DOST, the PAGASA for now making it possible bringing more accurate and timely weather forecasts and warnings for the benefit of the general population.

In closing, Mayor Atienza extended his warmest greetings he can give to the delegates coming from the various countries of the ESCAP region.

He specially thanked the Session organizers for holding the meeting in Manila and wished one and all an enjoyable stay in Manila and the country.

APPENDIX II.B

UNESCAP/WMO Typhoon Committee
39th Session, Manila, Philippines
Opening Address
By
Dr. Prisco D. Nilo
(Deputy Director for Operations & Services)
Officer-in-Charge, PAGASA

Hon. Estrella F. Alabastro, our minister of science and technology
Hon. Lito Atienza, Mayor of the City of Manila
Dr. Lee Hu Ti of UN-ESCAP
Dr. Tokiyoshi Toya of the World Meteorological Organization
Distinguished Guests,
Delegates,
Ladies and Gentlemen

Good morning!

We of the Philippine Atmospheric, Geophysical and Astronomical Services Administration extend our warm greetings in welcoming the delegates to this 39th Session of the Typhoon Committee.

The importance of the work of the Typhoon Committee in promoting cooperation and in coordinating regional activities that aim to reduce and mitigate the adverse impacts of tropical cyclones to the countries in the ESCAP region cannot be over-emphasized. Member countries, individually and collectively, have benefited much from scientific and technical undertakings initiated by the Typhoon Committee in terms of the sharing of and application of knowledge in addressing problems associated with tropical cyclones. It is in this context that this meeting will tackle vital issues on a range of topics that are lined up for discussion, including important decisions concerning the future programs and activities of the Typhoon Committee and the contributions that individual members will give to the overall effort.

It may be coincidental that for the past few weeks 2 very strong typhoons hit the Philippines in succession, and just last week or a few days before the opening this session of the Typhoon Committee a very intense typhoon hit the southern part of Luzon island, as if heralding the opening of this session. And at this time, our disaster management agencies and local government units are in full force in relief and recovery operations in the provinces hit by the typhoon.

- - - - - POWER POINT PRESENTATION - - - - -

We will continue to look up to the Typhoon Committee as a catalyst in promoting cooperation among nations in the ESCAP region, working for a common goal of making communities and people safe from the ravages of typhoons. We in the PAGASA are privileged to be part of, and contribute, to the overall effort. We have no doubt that the Typhoon Committee will be equal to the task. We are looking forward to work with our fellow delegates towards a productive and fruitful meeting.

Thank you and mabuhay!

APPENDIX II.C

WMO ADDRESS AT THE OPENING OF THE THIRTY-NINTH SESSION OF THE ESCAP/WMO TYPHOON COMMITTEE (Manila, Philippines, 4 December 2006)

by Dr Tokiyoshi TOYA
Regional Director for Asia and the South-West Pacific, WMO

Your Excellency, Dr Estrella F. Alabastro, Secretary of the Department of Science and Technology,
Your Excellency, Mr Jose Lito L. Atienza, Jr, Mayor of the City of Manila
Dr Prisco D. Nilo, Officer-in-Charge, Philippine Atmospheric, Geophysical and Astronomical Administration (PAGASA)
Dr Bui Van Duc, Chairman of the Typhoon Committee
Mr Le Huu Ti, Representative of UN ESCAP
Dr Roman L. Kintanar, Interim Secretary of the Typhoon Committee Secretariat
Distinguished Delegates and Guests,
Ladies and Gentlemen,

It is indeed an honour and a privilege for me to be here with you today as representative of the World Meteorological Organization, WMO, at the opening of the thirty-ninth session of the ESCAP/WMO Typhoon Committee. On behalf of Mr Michel Jarraud, Secretary-General of WMO, I would like to welcome all the participants and to take this opportunity of thanking the Honourable Dr Alabastro, Secretary of the Department of Science and Technology, and through you, the Government of the Philippines, for hosting this year's session in Manila. Your presence among us clearly demonstrates the importance the Government attaches to the programmes and activities of WMO and in regional and international cooperation.

I also wish to express my deep appreciation, and that of WMO, to Dr Nilo, Officer-in-Charge, Philippine Atmospheric, Geophysical and Astronomical Administration (PAGASA), and his staff, for the warm welcome and hospitality, and for the excellent arrangements made to ensure the success of the session.

I also wish to thank Dr Bui Van Duc, the Chairman of the Typhoon Committee and all those who contributed to the work of the Committee. I would also like to express my appreciation to the Government of Japan for the continued contribution of specialized tropical cyclone weather forecasting services of the Regional Specialized Meteorological Centre in Tokyo. I would further like to take this opportunity to extend thanks of WMO to UN ESCAP, for its long-standing close co-operation with WMO as our organizations jointly provide support to the activities of the Committee. I wish to assure you of WMO's continued support to the programmes and activities of the Committee and continuance of the excellent coordination with the UN ESCAP.

WMO's special appreciation and gratitude are extended to the Government of the Philippines for hosting the Committee's Secretariat and for providing the services of members of staff as well as the office facilities during this intersession period and since its establishment in 1971. Special thanks are also extended to Dr Roman L. Kintanar for his long devotion and dedication to the Typhoon Committee in his capacity as the Secretariat Coordinator and the Interim Secretary.

This session is convened immediately after the recent passage of Super-Typhoon Durian which caused flash floods and landslides and claimed more than 300 lives with about 300 people missing, in the northern Philippines. I wish to extend WMO's sincere condolences and sympathy to your Government and to the Philippine people who were adversely affected by the past typhoons.

In this connection, I wish to reiterate the fact that in this region the impact of tropical cyclones is illustrative of the damages that can be caused by hydrometeorological disasters both in loss of lives and economic damage. It need not be emphasized that developing countries are more vulnerable to these problems.

In recent years WMO has been intensifying its efforts in the mitigation of tropical cyclone disasters, within the framework of its involvement in the International Strategy for Disaster Reduction (ISDR) and in the context of Sustainable Development for Small Island Developing States (SIDS).

Distinguished Delegates and Guests,

Global efforts, especially within the context of the WMO Tropical Cyclone Programme, have resulted in a noticeable improvement in the warning systems in many parts of the world. It is evident that, where adequate warning and preparedness systems are instituted, many lives can be saved. It is therefore crucial to underscore the importance of further socio-economic studies to demonstrate more clearly the cost-benefit from investments in natural disaster prevention, particularly in early warning systems. It is worth noting that WMO's Tropical Cyclone Programme is currently undertaking a study on the economic and social impacts of tropical cyclones with emphasis on the assessment by end-users of relevant weather services in all the tropical cyclone affected areas in the world.

In this context, WMO is working with its partners at the international, regional and national levels to improve early warning capabilities further and ensure that these systems are available to all countries, particularly those with the least resources.

Ladies and Gentlemen,

One of the major strengths of the Typhoon Committee over the years has been that the main funding for its developmental programmes has come from the contributions of the Member countries themselves. However, there is a need for development partners to provide the assistance needed to effectively implement items in the Programme, which cannot be funded nationally. It is also important that other sources of extra-budgetary funding be tapped, such as bilateral and multi-lateral arrangements. WMO will continue to assist the Directors of National Meteorological and Hydrological Services (NMHSs) in their resource mobilization activities with partners in the region, such as regional financial institutions and development partners.

Ladies and Gentlemen,

I am sure that this session will offer a valuable opportunity for the exchange of views on the successes and problems experienced by the Committee since its last session. It is our hope that the session will come up with priority activities and related strategies to strengthen the existing systems and infrastructure and in the further *development of a culture of prevention* in the region.

Dear colleagues,

These matters will no doubt engage your attention for the coming days. I can assure you that WMO will continue to support the Typhoon Committee, to the fullest extent possible.
On behalf of the Secretary-General of WMO, I would, before closing, like to once again thank our host and wish you every success in your deliberations during the days to come.

Thank you all for your kind attention.

APPENDIX II.D

**MESSAGE FROM DR. KIM HAK-SU,
UNDERSECRETARY-GENERAL OF THE UNITED NATIONS AND
EXECUTIVE SECRETARY, UNITED NATIONS ECONOMIC AND SOCIAL
COMMISSION FOR ASIA AND THE PACIFIC**

It gives me great pleasure to address this message to the thirty-ninth session of the Typhoon Committee.

At the outset, I would like to express our sincere appreciation to the Government of the Philippines for hosting this session. I am pleased to note that as a founding member of the Typhoon Committee, the Philippines has been a driver in the common efforts to achieve the objectives of the Committee, particularly in promoting and coordinating the planning and implementation of measures and research activities required to minimize the loss of life and damage caused by typhoons.

I would also like to welcome all the distinguished delegates to the thirty-ninth session of the Typhoon Committee, which is expected to be a watershed for a new era of regional cooperation on management of typhoon-related disasters. The new era of regional cooperation is expected to result in important achievements in terms of saving lives and improving the livelihood of the many millions of people in the subregion.

These regional efforts are necessary to mitigate the impact of natural disasters, which have profoundly affected many countries in Asia and the Pacific in terms of number of people killed and socio-economic damage. This is particularly true with the increasing impact of natural disasters in the region in recent years, including the tragic impact of the December 2004 Tsunami.

A recent study of UNESCAP showed that natural disasters have had much greater socio-economic impact in the region than in any other regions of the world. For the period from 1900 to 2005, the number of deaths caused by natural disasters in the region accounted for 91 per cent of the total number of deaths by natural disasters in the world, while the total economic damage accounted for 49 per cent of the world's damage during the period.

For the Typhoon Committee subregion, I am pleased to note important achievements made by members of the Typhoon Committee over the years and especially in recent years. The decision of the Committee to develop a strategic plan with supporting annual operating plan marks a giant step in the common efforts to cope with the rising impact of natural disasters. UNESCAP has always attached importance to the work of the Committee, particularly through its programme to promote regional cooperation on disaster reduction.

In the case of the countries covered by the Typhoon Committee, we deeply concerned about the severe impact of typhoon-related disasters. For the period from 1990 to 2006, the number of people killed by typhoon-related disasters accounted for 84 per cent of the total number of deaths (some 73,000 persons killed) by natural disasters. Furthermore, the total socio-economic damage wrought by typhoon-related disasters accounted for 98 per cent of the total damage by all natural disasters during the same period.

In view of the steadily increasing impacts of natural disasters, the efforts of the Typhoon Committee are essential to create better conditions for developing countries in the region to work towards achieving the Millennium Development Goals.

I would like to take this opportunity to express our sincere appreciation to the Government of the Philippines for hosting the Typhoon Committee Secretariat over the course of the past

35 years, including the provision of valuable services of Dr Roman L. Kintanar in supervising the Secretariat as well as the services of meteorologists and hydrologists. On this occasion, I would like to put on record our sincere appreciation of the continuous contribution and consistent dedication of Dr Roman L. Kintanar to the work of the Typhoon Committee since its establishment. I would also like to take this opportunity to wish Dr Roman L. Kintanar a happy retirement.

I would also like to express our gratitude to the Ministry of Land, Infrastructure and Transport of Japan, and of the Ministry of Construction and Transportation of the Republic of Korea for their generous support in terms of financial and technical assistance in the implementation of various activities jointly undertaken by the Typhoon Committee and UNESCAP in the field of hydrology.

I warmly welcome the intention of several other Typhoon Committee Members, such as China; Hong Kong, China; Macao, China; Malaysia; the Philippines; and the U.S.A., to support these common endeavours. I wish to particularly appreciate the substantive support of the Regional Specialized Meteorological Centre of Tokyo, Japan, and the Hong Kong Observatory of Hong Kong, China, in the operations of the Committee and the continuous support of the Government of the Philippines in providing secretariat services for the Typhoon Committee during the past several decades.

After the thirty-ninth session, we shall enter a new era with the newly-approved Strategic Plan for 2007-2011, the Annual Operating Plan and the first annual budget prepared by the Committee Members and most importantly a new Typhoon Committee Secretariat, hosted by Macao, China.

On behalf of UNESCAP, I would like to express our deep gratitude to the Government of Macao, China, for hosting the new Typhoon Committee Secretariat from 2007 onward and for providing financial support amounting to US$250,000 per year, together with services of the Typhoon Committee Secretary, and the full-time services of three technical experts: a meteorologist, a hydrologist and a disaster and preparedness experts. This support is especially valued as it remains a major challenge for the Committee to solicit further support from all Typhoon Committee Members, donors and international organizations.

UNESCAP is committed to supporting your efforts to enhance subregional cooperation in typhoon-related disaster mitigation and water resources management with the framework of our own programme of work and available resources.

With your active participation, I am confident that the deliberations of the session will be fruitful and that the distinguished representatives will be able to provide useful guidance on the future activities of the Committee.

I wish the session every success.

APPENDIX II.E

UNESCAP/WMO Typhoon Committee
39th Session, Manila, Philippines

Message
by
The Honorable Estrella F. Alabastro
Secretary, Department of Science and Technology

Distinguished Guests,
Delegates,
Ladies and Gentlemen

The Government of the Philippines extends its warm greetings to the participants of this 39th Meeting of the Typhoon Committee. I personally take pleasure in welcoming our distinguished guests and the delegates representing the various countries of the ESCAP region.

The contribution of the Typhoon Committee for the advancement of meteorology in the ESCAP Region, particularly in relation to tropical cyclone forecasting, warning and mitigation, is well recognized and much appreciated, in terms of the benefits that countries in the region derive through regional programs and initiatives that highlight the sharing of and application of scientific knowledge and technological advances aimed at enhancing the capabilities of governments to better respond to the destructive potentials of tropical cyclones, or "typhoons" , as they are more commonly known in this part of the world.

And, even the potential benefits from the application of scientific knowledge for mitigating the destructive impacts of tropical cyclones to society and the economies of nations are far from being fully realized, work continues towards a better understanding of the genesis of development of tropical cyclones vital to the formulation and adoption of rational and effective responses to these events. This, coupled with improved methods for distributing information expeditiously utilizing technologically advanced channels of communications, are important to disaster preparedness and mitigation efforts of countries in the region. And, we have much to be grateful to the Typhoon Committee for its efforts in promoting regional cooperation in this effort. It will be recalled that the Typhoon Committee was organized jointly by the UNESCO and the WMO in 1968 precisely in response to this need.

The extent of damage to property and loss of life caused by tropical cyclones very widely from year to year. And, not all tropical cyclones cause disasters; but those that do, affect many communities and a large number of people. Global statistics continue to highlight an increasing number of people affected by tropical cyclones. Thus, the detection monitoring and forecasting the movement of tropical cyclone are of prime importance to countries that are threatened so that appropriate measures for mitigating their impacts can be put in place for the safety and well-being of the general population. In our country alone, we are witness to the devastation that tropical cyclones cause upon us. Even economic giants Japan and U.S.A. have not been spared from the wrath of tropical cyclones, or hurricanes, as they are called in the west. We read newspaper accounts, or watch the news on TV, about widespread destruction and flooding directly resulting from these extreme weather events.

Ladies and Gentlemen,

The Philippine Government has laced a high premium on the enhancement of the forecasting and warning capabilities of PAGASA, the country's meteorological service agency, as articulated in the president's 10-Point Agenda for Development, and given substance by the

4-point Action Plan for Disaster Preparedness of the National Coordinating Council (NDCC). Facilities have been upgraded and improved through the acquisition of modern, state-of-the-art equipment to make the agency at par with those of other countries in the region. And, opportunities for the improvement of manpower resources continue to be supported by government.

As a component of the overall development of the country's meteorological and hydrological service, and integrated into the national disaster prevention and preparedness program, we have seen the positive results of investments made for the upgrading of equipment and manpower development that has benefited the various economic sectors and the general public in terms of improved services. This has been demonstrated during the occurrence of three strong typhoons that recently crossed the country in a span of two months. The country's disaster managers acknowledge that the accurate and timely warnings by PAGASA have contributed greatly in mitigating the impacts of these typhoons. In this respect, we acknowledge, with appreciation, the support, of the UNESCAP and the WMO, through the work of the Typhoon Committee in promoting technical cooperation among countries in the region, in both operational and research activities.

The government also takes cognizance of its commitments to regional cooperation and continue to support initiatives and actions needed in addressing issues associated with tropical cyclones. This is borne out of the reality that weather, and for that matter, typhoons, recognize no national boundaries and that regional cooperation is an imperative that nations recognize. It is in this spirit of regional cooperation that the Philippines has played host to the Typhoon Committee Secretariat for the past 35 years. Hosting of the Secretariat is due to be turned over to Macao; and even as we prepare for the transfer, the Philippine Government continues its unqualified support to the work of the Typhoon Committee.

We look forward to a productive meeting and wish the delegates an enjoyable stay in the country.

Thank you.

APPENDIX III

AGENDA

1. Opening of the Session

2. Election of officers

3. Adoption of the agenda

4. Parallel working session of Meteorological, Hydrological and Disaster Prevention and Preparedness Working Groups

5. The Committee's activities during 2006:

    5.1 Meteorological component;
    5.2 Hydrological component;
    5.3 Disaster Prevention and Preparedness component;
    5.4 Other activities related to training and research
    5.5 Activities of the Advisory Working Group
    5.6 Activities of the Working Group on Resource Mobilization

6. Review of the 2006 typhoon season/annual publications

7. Coordination with other activities of the WMO Tropical Cyclone Programme

8. Programme for 2007 and beyond

9. Support required for the Committee's programme

10. Date and place of the Fortieth session

11. Scientific lectures

12. Other Matters

13. Adoption of the report

14. Closing/Turn Over Ceremony of TCS

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APPENDIX IV

REVIEW OF THE COMMITTEE'S ACTIVITIES DURING 2006

Summary of the report of the Typhoon Committee Members on their activities related to the Meteorological component

China

1. Progress in Member's Regional Cooperation and Selected RCPIP Goals and Objectives

a. Hardware and/or Software Progress

During the typhoon season in 2006, CMA switched to FY-2C intensive observation mode every half an hour again. CMA also has developed a microwave TC analysis system this year.

Up to the end of 2006, 105 CINRAD radars will have been set up, and 10 CINRAD radars will be deployed in next year.

CMA continually improves and enhances its upper air sounding and surface observation system, such as upper air sounding stations, wind profiler radar network, GPS/MET detecting network and automatic weather stations etc. By the end of 2006, there will be 15 wind profilers, 226 GPS/MET and 2010 AWS putting into operational use at the relative regions respectively.

The GMTTP (Global Model for Tropical cyclone Track Prediction) was put into operational run this year. This system provides 120h track forecast and four times a day during typhoon season. In addition, the ensemble prediction system for TC track and the new initialization scheme on the TC vortex is under development.

c. Interaction with users, other Members, and/or other components

At RTH Beijing, the GTS link to New Delhi has been upgraded by a FR link with a symmetric CIR of 8/8kbps in December, 2005.

RTH Beijing also upgraded the CIR for the incoming PVC of Beijing-Tokyo link from 48kbps to 96kbps for collecting ATOVS 1b data from RTH Tokyo in July 2006.

In March 2006, the internet connection for the timely exchange of GTS data was established between CMA and Bureau of Meteorology (BOM). Currently, CMA has accessed to BOM's NWP products and observation data from the southern hemisphere from Melbourne.

Since September, 2006, CMA has been routinely downloading the hourly METEOSAT images from DWD ftp server over Internet. And the data has been used in NMC's forecast operations.

d. Research Progress

In 2006, some research progresses on TCs has been achieved, such as TC track prediction, TC structure and intensity, TC Genesis and climatology, numerical assimilation technique and TC precipitation mechanism et..

2. Progress in Member's Important, High-Priority Goals and Objectives
(towards the goals and objectives of the Typhoon Committee)

a. Hardware and/or Software Progress

The IBM Cluster 1600 was delivered by IBM to the China Meteorological Administration (CMA) for operational use by the end of March 2005. The peak performance of the latest system is 21TFLOPS and the total number of processors on this system was 3248.

A mobile station for typhoon surveillance has been set up in the Spring by the Shanghai Typhoon Institute (STI). Some new sounding instruments have been equipped, including an acoustic wind profiler from Germany, a GPS sounding from USA, a Sonic Anemometer/Thermometer, an automatic meteorological station, and a remote control camera.

The STI operational typhoon numerical model GRAPES_TCM2.1 (GT2.1) has been upgraded to G RAPES_TCM2.6 (GT2.6) for operational use.

A numerical prediction system with the horizontal resolution of 9km within the area of the East China was set up this year, focusing on wind and rainfall associated with Typhoon Landfall. on of the typhoon structure. The system is expected to make quantitative forecast on the coverage and intensity of typhoon-induced wind and heavy rainfall.

The updated SHTM with BDA (Bogus Data Assimilation) initialization technique has been put into operation in 2006. Until the mid October, it has forecasted 19 TCs with 24- and 48-hour forecasting for 114 and 88 times respectively, with an averaged error of 135.2 and 224.9 km accordingly.

The improved operational wind and wave numerical forecast system was established by Shanghai Typhoon Institute based on the hybrid wave model version 3 and a mesoscale atmospheric model. This system has been put into operation and was introduced to Shanghai Weather Center in the flood season of 2006.

b. Implications to Operational Progress

The TC data retrieval system covering the Western North Pacific region has been revised and upgraded. The historical environmental TC data and some new retrieval functions in the system have been added. The added products include general situation for each TC, distribution figure of daily rainfall for each TC, disaster situation caused by a TC, selected satellite image and weather chart of each TC.

CMA is developing a new satellite-based broadcasting system, DVB-S system, for replacing the current PCVSAT system. A pilot system, which includes a hub station installed at the National Meteorological Information Center (NMIC) and some receiving stations installed at provincial centers，and supports the services of data broadcasting and multimedia program broadcasting, has been put into running since April, 2006.

Since December, 2005, CMA started distributing the cloud motion wind products derived from CMA's FY satellite and coded in BUFR format over GTS.

c. Interaction with users, other Members, and/or other components

The first weather channel in China (CWTV) was launched on 18 May 2006, providing updated weather forecasts every ten minutes around the clock.

d. Training Progress

From October 2005 to July 2006, China Meteorological Administration Training Center (CMATC) has held 5 Training Courses on the application of the Next Generation Doppler Weather Radar in all; more than 200 trainees attended the courses.

In January 2006, CMATC held a Training Course on the interpretation of the Meteorological Satellites Data with 56 participants.

From September to December 2006, CMATC held a Training Course for Fresh Forecasters, with 38 participants in the class.

An advanced training course for chief forecasters was held from October to December 2006, 37 chief forecasters all over China took part in it.

e. Research Progress

- TC Track
- TC Intensity Change
- TC Structure and Dynamic and Thermodynamic Process
- TC Precipitation Quantitative Estimation
- Impacts of Global Warming on Typhoon Activity

Hong Kong, China

Under a RA II pilot project, NWP-based forecast time series of weather parameters for selected cities up to seven days ahead were generated in graphical format by advanced centres and made available to participating RA II Members for reference via the Internet. The project webpage, launched in January 2006, covered 46 cities from eight RAII Members (which included three Typhoon Committee Members).

A cooperative research project between HKO and the Japan Meteorological Agency (JMA) on the utilization and verification of JMA's Ensemble Prediction System (EPS) tropical cyclone track data was completed. A number of new ensemble processing algorithms and ensemble TC forecast products were developed and put into operational trial.

In preparation for the cessation of HiRID broadcast from JMA's MTSAT-1R in December 2007, a new ground reception system was being procured and would be installed in early 2007 to receive MTSAT data in both High Rate Information Transmission (HRIT) and Low Rate Information Transmission (LRIT) formats.

An automatic windshear alerting algorithm based on the data from the infrared Doppler Light Detection And Ranging (LIDAR) system had been put into operation at the Hong Kong International Airport (HKIA) since December 2005. It provided windshear alerts to HKO's Windshear and Turbulence Warning System at HKIA under rain-free condition, including rain-free areas between the rainbands of tropical cyclones.

A new forecasting system called RAPIDS (Rainstorm Analysis and Prediction Integrated Data-Processing System) was under trial operation in 2006. Based on outputs generated by the nowcasting system SWIRLS (Short-range Warning of Intense Rainstorms in Localized Systems) and a high-resolution non-hydrostatic model (NHM), RAPIDS provides forecasters with hourly-updated rainfall analysis, quantitative precipitation forecast guidance as well as predicted rainstorm warnings for the next 6 hours.

A tool for probability forecasts of significant crosswinds due to tropical cyclones, by perturbing the forecast track using statistical or dynamical method, was put into operational use at the Hong Kong International Airport.

In addition to the existing display of tropical cyclone forecast tracks every 3 hours for tropical cyclones centred within the area of responsibility of Hong Kong (i.e. 10-30 °N, 105-125 °E), the information service was enhanced in July 2006 to provide through HKO's website the 72-hour forecast tracks based on 00 UTC and 12 UTC data, updated daily at round noon and midnight respectively, for tropical cyclones centred within an expanded region bounded by 7-36 °N, 100-140 °E.

A comprehensive review of the Tropical Cyclone Warning Signal System in Hong Kong commenced in August 2006 as a result of intense public and media interest in the aftermath of Typhoon Prapiroon. Experts from various disciplines (covering both physical and social sciences), officials from relevant government departments, key stakeholders and the general public would be engaged to update the signal system to better serve the changing needs of the society.

Japan

- **Tropical Cyclones affected Japan in 2006**

As of 25 October, eighteen tropical cyclones of tropical storm (TS) intensity or higher formed in the western North Pacific and the South China Sea in 2006. Out of eighteen, eleven cyclones reached typhoon (TY) intensity, three severe tropical storm (STS) intensity, and four TS intensity.

- **Satellite observations**

The Multi-functional Transport Satellite-1R (MTSAT-1R) launched on 26 February 2005 has been operated in the geostationary orbit at 140 degrees East since 28 June 2005. The Multi-functional Transport Satellite-2 (MTSAT-2) launched on 18 February 2006 went through the In-Orbit Test (IOT) and has been on standby in orbit at 145 degrees East since 4 September 2006.

The High Rate Information Transmission (HRIT), the High Resolution Imager Data (HiRID; compatible with S-VISSR), the Low Rate Information Transmission (LRIT) and WEFAX have been provided since 28 June 2005. Broadcasting service of HiRID and WEFAX is planned to be continued until the end of 2007 for S-VISSR/WEFAX users in transition to HRIT/LRIT. The timetable of imagery dissemination from MTSAT-1R is available on the website of the Meteorological Satellite Center (MSC), Japan Meteorological Agency (JMA) at http://mscweb.kishou.go.jp/operation/daily_sch.pdf.

The hourly full-disk imagery of infrared channel 1 (IR 1: 10.5-11.5μm) of HRIT has also been provided for registered National Meteorological and Hydrological Services (NMHSs) through the Internet as a backup service of the direct broadcast via the satellite since 28 June 2005. JMA plans to start providing HRIT satellite imagery of all the channels (IR1-4 and VIS) at every observation to NMHSs through the Internet in March 2007. JMA presents the latest information on MTSAT series on its website at http://www.jma.go.jp/jma/jma-eng/satellite/index.html.

- **Improvement of global numerical weather prediction model**

ATOVS data (radiance data from Advanced Microwave Sounding Unit (AMSU)-A/-B of NOAA15-17 and Aqua satellites) have been assimilated in the JMA's global data assimilation system. In August 2006, several changes were made in ATOVS pre-processings including

improved QC (update of total column cloud liquid water (TCCLW) retrieval algorithm used for detecting cloud/rain-affected radiances and bias correction, stricter gross-error QC, adding rain detection based on TCCLW, removal of edge scans and revision of channel selection), recalculating scan bias correction, and modifying AMSU-A observation errors assigned. Among them, observation error modification had the largest impacts on NWP performance. The details of this modification can be found in Okamoto et al. (2006).

Cycle experiments were carried out for the periods from 20 July to 9 September 2004 and from 20 December 2004 to 9 February 2005 to assess these changes. With the new ATOVS pre-processings, the fit of temperature analysis against radiosondes became better in the Tropics and Southern Hemisphere, although worse in the stratosphere of the Northern Hemisphere. The forecast impacts for the 850hPa temperature and 500hPa geopotential height are positive in the Tropics and Southern Hemisphere, while neutral in the Northern Hemisphere. Especially there are distinct positive impacts in short-range forecast in the Southern Hemisphere. Typhoon track forecast errors are clearly reduced from the forecasts of 30-h onward.

- **Medium-range Ensemble Forecasts for NMHSs in Asia**

For the effective utilization of ensemble forecast products, JMA has opened a web site to provide daily products of medium-range ensemble forecasts since June 2006.

On the web site, prognostic charts for the western North Pacific area and point-forecast diagrams are available to registered users.

- **Training Progress**

The Typhoon Operational Forecasting Training has been annually conducted by the RSMC Tokyo-Typhoon Center according to the decision made by the Typhoon Committee since 2001. The purpose of the training is to improve tropical cyclone analysis and forecasting skills of forecasters from Members of the Typhoon Committee. In 2006, the training was carried out with participation of two forecasters from Laos and Vietnam from 19 to 28 July at the Center. The training in 2006 includes the introduction of operations at the Center, lectures on tropical cyclone analysis and forecast, real-time on-the-job training on analysis of KAEMI (0605) at the JMA's operational room.

JMA has conducted Group Training Course in Meteorology since 1973, and renewed the Course in 2003. The current Training Course focuses on “Utilization of satellite data including neph-analysis”, “Application of numerical weather prediction” and “Application of climate information and data”. In September 2006, the three-month Training Course for the year started with 8 participants from 8 countries including Malaysia and Thailand from TC member countries.

- **Research Progress**

The main topics of research progress are as follows:

- A statistical study on extratropical transition of typhoons
- Statistical analysis of organized cloud clusters with the possibility to develop to tropical storms in the western North Pacific and their warm core structure
- A numerical simulation of storm surge observed in Seto Inland Sea in 2004
- Development of the portable X-band Doppler radar (X-POD)

- The development of the new version of the third-generation wave model MRI-III for operational use
- Targeting observation sensitivity experiments using a singular vector method

Republic of Korea

Three typhoons affected Korea, EWINIAR (0603), WUKONG (0610) and SHANSHAN (0613). Particularly, EWINIAR continuously moved along the west coast line after making landfall at Jindo which resulted in serious damages such as the death of five and the economic loss of 354.5 billion won (US$ 354.5M).

In 2006, KMA has provided the real-time updating typhoon information at least twice a day to about 100 organizations while KMA produced the information only one time until 2005.

There have been a couple of significant improvements for NWP at KMA. KMA improved the resolution of global model from T213L30 to T426L40 which shows the improvement of the performance of typhoon forecast. Along with the improvement of Global Model, EPS has been upgraded for the horizontal resolution from T106 to T213 and a Tide and Storm Surge Model (TSSM) with about 8km horizontal resolution developed by METRI of KMA, which has been found a very useful tool to catch the information of tide and storm surge when typhoon comes to the Korean peninsula. KMA is already operation 5 wind profilers and will be installed 5 more wind profilers in 2007 to improve the temporal and spatial resolution of upper-air observation.

To support TRCG program, KMA invited a scientist from the NHMS of Vietnam under the TRCG Fellowship program from June to August and performed co-research work with METRI experts on the numerical simulation of typhoon RUSA with a very high resolution mesoscale model, and calibration of intensity of typhoon with Kalman filtering. The training course on Information and Communication Technologies for Meteorological Services was conducted by the KMA sponsored by the KOICA from April 2 to 29, 2006, and was attended by 14 participants from 12 countries, including two ESCAP/WMO Typhoon Committee member countries – Vietnam and the Philippines.

For more timely and effective Typhoon forecast, KMA is constructing a new National Typhoon Center (NTC). The NTC will be located at Jeju Island, Korea and will be completed in early 2008. The mission of this center is to produce more accurate and appropriate Typhoon forecast.

Macao, China

Highlight of activities in Meteorological Component:

- The Expanded Best Track (EBT) data of Macao for the period 1968 to 2005 was compiled and sent to the Regional Specialized Meteorological Center (RSMC), Tokyo in November 2005 and March 2006.

- New Telephone Weather Enquire system was installed and implemented from January 2006. The system provide in 3 languages, Chinese (with 2 dialects---Mandarin and Cantonese), English and Portuguese, the real time weather report, forecast and warnings and air quality report and forecast. It is one of the popular and widely used public services in Macao.

- Local weather forecast and warnings as well as weather forecast for major cities in China were provided to new TV broadcast company, the MASTV (Macao Asian Satellite Television Company). The broadcast of MASTV cover China and most of the countries of South East Asia.

- To enhance capability of safety management of heavy rainstorm especially to school students. Rainstorm exercise was performed with cooperation with the Education and Youth Affairs Bureau.

- A joint exercise on tsunami was performed on May 17, together with PTWC, JMA and National Ocean Bureau of China. In addition, with effective from early August, PTWC and JMA has started sending through e-mail messages on tsunami alarms and SMG also started the study of using SMS messages to disseminate the alarms to related departments and personnel in charge.

- To arouse the public regarding the importance and the influence of severe weather and climate change as well as promote knowledge and understanding of general science on meteorology and geophysics, a program on “Interactive Talk” was provided by our colleagues to the local high schools students from March 13 to 31. Topics of the talk included “Preventing and mitigating Typhoon disasters”, “Climate Change”, “Earthquake and its Influence”, “Knowing Rainstorm and its impact”, “Air Pollution and Health” and “Horizontal Eye-safe Mie LIDAR for Monitoring of Urban Aerosols in Macao”. The program obtained positive participation from many schools and the effect was desirable and fruitful. Totally 28 lectures were delivered and with over 5200 students attended.

- New Airport Thunderstorm Warning with increase element of forecasting was started from July 10, 2006 to provide the airport entities in making better planning.

- New Airport Meteorological Office homepage was launched on March 15 2006 to provide aeronautical meteorological information to internal operators of Macao International Airport.

- The “11th Guangdong-Hong Kong-Macao Meteorological Operational Cooperation meeting” and the “20th Guangdong-Hong Kong-Macao Seminar on Meteorological Science and Technology” was held in Macao from January 18 to 20. During the cooperation meeting, meteorological data and information exchange and sharing as well as severe weather forecast and briefing etc. were discussed. While in the seminar, 30 experts from the three agencies sharing and exchanging, through presentation and discussion, the experiences and research study. The presentation included topics on Severe Weather, Forecast Technique with new Technology, Observation and Database capacity building.

- The "2nd Guangdong, Hong Kong and Macao Seminar on Earthquake Science and technology " was held in Macao from March 1 to 2. The seminar brought together 39 officials and experts from the three places sharing and exchanging experiences and research study on the topic of earthquake and its influence. During the seminar, 17 papers were presented by the three parties, which included topics on the forecast, prevention, application and development of earthquake, Earthquake Engineering and tsunami.

- “Workshop on Integrating Activities of the Hydrology, Meteorology and DPP components of the Typhoon Committee into the Related International Frameworks for Disaster Risk Management for Better Impacts and Visibility” was held in Macao, China from 4 to 9 September 2006. The Workshop was attended by 65 participants from 13 out of 14 Members of the Typhoon Committee, namely: Cambodia; China;

Democratic Peoples Republic of Korea; Hong Kong, China; Japan; Lao People's Democratic Republic; Macao, China; Malaysia; Philippines; Republic of Korea; Thailand; the Socialist Republic of Viet Nam; and the United States of America (USA). The Workshop was also attended by representatives from the Economic and Social Commission for Asia and the Pacific (ESCAP), the World Meteorological Organization (WMO) and Typhoon Committee Secretariat (TCS).

Malaysia

For the period 1st October 2005 to 31st October 2006, 5 of the tropical cyclones that moved into the South China Sea had some indirect impact on the weather in Malaysia. The passage of Typhoon Chanchu through the South China Sea from 12-16 May 2006 enhanced the afternoon convection over Malaysia through its tail effects while Tropical Strom Jelawat resulted in floods over the western part of Sabah on 26 June 2006. For the period from late July to early November, the presence of a positive Indian Ocean Dipole in the Indian Ocean and the development of a weak El Nino in the Central Pacific led to drier than normal conditions over the Malaysia-Indonesia region. The passage of Typhoon Prapiroon (31 July-5 August 2006), Typhoon Xangsane (26 September–2 October 2006) and Typhoon Cimaron (27-31 October 2006) enhanced the transport of transboundary haze into the Malaysia region from neighbouring country.

The facilities for weather forecasting continued to be improved. In 2005 and 2006, the Malaysian Meteorological Department took further steps in implementing the infrastructure to support the needs of its operational numerical weather prediction system. The operational runs of the MM5 model now consist of twice daily runs at 36 km and 12 km resolutions for the South-east Asia and Malaysia domain respectively. A MM5 3D-VAR scheme has been put into operations since March 2006. Implementation of new facilities for reception of the polar orbiting meteorological satellites (NOAA Series, FY-1D, MODIS TERRA and AQUA) and geostationary meteorological satellites (MTSAT and FY 2C) were also carried out in 2005 and 2006. The National Tsunami Early Warning System has also been put into operations with some of the observational platforms (buoys, tide guages and coastal cameras) and information dissemination components being configured towards a multi-hazard early warning system configuration.

Singapore

Singapore reported that there was no direct impact of any tropical cyclones in the year 2006. However, there were indirect impacts due to strengthening of southwesterly winds in the near-equatorial region of the South China Sea as a result of tropical cyclones passage across the South China Sea. The wind strengthening in late September and October 2006 aggravated the trans-boundary transport of smoke haze to Singapore on some days.

As part of the capacity building effort in the use of Numerical Climate Models, Singapore had participated, together with other ASEAN meteorologists in a one-month work visit to the International Research Institute for Climate and Society (IRI). The visit was organised and sponsored by the National Oceanic and Atmospheric Administration (NOAA), USA. Evaluation on the usability of climate variation prediction was carried out for the ASEAN region and statistics for seasonal prediction were also developed. Initial prediction results were promising, particularly for the months of June, July and August.

As part of the programme, a regional workshop on Seasonal Climate Prediction will be held in Singapore in 2007 for scientists in the ASEAN countries. The work visit participants would then be able to share their implementation experiences with others in the ASEAN countries.

The development of Singapore's national Tsunami Early Warning System (TEWS) was one of the high priority projects in the year 2006. The objective was to enable Singapore to better assess potential impacts of tsunamis on the country, enhance its national preparedness and contribute to regional and international efforts to monitor and mitigate potential disasters.

The development includes upgrading of software and hardware to enable real time exchange of data with countries in the region including tide data from the new tidal guage network. The Meteorological Service Division, National Environment Agency (MSD-NEA) is also collaborating with local educational institutions to develop tsunami modelling capabilities, targeted to be completed by August 2008. The establishment of TEWS has also enhanced the overall preparedness of Singapore for natural disasters through organization change and tighter operational cooperations between various agencies in Singapore.

The development has resulted in some organization change. MSD-NEA has now a "Specialized Services" section whose staff are on development tasks normally and can be deployed to support the surge of operational duties when needed.

Thailand

1. Progress in Member's Regional Cooperation and Selected RCPIP Goals and Objectives:

a. Hardware and Software Progress

+ Bangkok – Singapore GTS circuit has been upgraded from X.25, speed 2,400 bps to TCP/IP Frame Relay, speed 16 Kbps (CIR).

+ Bangkok – Phnom Penh GTS circuit will be established within the end of December 2006.

+ Bangkok – New Delhi GTS circuit will be upgraded very soon to support the Tsunami Warning System in the Indian Ocean.

+ A numerical weather model for storm surges forecasts has been developed from one provided by Mr. Masakazu Higaki (Japan Meteorological Agency, Japan) and Prof. Shishir K. Dube (The Indian Institute of Technology, Kharagpur, India). The equations in the developed model have been modified in order to get it suitable to the coastal lines of Thailand. The data of sea surface level are used to check the accuracy of such model too.

b. Implications to Operational Progress

Nil

c. Interaction with users, other Members, and/or other components

+ TMD's website development : The TMD's website under a new design which is easier for the public members to access is expected to be available by December 2006.

+ The TMD has applied the weather forecasts from other forecasting centers in its own weather forecasts, in both medium and long ranges.

d. Training Progress

During 1 October 2005 – 30 September 2006, 5 meteorologists of the TMD had joined overseas training.

Table 1 : **The overseas training courses which the staffs of the TMD had joined**

No.	Course Title (s)	Duration	Country	No. of participant(s)
1.	Training Seminar on Tsunami Early Warning System	22 Jan. – 11 Feb. 2006	Japan	1
2.	Training on Basic Numerical Weather Prediction	24 – 29 Apr. 2006	India	2
3.	Training programe on Seismic data acquisition system "Seiscom P"	27 – 29 Mar. 2006	Indonesia	1
4.	Training under Master Program on Space Technology and Application	July 2006 – Mar.2007	China	1

e. Research Progress

Nil

2. Progress in Member's Important, High-Priority Goals and Objectives

(towards the goals and objectives of the Typhoon Committee).

a. Hardware and Software Progress

+ A new C-band Doppler Radar had been installed at Khao Khiew in order to enhance the capacity in monitoring the changes of rainy areas in the lower part of Northeastern Thailand.
+ All observation stations in Thailand have been installed with either 512K ADSL (in urban areas) or 256K Ipstar (at remote sites). In addition, 4 regional forecasting centers have been utilized with the safer VRN circuits. The Internet can be used to easily via ISP whilst the TMD's Intranet must be connected and registered through the VPN server at the TMD's headquarters.

b. Implications to Operational Progress

The progress on installation of equipment which had conducted under the aeronautical meteorological project at the Suvarnabhumi Airport (the new international airport of Thailand) are :

- Low Level Windshear Alert System : LLWAS
- Lightning Detection System : LDS
- World Area Forecast System : WAFS (both SADIS and ISCS systems)
- Weather Data Integration System
- Opmet Data Bank
- MTSAT and NOAA Satellite Receiving System

c. Interaction with users, other Members, and/or other components

The Meteorological Department has provided its cooperation to other governmental units of which responsibility is natural disaster prevention and mitigation under the "Mr. Warning" Project. The goal of this project is to educate the local staffs about natural disasters and concerning preventive measures.

d. Training Progress

Since 1 October 2005 till 30 September 2006, the TMD has provided training courses to its staffs on the regularly basis with the hope to be able to enhance their potentials in order to prepare them to cope with the advanced technology and concerned recent academic development. The courses had been available are shown in Table 2 :

Table 2 : The list of the local training course provided by the TMD for its staffs

No.	Course Title	Duration	No. of Participants
1.	Training Course on Basic Meteorology	7 Nov. 2005 – 30 Sep. 2006	40
2.	Training Course on Advanced Meteorology class 15	1 May 2005 – Sep. 2006	20
3.	Training Course on Capacity Enhancement in Proactive Operation in Earthquake monitoring	2-3 Feb. 2006	21
4.	Training Course on Guidelines for Microsoft Access XP	6-10 Feb. 2006	30
5.	Training Course on Weather Radar and Satellite Meteorology Data Analysis at Northern Meteorological Center	11-14 Mar. 2006	23
6.	Training Course on Weather Forecast Techniques	20-21 Mar. 2006	50
7.	Training Course on Weather Radar and Satellite Meteorology Data Analysis at Northeastern Meteorological Center	6-9 May 2006	36
8.	Training Course on Weather Radar and Satellite Meteorology Data Analysis at Southern West Coast Meteorological Center	3-7 June 2006	27
9.	Training Course on Meteorology for Transportation at Chiengmai province	1-3 July 2006	34
10.	Training Course on The International Postgraduate Training Course on Agrometeorology	17-28 July 2006	60
11.	Training Course on Weather Radar and Satellite Meteorology Data Analysis at Rayong province	8-11 July 2006	29
12.	Training Course on Marine Meteorology	5-6 Sep. 2006	27
13.	Training Course on Capacity Enhancement in Earthquake monitoring	6-8 Sep. 2006	26

e. Research Progress

To support disasters warning activities, and to be the centre of meteorological knowledge in Thailand, a number of researches have been done by the TMD's meteorologists as listed below:

- The implication of SST in Development of Tropical Cyclone using TRMM.
- Rainfall Intensity-Duration-Frequency Relationship in Southern Region of Thailand.
- Analysis of the Relation between the Atmospheric Stability and Hail Occurrence.
- Prediction of Droughts in Thailand Using SPI Model.
- Daily Minimum Temperature Forecast in the Upper Part of Northeastern Thailand.
- Correlation between the Northeast Monsoon and Rainfalls along the Eastern Coast of Southern Thailand.
- Rainfall Forecast in Thailand based on the Monsoon Indices Using Time Series Analysis.
- A Study of Daily Rainfalls in Upper Thailand during the Southwest Monsoon Period using Wave Analysis.
- Precipitation Patterns for Aviation activities in the lower Part of Southern Thailand using Radar Data.
- Correlation between Run-up of Tsunami and Coastal Characteristics.
- Analysis of the Cause of Earthquake and Tsunami on 26 December 2004

f. Other Cooperative/RCPIP Progress

Nil

United States of America

Tropical Cyclone Wind Damage. First responders sent to assess the winds associated with Super-Cyclone Larry that hit the coast of Queensland, Australia in March 2006 requested a copy of the Tropical Cyclone Scale developed by the WFO Guam Warning Coordination Meteorologist (WCM) and the University of Guam's Dr. Mark Lander. This Scale is the official scale used in the western North Pacific and in much of the Southwest Pacific. The WCM transferred the Scale and an associated User's Manual to the requestor.

World Meteorological Organization (WMO) 5th Tropical Cyclone Regional Specialized Meteorological Centers (RSMCs)/Tropical Cyclone Warning Centers (TCWCs) Technical Coordination Conference. The 5th Tropical Cyclone RSMCs/TCWCs Technical Coordination Conference was hosted by RSMC Honolulu/WFO Honolulu from 5-8 December 2005. The Opening Ceremony featured Mayor Mufi Hannamann of the City and County of Honolulu and Max Mayfield, Director, RSMC Miami. The meeting focused on coordination and standardization among tropical cyclone warning centers. They discussed web sites, wind averaging periods, relationship with the international media, training, research, and developed a set of recommendations for the International Workshop on Tropical Cyclones – VI which will be held in Costa Rica in November 2006. There was good media coverage of the opening event and it appeared in both statewide newspapers and on the 4 local television channels.

International Pacific Desk Training Internship. Since the beginning of the WMO Regional Association (RA) V Pacific Desk Internship program in 2001 hosted by RSMC Honolulu, the Pacific Desk has trained 32 students from 14 different countries in the south Pacific and

Southeast Asia. In 2006, 6 students from Kiribati, Papua New Guinea, Philippines, Solomon Islands, Vanuatu, and Vietnam.

Viet Nam

Observation network

- Put into operation 2 agro-meteorological stations.
- Successfully installed 3 automatic air-environment stations at Son La, Vinh and Can Tho provinces.
- Add 12 UTC upper-air observation of Ho Chi Minh (48900) station since 1 November 2006.

Technical advancement

- DVORAK technique is adopted to estimate the intensity of tropical cyclones in operational forecasting.

Data exchange

- Participated in the UCAR's IDD network as a peer host to receive the data feed from UCAR and act as a bridging hub for data transfer on request.

- The website of National Center for Hydro-Meteorological Forecasting at www.nchmf.gov.vn has been updated with new feature for tropical cyclone warnings (the picture below shows an example of the typhoon warnings)

Numerical Weather Prediction

- The High Resolution Model (HRM) is operationally running with the increased horizontal resolution of 14km x 14km with the initial and boundary conditions interpolated from the DWD's global model GME.

- The storm surge model adopted from Japanese version has been used semi-operationally when a typhoon is predicted to affect our region. The input data are taken from either the forecast fields from Japanese GSM model, HRM outputs or the predicted tracks.

- The barotropic model WBAR for tropical cyclone track forecasts is put on operational in the case of approaching typhoons. The input data are calculated from the GSM outputs with the options to use different atmospheric layers.

	Mean (km)		**Standard Deviation (km)**	
	24h	48h	24h	48h
DPE	92	172	61	128
AT	-41	-27	71	109
CT	-10	-54	73	173
No.Cases	72	35		

Training

- 7 staffs from NHMS attended several international and regional workshops and trainings.
- 1 staff attended the Research Fellowship with Typhoon Research Team at METRI, KMA from 1 June to 29 August 2006.
- Organized a Roving seminar from 4-7 Sep. 2006 in Hanoi. 70 participants (7 overseas and the rest come from regional and provincial forecasting offices of Viet Nam). Right after the roving seminar, there was a 1-week training on the Dvorak technique for domestic forecasters.

Research Progress

- Researches on the use of initial and boundary conditions for HRM model from GSM (Japan) and GFS (US) instead of GME are being carried out.

- Experimental research on heavy rainfall forecasting in Viet Nam by MM5.

Operational Progress

- Working on interactive software to create weather maps has been done operationally and sent to regional forecasting offices since August 2005.

- Special arrangements are made with the national television channels to improve the weather programs. Forecasted parameters and fields are automatically sent to the TV by a reserved server. In the case of extreme weathers such as tropical cyclone, additional briefings are provided to the TV weather interpreters so that the weather situations can be better explained to the public. As a result, the weather forecasts as well as tropical cyclone warnings have become more popular and understandable to the people.

- A link has been established from NCHMF to the office of Emergency Rescues for a quick dissemination of information (satellite images, observations, weather bulletins and TC warnings)

Research Progress

- Experimental use MM5 for weather prediction with the input data from GFS outputs (at Hydro-Meteorological Institute)

- Study the capability of MM5 for forecasting tropical cyclone tracks with the use of a asymmetrical 3D bogus scheme (at Hydro-Meteorological Institute)

WMO

General component

The main activities in 2006 under the general component continued to be directed towards the publication of manuals and reports, which provide information and guidance to Members to assist them in the increased application of scientific knowledge and technology for the improvement of warning and disaster prevention and preparedness systems. Under this component, attention was also given to the broader aspects of training under the TCP.

Regional component

Many activities were carried out under the regional component with a view to minimizing tropical cyclone disasters through close regional cooperation and coordination. Major emphasis was placed on improvement in the accuracy of the forecasts, provision of timely early warnings and on the establishment of necessary disaster preparedness measures. Each of the tropical cyclone bodies has in place a formally adopted tropical cyclone operational plan or manual, aimed at ensuring the most effective tropical cyclone forecasting and warning system with existing facilities, through cooperative agreement on sharing of responsibilities and on coordinated activities within the respective region. Each of these bodies was giving attention to the implementation of their technical plan for future development of services to meet regional needs for upgrading forecasting and warning facilities and services for tropical cyclones and associated floods and storm surges, as well as for related disaster prevention and preparedness measures and supporting activities in training and research.

APPENDIX V

REPORT OF PARALLEL SESSION OF THE WORKING GROUP ON METEOROLOGY (WGM)

Draft at 17:45 on 5 December 2006

1. The meeting of the WGM was convened by Mr Wang Bangzhong (China) at 1045, December 4, 2006 in Manila Hotel, Manila, Philippine. The meeting was attended by 25 participants from the Members of the Committee as well as WMO and UNESCAP.

2. The Agenda for the meeting of WGM included Review of the Activities (highlight the achievements), Recommendation for the Coming Year, Possibility for Raising funds, Strategic Plan, Annual Operating Plan and Budget as well as Election for WGM.

3. As warm-up process, the Chair of WGM provided a briefing on the report of WGM, which will be submitted to the Plenary Session. The WGM report covers the introduction about WGM's mandate from the 38th session, review of activities in past year and further actions for the next year as well as the outcome from the Workshop on Integrating Activities of the Hydrology, Meteorology and DPP components of the Typhoon Committee into the Related International Frameworks for Disaster Risk Management for Better Impacts and Visibility which was held in Macao, China from 4 to 9 September 2006.

4. The Chair of WGM also provided the information about the Strategic Plan and Annual Operating Plan with an aim to initiate the process to discuss the related documents. During the session, the continuing discussion results in the revision and addition for document on the Strategic Plan and Annual Operating Plan.

5. The meeting of WGM noted that WGM/RSMC initiated consideration of TD naming, that is, RSMC to explore options in naming/labelling of TD: (1) use names from existing names; (2) label by number or alphabets; (3) separate name list for book-keeping and referencing purpose to be assigned after the TD has dissipated; (4) no change, based on the discussion at the Workshop in Macao, China.

6. The meeting of WGM also noted that the initial assessment of Tropical Cyclone Forecasting Guidance Requirement. Only several TC members had no NWP capability to run limited area models, and to make all members NWP-ready should be a long term goal rather than a priority. More immediate needs are integration, interpretation and validation of NWP-generated information for operational warnings. Model data from different centres now available via different sources, and RSMC Tokyo has also provided such information for consensus forecast.

7. Regarding the outcome from the Workshop held in Macao, China last September, the participants in the meeting was interested in the three project-concepts, which include the "Improvement of Information Processing System among the Member", and "Improvement of Precipitation Forecasting related to Interaction between Monsoon and Tropical Cyclone" and "GTS and DVBS Data Sharing". The participants in the meeting raised constructive ideas for further work. These projects may be implemented by using pilot approach. The Working Group on Meteorology recommended the plenary session to accept these project concepts.

8. The meeting of WGM took note of the primary assessment of the current status of GTS and communication system in the Typhoon Committee region, based on the Member's report. The results are that there are 18 GTS circuits planned among the Member centres of Typhoon Committee. Currently, 17 of the planned 18 circuits are in operation, and about 70 percent are operating on pure TCP/IP. Problems are that NMC Phnom Penh be isolated

from the GTS, and that 4 circuits be still running on X.25 or ASYNC protocol. There are a necessity for a further investigation on the matter, especially on the GTS and communication system in the Cambodia, DPR of Korea and Lao PDR with a view to seeking the support for these Members by implementing GTS and DVBS Data Sharing Project.

9. The meeting agreed that the project, namely, "Improvement of Precipitation Forecasting related to Interaction between Monsoon and Tropical Cyclone", will cover the whole impacted region.

10. The meeting was reminded there will be a workshop, namely, "Inter-comparison of Typhoon Monitoring, Forecasting and Information System in the Typhoon Committee Region" , including discussion on Ensemble Prediction Systems (EPS) in conjunction with TRCG regional workshop/roving seminars in 2007, with an aim to exchange good practice among Members and improve the Members' typhoon forecaster platforms. The workshop will include all members, with or without such systems, to exchange experience, generate new ideas, and identify essential key features, which will make the contribution to the "Improvement of Information Processing System among the Member" project.

11. The meeting discussed the new standards or categories for tropical cyclones, taking into account the requirement from the emergency and disaster management. This activity is meaningful but must take some time to be implemented in detail with a common format among the Members, considering the different time-scale in averaging wind speeds. It is noted that there is necessity for WGDPP to take part in this activity.

12. The participants in the meeting made the effort to seek the raising fund to support the activities of WGM.

13. The Members of the working group re-elected Mr Wang Bangzhong (China) as Chair and Ms Duong Lien Chau (Viet Nam) as vice-chair, respectively.

Conclusion:

14. On the basis of the information provided by Members and finds of the Working Group Session on Meteorology, the following conclusions were reached:

> The Committee expressed its appreciation to the Chair of WGM, Mr Wang Bangzhong (China), and Vice Chair of WGM, Ms Duong Lien Chau (Viet Nam), for their contribution during the past year.
>
> The Committee took note of important progress made in the implementation of the RCPIP under Meteorology by Members.
>
> The Committee noted with satisfaction that WGM/RSMC initiated the process for consideration TD naming, that is, RSMC to explore options in naming/labelling of TD: (1) use names from existing names; (2) label by number or alphabets; (3) separate name list for book-keeping and referencing purpose to be assigned after the TD has dissipated; (4) no change, based on the discussion of the Workshop in Macao, China in September 2006.
>
> The Committee noted that WGM began to consider classification of typhoons taking into account its significance for disaster management.
>
> The Committee also noted that the outcomes from the "Third International Conference on Early Warning" (Bonn, Germany, 27-29 March 2006), the "Workshop on Integrating Activities of the Hydrology, Meteorology and DPP components of the Typhoon Committee into the Related International Frameworks for Disaster Risk

Management for Better Impacts and Visibility" (Macao, China, 4-8 September 2006) and the "Sixth International Workshop on Tropical Cyclones" (San Jose, Costa Rica, 20-30 November 2006) were considered by WGM for revision and addition of its Strategic Plan and Annual Operating Plan.

The Committee felt concern that if the migration of TACs to TDCFs is implemented as scheduled by WMO, some Members would be in trouble in typhoon analysis because of delay in their adaptation to the migration.

The Committee took note of the primary assessment of the current status of GTS and communication system in the Typhoon Committee region, based on the Members' report. The problems are that NMC Phnom Penh is isolated from the GTS and that 4 circuits are still running on X.25 or ASYNC protocol.

The Committee was satisfied with the three project-concepts of the WGM, which include the "Improvement of Information Processing Systems of Members", "Improvement of Precipitation Forecasting Related to Interaction between Monsoon and Tropical Cyclone" and "GTS and DVBS Data Sharing".

Recomendation:

15. On the basis of the information provided by Members and the findings of the WGM pre-session, the following decisions were reached:

To approve three project-concepts submitted by the WGM, namely, "Improvement of Information Processing System among Members", "Improvement of Precipitation Forecasting related to Interaction between Monsoon and Tropical Cyclone" and "GTS and DVBS Data Sharing", considering that these projects may be implemented by using pilot approach.

To continue the process to address the issues of naming tropical depressions and to request WGM to give further consideration to the necessity of classification of typhoons with a view to reviewing these work at the future sessions. In this regard, collaboration with WGDPP is considered necessary.

To initiate the assessment process on the change of frequency and intensity of tropical cyclone in order to provide the latest information on this matter for the policymaker and the public

To further assess the requirement on the GTS and communication system in the Cambodia, DPR of Korea and Lao PDR with an aim to seek the support for these Members by implementing GTS and DVBS Data Sharing Project and others

To encourage the participation of Committee Members at the ASIA/THORPEX, especially on the issues of EPS/NWP and enhanced observation, and to join the Asian THORPEX Regional Committee (ARC).

To reconfirm to organize a workshop, namely, "Inter-comparison of Typhoon Monitoring, Forecasting and Information System in the Typhoon Committee Region" in 2007, with an aim to exchange good practice among Members and improve the Members' typhoon forecaster platforms. The workshop will include all members, with or without such systems, to exchange experience, generate new ideas, and identify essential key features

To request from TCS to the WMO/CBS expert team concerned by the end of December 2006 to extend the deadlines for the migration of SAREP and SATOB, while TCS conducts a survey of the current progress of each Member for the migration and their possible time to be prepared. Results of the survey should be sent to the expert team by the end of February 2007.

To request WMO to publish as early as possible the 2007 edition of the Typhoon Committee Operation Manual (TOM) as submitted by the Rapporteur, Mr. Nobutaka Mannoji (Japan) with the amendments given in Appendix ##.

To request Members to report on the status of implementation of the TOM performance measures, and the Rapporteur to submit the report to the next session of the Committee, considering that some of the performance measures described in TOM have not been reviewed in recent years.

To request WMO to upload the updated TOM on the TCP Website and distribute the 2007 edition in CD ROM format to Members by March 2007.

To request Japan to continue the services of Mr. Mannoji as TOM Rapporteur.

To replace the TC names - Matsa, Nabi and Longwang by Pakhar, Doksuri and Haikui, respectively.

To request the relevant Members to propose new TC names before at least two months before the 40th session with their meaning and pronunciation for consideration of the replacement of Chanchu, Bilis, Saomai, Xangsane and Durian at the session.

To appoint Mr Wang Bangzhong (China) as Chair and Ms Duong Lien Chau (Viet Nam) as Vice-chair, respectively.

APPENDIX VI

ACTIVITIES OF THE RSMC TOKYO - TYPHOON CENTER IN 2006

1. Provision of RSMC Products

The RSMC Tokyo-Typhoon Center (hereafter referred to as the "Center") has been providing the Typhoon Committee (TC) Members with various kinds of products on tropical cyclones in the western North Pacific and the South China Sea through the GTS and the AFTN. Table 1 shows the total numbers of the products issued by the Center in 2006 (as of 31 October).

2. Track Forecast

Operational track forecasts for 19 tropical cyclones which attained TS intensity or higher in 2006 (as of 6 November) were verified against analysis data* of the Center. Figure 1 shows annual mean errors of 24-hour (from 1982), 48-hour (from 1988) and 72-hour (from 1997) forecasts of center positions. The annual mean position errors for this year are approximately 107km (101km in 2005) for 24-hour forecast, 201km (176km) for 48-hour forecast and 291km (266km) for 72-hour forecast. The annual mean position errors for 24-, 48- and 72-hour forecast in 2006 are the second smallest next to 2005 since the forecasts started operationally. The annual mean ratios of position errors of operational forecasts (EO) to position errors of PER-method forecasts (EP) are 52% (53% in 2005) for 24-hour forecast, 43% (39%) for 48-hour forecast and 37% (37%) for 72-hour forecast, almost the same as that in 2005. Position error statistics of 24-, 48- and 72-hour forecasts for the tropical cyclones are shown in Table 2.

*Analysis data means post-analysis data of 14 cyclones from CHANCHU (0601) to YAGI (0614) and operational analysis data of 5 cyclones from XANGSANE (0615) to CIMARON (0619).

3. Intensity Forecast

Table 3 gives Root Mean Square Errors (RMSEs) of 24-, 48- and 72-hour intensity forecasts for the tropical cyclones in 2006 (as of 6 November). The annual mean RMSEs of central pressure forecasts were 12.7hPa (12.8hPa in 2005), 16.7hPa (17.0hPa) and 18.9hPa (19.0 hPa) for 24-, 48- and 72-hour, respectively, while those of maximum wind speed forecasts for 24-, 48- and 72-hour were 5.6m/s (5.7m/s in 2005), 7.4m/s (7.7m/s) and 8.4m/s (10.0m/s), respectively. The overall performance of intensity forecasts in 2006 was better than that in 2005.

4. RSMC Data Serving System

The Center operates the RSMC Data Serving System (RSMC-DSS) to provide the TC Members with NWP products such as GPVs and observational data through the Internet. RSMC-DSS is used by nine TC members as of 31 October. The products and data being provided through the system are listed in Table 4.

5. JMA Numerical Typhoon Prediction (NTP) Website

The Center has officially operated the Numerical Typhoon Prediction (NTP) Website in cooperation with seven NWP centers: BoM (Australia), MSC (Canada), DWD (Germany), ECMWF, KMA (Republic of Korea), NCEP (USA), UKMO (UK) since October 2004. The NTP Website offers predictions of tropical cyclone tracks derived by models of major NWP centers in order to assist the NMHSs of the TC Members in their tropical cyclone forecasting and warning services. The NTP website is available only to registered organizations including the

NMHSs of the TC Members and the participating NWP centers. Eleven TC Members except Japan have accessed the NTP Website as of 14 November. The contents of the NTP Website include the following:

1) Prediction of tropical cyclone track, in table and chart form, of the participating NWP centers together with the prediction of JMA. Ensemble mean prediction of any combination of the products is also available.

2) NWP model products, in chart format, of the participating NWP centers.

6. Migration of SAREP and RADOB to BUFR

The World Meteorological Organization (WMO) is facilitating code migration from Traditional Alphanumeric codes (TACs) to Table Driven Code Forms (TDCFs) based on the migration plan which was approved by the extraordinary session (2002) of the Commission for Basic Systems (Cairns, 2002) and the 14th World Meteorological Congress (Geneva, 2003). In accordance with the migration plan which calls for migration of SAREP (Category 2) and RADOB (Category 4) by 2006 and 2008, respectively, the TC Members concerned are urged to take necessary actions according to their national migration plans. The Center started disseminating SAREP in BUFR format in addition to the existing SAREP in TACs in November 2005, and then issued first RADOB in BUFR format together with the existing RADOB in TACs in September 2006.

7. Expanded Best Track Data Set for the Western North Pacific and the South China Sea

At the thirty-sixth session of the Typhoon Committee (Kuala Lumpur, 2003), a plan to produce an "Expanded Best Track Data Set for the Western North Pacific and the South China Sea" (hereafter EBT) was approved. In the plan, the TC Members were requested to send observational data and disaster-related data from 1999 to 2003, and the Center was requested to put the data into EBT after basic screening by 2004 as the first step. As of 31 October, ten TC Members have provided the data to the Center. Considering that EBT would contribute to the disaster preparedness of each TC Member, the Members which have not provided the data are requested to do so as soon as possible. In the process of basic screening of data submitted by the TC Members, the Center has been facing a problem in dealing with maximum sustained wind data in EBT. Although the TC Members use different averaging time in calculating sustained wind data, e.g. 1 minute by USA, 2 minutes by China and 10 minutes by Japan, 10-minute averaged data is available in the present format which is shown in the summary report of the Working Group on a Unified North-West Pacific Tropical Cyclone Best Track Data Set (Appendix XV) approved by the thirty-sixth session of the Typhoon Committee. In this regards, the Center will propose to the EBT contact persons by the end of this year that an option for averaging time of sustained wind data be added to the format as follows:

- ***Present format***

  44444 7701 10-minute maximum sustained surface wind speed (kt)
  HK 57 160 47662 357 1397 197703280940
  This is the format for a 10-minute maximum sustained surface wind speed (kt). The first line is the header for additional data and is followed by data line(s). The data line consists of country code, 10-minute maximum sustained surface wind speed (kt), its direction (deg), station code, latitude and longitude of the station, date and time (YYYYMMDDhhmm, UTC) in order

- ***Updated format***

  44444 7701 **Maximum sustained surface wind speed** (kt)
  HK 57 160 **10** 47662 357 1397 197703280940
  This is the format for maximum sustained surface wind speed (kt). The first line is the header for additional data and is followed by data line(s). The data line include country code, maximum sustained surface wind speed (kt), its direction (deg), **averaging time of sustained wind (min)**, station code, latitude and longitude of the station, date and time (YYYYMMDDhhmm, UTC), in this order.

8. Publication

The Center published "Annual Report on Activities of the RSMC Tokyo-Typhoon Center in 2005" in October 2006. It is also available at the website of the Center (http://www.jma.go.jp/jma/jma-eng/jma-center/rsmc-hp-pub-eg/RSMC_HP.htm).

9. Training

Two forecasters from Laos and Vietnam visited at the Center from 19 to 28 July 2006 to participate in the on-the-job training for typhoon operations. The training was carried out with the support of WMO in response to the proposal presented at the thirty-third session of the Typhoon Committee. During the two weeks training, the two forecasters experienced the operational procedure of the Center in analysis and forecast of tropical cyclones including KAEMI (0605).

10. Implementation Plan

Table 5 shows the implementation plan of the Center for the period from 2006 to 2010.

Table 1 Monthly and annual total numbers of products issued by the RSMC Tokyo - Typhoon Center in 2006 (As of 31 October)

Product	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
TCNA20	0	0	7	0	39	13	102	141	128	86			**516**
TCNA21	0	0	0	0	38	8	93	130	114	72			**455**
IUCC30	0	0	7	0	77	21	195	271	242	158			**971**
WTPQ20-25	0	0	14	0	79	29	207	283	258	174			**1044**
WTPQ30-35	0	0	4	0	19	6	51	70	65	42			**257**
FXPQ20-25	0	0	10	0	58	20	152	196	192	127			**755**
FKPQ30-35	0	0	7	0	39	14	102	139	127	85			**513**
AXPQ20	0	0	0	0	0	0	0	6	0	3			**9**

Notes:
Names of the products and their headers via the GTS or the AFTN

SAREP	(TACs)	TCNA20/21 RJTD
	(BUFR format)	IUCC30 RJTD
RSMC Tropical Cyclone Advisory		WTPQ20-25 RJTD
RSMC Prognostic Reasoning		WTPQ30-35 RJTD
RSMC Guidance for Forecast		FXPQ20-25 RJTD
Tropical Cyclone Advisory for SIGMET		FKPQ30-35 RJTD
RSMC Tropical Cyclone Best Track		AXPQ20 RJTD

Table 2 Mean position errors of 24-, 48- and 72-hour track forecasts in 2006
(As of 6 November)

Tropical Cyclone			24-hour Forecast				48-hour Forecast				72-hour Forecast			
			Mean (km)	S.D. (km)	Num.	EO/EP (%)	Mean (km)	S.D. (km)	Num.	EO/EP (%)	Mean (km)	S.D. (km)	Num.	EO/EP (%)
TY	CHANCHU	(0601)	90	68	34	49	181	105	30	43	225	103	26	31
TS	JELAWAT	(0602)	56	21	2	-	-	-	0	-	-	-	0	-
TY	EWINIAR	(0603)	93	58	35	61	149	92	31	42	183	106	27	34
STS	BILIS	(0604)	100	66	20	48	178	83	16	51	246	138	12	38
TY	KAEMI	(0605)	120	37	22	69	199	53	18	58	222	72	14	46
TY	PRAPIROON	(0606)	121	38	11	81	234	38	7	76	343	32	3	83
TY	MARIA	(0607)	155	92	14	71	477	109	10	73 1	105	214	6	94
TY	SAOMAI	(0608)	121	84	18	95	268	185	14	108	536	181	10	124
STS	BOPHA	(0609)	168	84	7	148	326	90	3	88	-	-	0	-
STS	WUKONG	(0610)	116	62	22	45	151	63	18	35	275	101	13	41
TS	SONAMU	(0611)	190	-	1	-	-	-	0	-	-	-	0	-
TY	IOKE	(0612)	86	49	38	42	194	159	34	43	344	361	30	47
TY	SHANSHAN	(0613)	77	36	28	42	153	65	24	28	152	80	20	17
TY	YAGI	(0614)	81	41	28	24	203	76	24	21	299	187	20	17
TY	XANGSANE	(0615)	64	41	19	44	126	65	15	36	180	81	11	31
TS	BEBINCA	(0616)	315	171	8	85	370	87	4	106	-	-	0	-
TS	RUMBIA	(0617)	103	41	7	43	95	71	3	143	-	-	0	-
TY	SOULIK	(0618)	117	41	23	38	201	143	19	29	261	162	15	25
TY	CIMARON	(0619)	119	66	35	79	242	79	31	73	348	154	27	60
Mean (Total)			107	73	372	52	201	124	301	43	291	238	234	37

Note:
S.D. means standard deviation of operational forecast errors.
Num. means numbers of forecasts
EO/EP indicates the ratio of EO (mean position error of operational forecasts) to EP (mean pos
forecasts by the persistency method)

Table 3 Root Mean Square Errors (RMSEs) of 24-, 48- and 72-hour intensity forecasts for tropical cyclones in 2006 (As of 6 November)

Tropical Cyclone			RMSE of 24-hour Forecast			RMSE of 48-hour Forecast			RMSE of 72-hour Forecast		
			Central pressure (hPa)	Maximum Winds (m/s)	Num.	Central pressure (hPa)	Maximum Winds (m/s)	Num.	Central pressure (hPa)	Maximum Winds (m/s)	Num.
TY	CHANCHU	(0601)	10.9	4.6	34	11.4	4.4	30	14.1	6.1	26
TS	JELAWAT	(0602)	4.0	4.1	2	-	-	0	-	-	0
TY	EWINIAR	(0603)	16.2	5.9	35	20.0	6.9	31	21.4	7.3	27
STS	BILIS	(0604)	3.1	2.9	20	4.0	3.5	16	6.3	7.2	12
TY	KAEMI	(0605)	14.9	5.9	22	15.0	7.6	18	12.0	7.3	14
TY	PRAPIROON	(0606)	12.8	6.4	11	13.5	7.2	7	18.5	10.5	3
TY	MARIA	(0607)	4.6	5.3	14	5.4	3.5	10	14.1	4.7	6
TY	SAOMAI	(0608)	14.7	9.2	18	20.9	12.3	14	30.4	15.2	10
STS	BOPHA	(0609)	7.1	2.9	7	19.9	12.4	3	-	-	0
STS	WUKONG	(0610)	4.6	2.0	22	9.3	3.2	18	16.1	6.8	13
TS	SONAMU	(0611)	2.0	2.6	1	-	-	0	-	-	0
TY	IOKE	(0612)	9.5	4.0	38	14.9	6.2	34	16.1	7.4	30
TY	SHANSHAN	(0613)	15.5	7.5	28	19.1	8.4	24	12.9	5.9	20
TY	YAGI	(0614)	13.9	5.4	28	22.5	9.6	24	27.1	10.7	20
TY	XANGSANE	(0615)	15.5	6.9	19	9.9	8.0	15	15.1	7.5	11
TS	BEBINCA	(0616)	4.7	2.4	8	12.0	6.2	4	-	-	0
TS	RUMBIA	(0617)	4.2	2.2	7	7.1	3.6	3	-	-	0
TY	SOULIK	(0618)	7.5	3.0	23	9.7	4.2	19	8.6	3.5	15
TY	CIMARON	(0619)	19.2	7.7	35	25.5	10.6	31	26.8	12.4	27
Mean (Total)			12.7	5.6	372	16.7	7.4	301	18.9	8.4	238

Note:
Num. means numbers of forecasts.

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

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

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

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

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

Products/ Data	Satellite data	Typhoon Information	Global Wave Model	Observational data
Contents	MTSAT-1R data (GRIB) • High density atmospheric motion vector (VIS, IR, WV)	Tropical cyclone related information (BUFR) •Position, etc.	• Significant wave height • Prevailing wave period • Prevailing wave direction (GRIB) Forecast hours: 0, 6, 12, 18, 24, 30, 36, 42, 48, 54, 60, 66, 72, 78, 84 (00 and 12 UTC); 96, 108, 120, 132, 144, 156, 168 ,180 and 192 hours (12 UTC)	(a) Surface data (SYNOP, SHIP) (b) Upper-air data (TEMP, parts A-D) (PILOT, parts A-D)
Frequency (initial times)	VIS: twice a day (00 and 06UTC) IR and WV: 4 times a day (00, 06, 12 and 18UTC)	4 times a day (00, 06, 12 and 18 UTC)	Twice a day (00 and 12 UTC)	(a) Mostly 4 times a day (b) Mostly 2 times a day

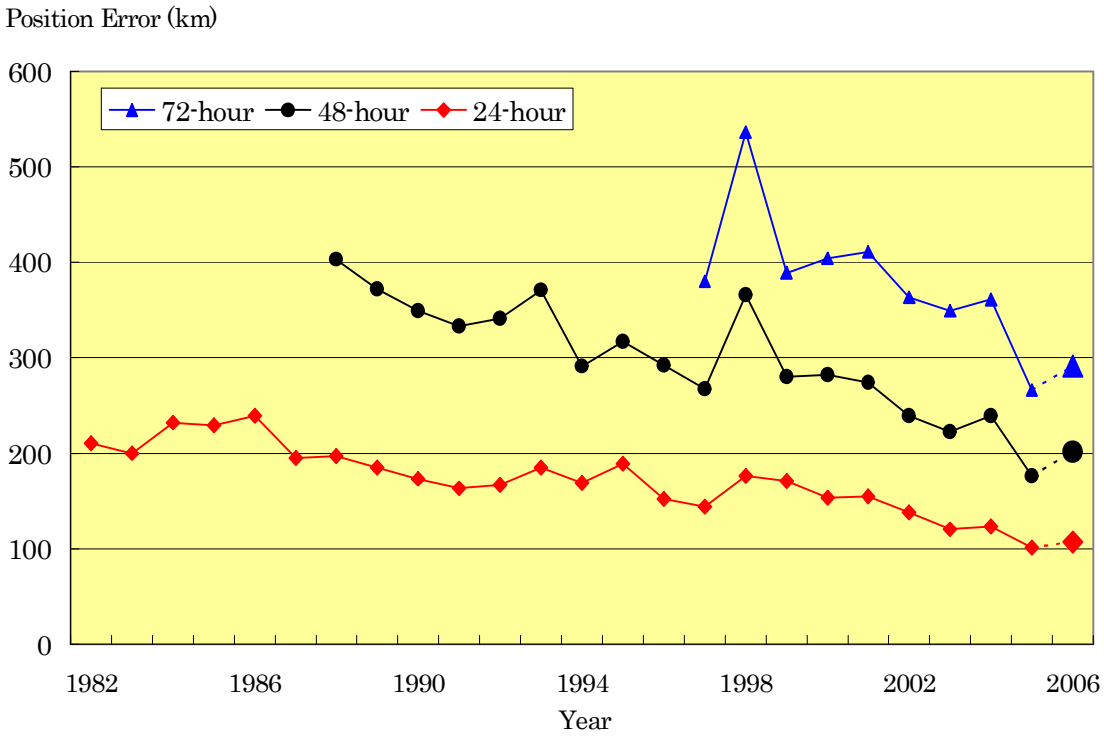
Table 5 Implementation Plan of the RSMC Tokyo-Typhoon Center (2006-2010)

PRODUCT	2006	2007	2008	2009	2010	REMARKS
Satellite Observation						
MTSAT HiRID						All observed cloud images (full or half-disk)
MTSAT HRIT						All observed cloud images (full or half-disk)
MTSAT WEFAX						8 times/day (4-sector), 24 times/day (Image H), 24 times/day (Image I or J)
MTSAT LRIT						24 times/day (full-disk) 24 times/day (polar-stereo East Asia)
Cloud motion wind (SATOB)						4 times/day
Cloud motion wind (BUFR)						4 times/day
Analysis						
RSMC Tropical Cyclone Advisory						8 times/day
SAREP (for tropical cyclones, TACs)						8 times/day Position of cloud sytem center, etc.
SAREP (for tropical cyclones, BUFR)						4 times/day Dvorak intensity
Sea Surface Temperature						
Objective analysis pressure pattern, etc						
Forecast						
RSMC Tropical Cyclone Advisory						4 times/day up to 72 hrs 8 times/day up to 24 hrs
RSMC Prognostic Reasoning						2 times/day
RSMC Guidance for Forecast						TYM up to 84 hours 4 times/day GSM up to 90 hours 2 times/day
NWP products pressure pattern, etc						
Numerical Typhoon Prediction Web Site tracks and prediction fields, etc						mostly updated 2 times/day up to 84 hrs
Others						
RSMC Tropical Cyclone Best Track						
Annual Report						Publication
Technical Review						Publication (as necessary)

SUPPORTING ACTIVITY	2006	2007	2008	2009	2010	REMARKS
Data archive						
Monitoring of data exchange						
Dissemination of products						RSMC Data Serving System

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

(As of 6 November)



APPENDIX VII

TERMS OF REFERENCE OF THE WORKING GROUP ON METEOROLOGY

In order to coordinate efforts on the implementation of various activities under the Meteorological Component with the aim to better support the socio-economic development process in the Typhoon Committee Area and to help accomplish the meteorological related goals and objectives in the Strategic Plan, the Typhoon Committee has established the Working Group on Meteorology (WGM) with the following Terms of Reference and operational modalities.

Terms of Reference

The WGM will promote cooperation among the Members in the implementation of activities under the Meteorological Component of the Committee's Strategic Plan with the aim to support the socio-economic development process and enhance cooperation among the Members in all the three components. (Training and Research are incorporated as part of these three.) Towards this end, the WGM is expected to advise and assist the Committee in:

- Identifying priority issues and areas of cooperation in the Meteorological Component;
- Promoting and facilitating the exchange of experiences and knowledge on latest developments and techniques related to the above issues and areas;
- Coordinating and implement priority activities and programmes of the Committee aiming at strengthening capacity of the Members in meteorology;
- Mobilizing resources to carry out priority activities of the Committee related to the meteorological Component;
- Reporting overall progress in the implementation of the meteorology component of the Strategic Plan; and
- Recommending to the Committee priority areas, programmes and activities for cooperation in meteorological research by related experts of the Members.

Membership

The WGM will consist of the following members:

- Mr Wang Bangzhong, China as Chairperson
- Ms Duong Lien Chau, Viet Nam as Vice Chairperson
- Members' representatives

The Committee also requests other interested Members to take part in the working group and invite ESCAP and WMO representative to be involved in the work of this Working Group. The term of service on the WGM is 1 year subject to extension authorized by the Committee.

Operation modalities

In view of the limited financial resources of the TC Trust Fund, the WGM is expected to perform its work through email and other means. If possible without financial support, the WG members should meet during the pre-session period before the TC Session.

Reporting requirements

The Chairperson of the WGM is required to submit an annual report on meteorological activities to implement Strategic Plan meteorology priority goals through the TCS to the TC Chairperson and the TC Members for their consideration under the framework of the Committee. This report will include recommendations related to priority activities to be undertaken in the coming years.

APPENDIX VIII

REPORT ON AMENDMENTS TO THE TYPHOON COMMITTEE OPERATIONAL MANUAL

Introduction

1. The Typhoon Committee Operational Manual - Meteorological Component (TOM) has been reviewed and updated every year since its first issue in 1987. The 2006 edition of TOM was completed in August 2006 in accordance with the approval of amendments to the previous issue by the rapporteur of TOM at the thirty-eighth session of the Typhoon Committee (14 to 19 November 2005, Hanoi, Vietnam).

2. At the thirty-eighth session, the Committee decided that the rapporteur of the Japan Meteorological Agency (JMA) would continue arrangements for updating TOM. On 30 August 2006, the rapporteur, Mr. Nobutaka Mannoji, Head of the RSMC Tokyo - Typhoon Center, invited the individual focal points of the meteorological component of the TC Members to provide him with proposals on the further update of TOM.

3. As of 29 November, proposals were submitted by the eight focal points of China, Hong Kong/China, Japan, Macao/China, Malaysia, Republic of Korea, Singapore and Vietnam.

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

- Amendment to Chapter 3 to update information on the RSMC products;
- Amendment to Chapter 5 to update information on telecommunication network in China, Japan, Malaysia and Singapore;
- Amendment to Appendix 2-B to update information on enhanced upper-air observation stations in Malaysia;
- Amendment to Appendix 2-D to update information on radar observation in Republic of Korea and Vietnam;
- Amendment to Appendix 2-F to update information satellite imagery receiving facilities in Hong Kong/China, Republic of Korea and Singapore;
- Amendment to Appendix 3-A to update information on tropical cyclone prediction models of Japan;
- Amendment to Appendix 3-B to update information on tropical cyclone prediction models of China;
- Amendment to Appendix 3-E to update information on tropical cyclone prediction models of Hong Kong/China;
- Amendment to Appendix 4-B to update information on weather forecast areas in Republic of Korea;
- Amendment to Appendix 4-C to add tropical cyclone warning broadcasting stations in Malaysia; and
- Amendment to Appendix 5-C to add tropical cyclone forecasts of Hong Kong/China.

5. TOM contains a number of performance measures for the analysis and forecast of tropical cyclones, some of which have not been reviewed in recent years. The Committee may wish to consider these measures and reaffirm that they are still applicable.

Action Proposed

6. The Committee is invited to:

(a) Note the information given in this document;

(b) Review and approve the proposed amendments to TOM with modifications as necessary; and

(c) Requests the Members to report on the status of implementation of the TOM performance measures for the analysis and forecast of tropical cyclones, the form of which is attached as Annex II of this document, and submit the report to the next session of the Committee.

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

Page	Line	Present Description	Proposed Amendment
CHAPTER 3			
11	23	*3.1, para 4* **Various** analysis based on MTSAT …… …… by the RSMC Tokyo-Typhoon Center. These analyses include five-day mean cloud amount and that of long-wave radiation. In addition, analysis of sea-surface ……	*<< to deplete underlined words>>* Analysis based on MTSAT …… …… by the RSMC Tokyo -Typhoon Center. Analysis of sea-surface ……
18	24	*3.2, Para 4* Furthermore, the RSMC Tokyo-Typhoon Center should prepare a 24-hour ocean wave forecst once a day and a 10-day mean sea sureface temperature forecast every 10 days for the western North Pacific.	*<< to delete underlined words>>* Furthermore, the RSMC Tokyo -Typhoon Center should prepare a 24-hour ocean wave forecst once a day for the western North Pacific.
16		*Table 3.3 (Satellite data)* GOES-9 data (GRIB) Contents: Equivalent black body temperature Frequency (initial times): 4 times a day (00,06,12 and 18UTC)	*<< to be replaced by>>* MTSAT-1R data (BUFR) Contents: High density atmospheric motion vectors (VIS, IR, WV) Frequency (initial times): VIS: twice a day (00 and 06UTC) IR, WV: 4times a day (00, 06, 12 and 18UTC)
16		*Table 3.3 (Global Wave Model (GRIB))* Forecast hours: …… , 72 78, 84 (00 ……	*<< to add>>* Forecast hours: ….., 72, 78, 84 (00…….
CHAPTER 5			
23		*Figure 5.1*	*<< to be replaced by>>* new document (see Annex I-1)
24		*Table 5.1, 1. Main Telecommunication Network* Beijing - Tokyo Cable(FR), 48 Kbps(CIR) TCP/IP	*<< to br replaced by>>* Beijing - Tokyo Cable (FR), 48 kbps from Beijing / 96 kbps from Tokyo (CIR) TCP/IP
24		*Table 5.1, 1. Main Telecommunication Network*	*<< to add>>* Beijing -Offenbach Cable (FR), 48kbps (CIR) TCP/IP
25		*Table 5.1, 4. Inter-regional circuits* Bangkok -Kuala Lumpur Cable, 16Kbps, …….. Bangkok -Singapore Cable, 2400bit/s	*<< to be replaced by>>* Bangkok -Kuala Lumpur Cable, 64kbps/CIR 16, …….. Bangkok -Singapore Cable, 16kbps, Frame Relay
Appendix 2-B			
		Malaysia (48): 601, 615, 620, 647, 650, 657, 665 (96): 413, 421, 441, 449, 465, 471, 481, 491	*<< to be replace by>>* (48): 601, 615, 650, 657 (96): 413, 441, 471, 481

Page	Line	Present Description	Proposed Amendment
Appendix 2-D			
14,15		*Republic of Korea*	*<< to be replaced by>>* new document (see Annex I-2)
22		*Vietnam (station: Vinh)* Wave length: 6.3	*<< to be replaced by>>* 5.3
		Vietnam (station: Nha Be)	*<< to add>>* Station: Nha Be Location: 10.49N 106.43E Antenna elevation: 25m Wave length: 5.6cm Peak power of transmitter: 250 kW Pulse length: 0.4; 0.8; 2.0 Sensitivity minimum of receiver: -122dBm Beam width: 1 deg Detection range: 480km Scan mode in observation: 1, 2, 3 MTI processing: 1 Doppler processing: 1 Display: 1 Operation mode: 1, 3 Present status: 1
Appendix 2-F			
1		*Hong Kong, China (footnote)* Hong Kong, China recieves FY-1(CHRPT), FY-2(CHRPT) and EOS/MODIS.	*<< to be replaced by>>* Hong Kong, China receives FY-1 (CHRPT), FY-2 (CHRPT), AQUA (MODIS) and TERRA (MODIS).
2		*Singapore (footnote)* Singapore receives MODIS(TERRA), AQUA (MODIS), FY2B(S-VISSR) and FY1(CHRPT).	*<< to be replaced by>>* Singapore receives MODIS (TERRA), AQUA (MODIS), FY2C (S-VISSR) and FY1D (CHRPT).
2		*Republic of Korea*	*<< to be replaced by>>* new document (see Annex I-3)
Appendix 3-C			
1		*1.1.5* A large area of <u>the 10-day mean</u> SST ……	*<< to delete underlined words>>* A large area of SST ……
Appendix 3-A			
1	7	*4-D varational calculus (4D-VAR)* …… at 7.5 - 12.5 hr from synoptic time ……	*<< to be replaced by>>* …… at 5.5 - 11.5 hr from synoptic time ……
1	23	*Operation:* (schedule) twice (0000UTC, 1200UTC) daily (integration time) 90 hr from 0000UTC, 216 hr from 1200UTC	*<< to be replaced by>>* (schedule) four times (0000, 0600, 1200 and 1800UTC) daily (integration time) 90 hr from 0000UTC, 216 hr from 1200UTC and 36hr from 0600 and 1800UTC
2	2	*(b) Typhoon prediction Model (TYM 0306)* Data Assimilation: 4-D variational calculos (4D-VAR) …… - bogus structure is given as pseudo observation data to the analysis	*<< to be replaced by>>* Interpolation of the initial condition for GSM.
3	26	*Boundary conditions:* (SST) 1.0 deg. x 1.0 deg. daily analysis	*<< to be replaced by>>* (SST) 0.25 deg. x 0.25 deg. daily analysis

Page Line	Present Description	Proposed Amendment
Appendix 3-B		
1-3		*<< to be replaced by>>* new document (see Annex I-4)
Appendix 3-E		
1	*Description of the methods* (B) From RSMC DSS of JMA GOES-9 IR1 brightness tempterature data	*<< to be replaced by>>* (B) From FY-2C meteorological satellite of CMA FY-2C IR1 brightness temperature data
2 2	GOES-9 IR1 brightness temperature data	*<< to be replaced by>>* FY-2C IR1 brightness temperature data ....
Appendix 4-B		
8	*Republice of Korea*	*<< to be replaced by>>* new document (see Annex I-5)
Appendix 4-C		
1	*Malaysia*	*<< to add>>* Station / Call sign / Area covered Port Penang / LY 3010 / Strait of Malacca* Labuan / OA 3010 / South China Sea* Miri / OE 3010 / South China Sea* * within 300nm from station
Appendix 5-A		
1	*China* Director: Zhang Guocai Tel.: (+86) (10) 6840 6625 E-mail: zhanggc@cma.gov.cn	*<< to be replaced by>>* Director: Jiao Meiyan Tel.: (+86) (10) 6840 6169 E-mail: jiaomy@cma.gov.cn
	Hong Kong, China (telephone) (+852) 2926 8474 (24hours)	*<< to delete>>*
	Japan Director: J. Ichizawa Fax: (+81)(3) 3212 2453	*<< to be replaced by>>* Director: Y. Makihara Fax: (+81)(3) 3211 8303
	Republic of Korea Daejeon Regional Meteorological Office Korea Meteorological Adm. (Chief Executive: W.J. Lee) 22, Guseong-dong, Yuseong-gu, Daejeon Korea 305-338 Tel: (+82)(41) 862 8144 Fax: (+82)(41) 862 8141	*<< to be replaced by>>* Typhoon Forecasters Officer Korea Meteorological Adm. (Director: Hee-Dong Yoo) 460-18, Sindaebang-2dong, Dongjak-gu, Seoul 156-720 Tel: (+82) (2) 2181 0672 Fax: (+82) (2) 2181 0689
Appendix 5-C		
3	*Tropical Cyclone Forecast*	*<< to add>>* Heading / Receiving station HH FXPQ01 VHHH / O FXPQ02 VHHH / O FXPQ03 VHHH / O FXSS01 VHHH / O FXSS02 VHHH / O FXSS03 VHHH / O
3	*Tropical Cyclone Forecast* Heading / Receiving station MM SL FXPQ20 VHHH FXSS22 VHHH	*<< to be raplaced by>>* Heading / Receiving station MM SL FXPQ VHHH / TD TD FXSS22 VHH / TD TD

5.4 Meteorological telecommunication network for the Typhoon Committee region

The network is shown in Figure 5.1 and its present status is summarized in Table 5.1.

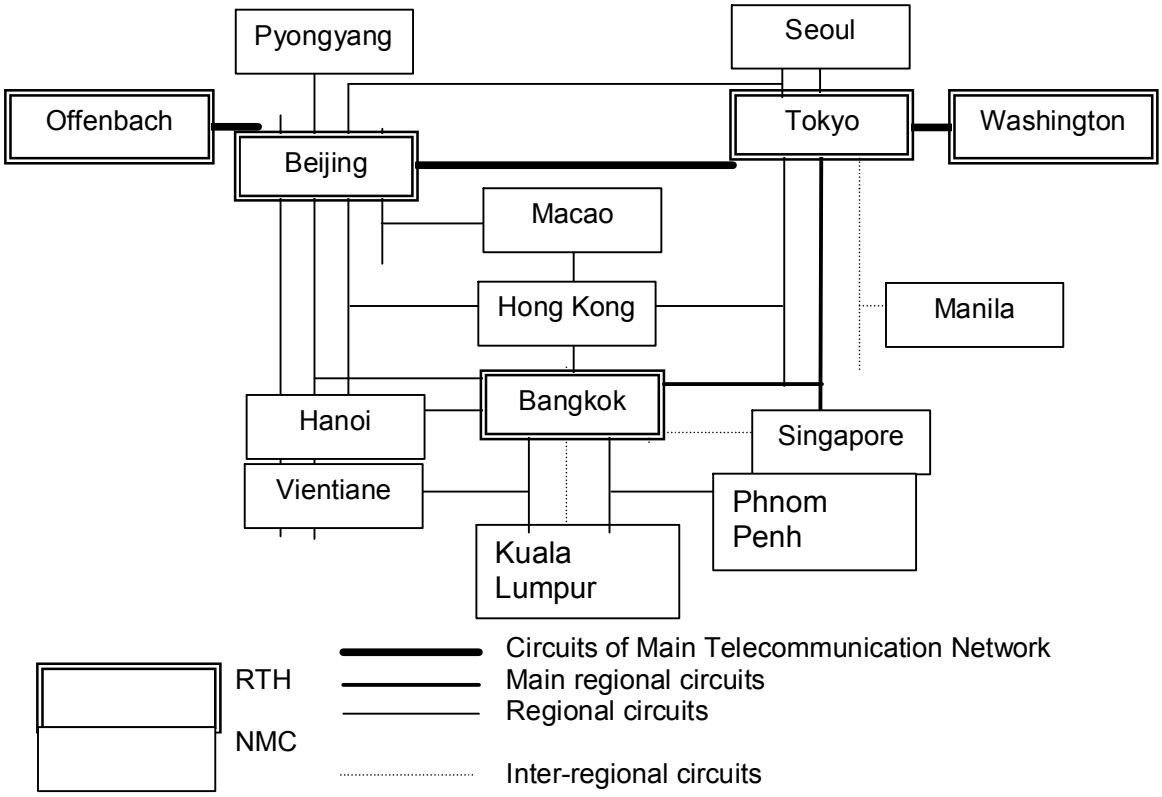


Figure 5.1 Meteorological telecommunication network for the Typhoon Committee

Name of the Member **Republic of Korea - 1**

NAME OF STATION			Gosan	Seongsanpo	Donghae	Osungsan	Baengnyeong-do
SPECIFICATIONS		Unit					
	Index number		47185	–	47106	47144	47102
	Location of station		33°17'N 126°10'E	33°23'N 126°53'E	37°30'N 129°07'E	36°01'N 126°48'E	37°58'N 124°38'E
	Antenna elevation	m	91	59	53	227	185
	Wave length	cm	10.3	10.3	5.6	5.6	5.3
	Peak power of transmitter	kW	750	750	250	250	250
	Pulse length	μs	1.0, 4.5	1.0, 4.5	0.8, 2.0	0.8, 2.0	0.5,18
	Sensitivity minimum of receiver	dBm	−112	−112	−108	−108	−108
	Beam width (Width of over −3dB antenna gain of maximum)	deg	1.0	1.0	1.2	1.2	0.9
	Detection range	km	250 (volume), 500 (lowest tilt)	250, 500	240, 480	240, 480	256, 512
	Scan mode in observation 1. Fixed elevation 2. CAPPI 3. Manually controlled		2, 3	2, 3	2, 3	2, 3	2, 3
DATA PROCESSING							
	MTI processing 1. Yes, 2. No		2	2	2	2	2
	Doppler processing 1. Yes, 2. No		1	1	1	1	1
	Display 1. Digital, 2. Analog		1	1	1	1	1
	Operation Mode (When tropical cyclone is within range of detection) 1. Hourly 2. 3-hourly 3. Others		3 (continuous)	3 (continuous)	3 (continuous)	3 (continuous)	3 (continuous)
	Present Status 1. Operational 2. Not operational (for research etc.)		1	1	1	1	1

APPENDIX 2-D, p.15

Name of the Member **Republic of Korea - 2**

NAME OF STATION		Jindo	Gwangdeok -san	Myeonbong -san	Gwanaksan	Gudeoksan
SPECIFICATIONS	Unit					
Index number		47175	47094	47148	47116	47160
Location of station		34°28'N 126°20'E	38°07'N 127°26'E	36°11'N 128°59'E	37°26'N 126°57'E	35°06'N 129°00'E
Antenna elevation	m	494	1066	1129	637	545
Wave length	cm	10.3	10.3	5.3	11	11
Peak power of transmitter	kW	750	750	250	850	850
Pulse length	μs	1.0, 2.5	1.0, 4.5	0.83, 2.5	1.0, 4.5	1.0, 4.5
Sensitivity minimum of receiver	dBm	-112	-112	-112	-114	-114
Beam width (Width of over -3dB antenna gain of maximum)	deg	1.0	1.0	0.913	1.0	1.0
Detection range	km	240, 480	240, 480	200, 400	240, 480	240, 480
Scan mode in observation 1. Fixed elevation 2. CAPPI 3. Manually controlled		2, 3	2, 3	1	2, 3	2, 3
DATA PROCESSING						
MTI processing 1. Yes, 2. No		2	2	2	2	2
Doppler processing 1. Yes, 2. No		1	1	1	1	1
Display 1. Digital, 2. Analog		1	1	1	1	1
Operation Mode (When tropical cyclone is within range of detection) 1. Hourly 2. 3-hourly 3. Others		3 (continuous)	3 (continuous)	3 (continuous)	3 (continuous)	3 (continuous)
Present Status 1. Operational 2. Not operational (for research etc.)		1	1	1	1	1

Member	Station		MTSAT 1. M-DUS 2. S-DUS 3. Movie	NOAA 1. HRPT 2. APT	Meteosat 1. P-DUS
Republic of Korea	Seoul	(37.6°N, 127.0°E)	1, 2, 3		1
	Incheon Int. Airport	(37.3°N, 126.3°E)	2, 3		
	Munsan				
	Seosan	(37.9°N, 126.8°E)		1	
	Pusan	(36.8°N, 126.5°E)			1
	Kwangju	(35.1°N, 129.0°E)	2, 3		
	Taejon	(35.2°N, 126.9°E)	2, 3		
	Kangnung	(36.4°N, 127.4°E)	2, 3		
	Cheju	(37.5°N, 130.9°E)	2, 3		
	Taegu	(33.5°N, 126.5°E)	2, 3		
	Taegu/Air Traffic	(35.9°N, 128.6°E)	3		
	Chonju	(35.9°N, 128.7°E)	3		
	Chongju	(35.8°N, 127.2°E)	3		
	Ullung-Do	(36.6°N, 127.4°E)	3		
	Mokpo	(37.5°N, 130.9°E)	2, 3		
	Chunchon	(34.8°N, 126.4°E)	3		
	Masan	(37.9°N, 127.7°E)	3		
	Tongyong	(35.2°N, 128.6°E)	3		
	Inchon	(34.9°N, 128.4°E)	3		
	Huksando	(37.5°N, 126.6°E)	3		
	Suwon	(34.7°N, 125.5°E)	2, 3		
	Sokcho	(37.3°N, 127.0°E)	3		
	Pohang	(38.3°N, 128.6°E)	3		
	Kunsan	(36.0°N, 129.4°E)	3		
	Baengnyeong-do	(36.0°N, 126.7°E)	3		
		(37.9°N, 124.6°E)	2, 3		

OPERATIONAL TYPHOON TRACK FORECAST METHODS
USED BY TYPHOON COMMITTEE MEMBERS

Name of the Member: China

Item	Method	Type of output
Name of the method	Global Numerical Model of Typhoon Track Prediction (GMTTP)	Track position up to 120h, interval is 6h
Description of the method	a) Forecast domain of GMTTP : Global b) Vertical resolution : 31L c) Horizontal resolution: T213 d) Time integration : Semi-Langilanri e) Physical processes: Short wave radiation：morcrette,1991 Long wave radiation：Fouquart and Bonnel,1988 Turbulence diffusion：Louis et al.,1982 cumulus convection：mass flux scheme(tiedtke,1989) cloud physics：prognostic cloud scheme (Tiedtke;1993) Surface physical processes: 4 level model (Viterbo and Beljaars, 1995)	

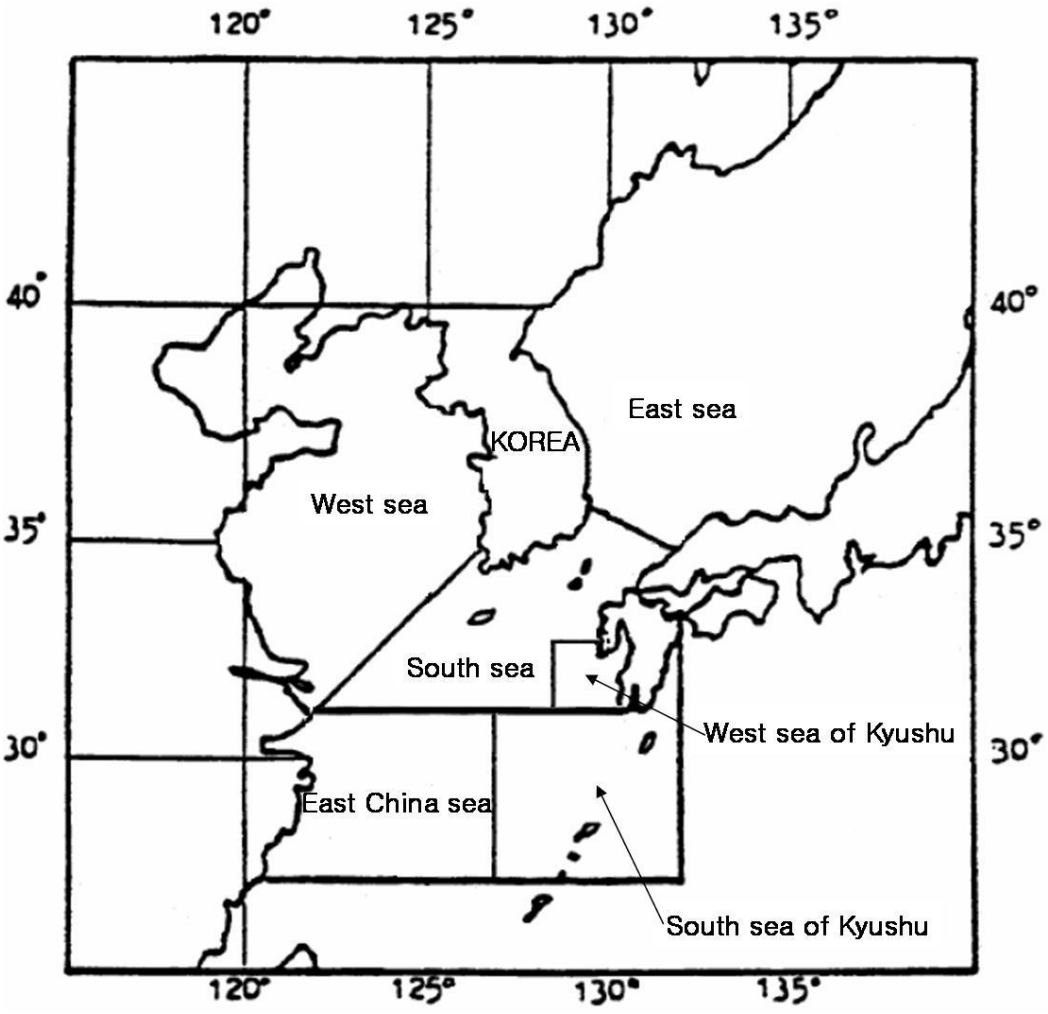
Name of the Member China

Item	Method	Type of output
Name of the method	Statistical dynamic method (SD-90)	12,24,36,48,60 and 72-hr forecast positions
Description of the method	a. Basic equations: $du/dt - fv = F_1$ $dv/dt + fu = F_2$ Where u and v are velocity components of typhoon center; F_1,F_2 represent the mean effects of the pressure gradient and some other forces in the vortex area, given out by: $F_1 + b_1^{(1)} + b_2^{(1)}t + b_3^{(1)}t^2$, $F_2 + b_1^{(2)} + b_2^{(2)}t + b_3^{(2)}t^2$, Here $b_i^{(j)}$ (i=1,2,3; j=1,2) represents 6 random variables, which are statistically obtained from samples over 30-year period (1961-1990). The 24-hr numerical forecast height values at 500 hPa are used as predictors. b. Domain: West of the Northwest Pacific area from 15°N-40°N, 115°E-140°E c. Frequency of forecast: Twice a day 06Z, 18Z up to 72-hr	

Name of the Member China

Item	Method	Type of output
Name of the method	Consensus forecast method using the canonical correlation	12,24,36,48,60 and 72-hr forecast positions
Description of the method	a. Basic equations: $X = a_0 + \sum a_i x_i$ $Y = b_0 + \sum b_i y_i$ Where X and Y are longitude and latitude of forecast typhoon position, respectively. x_i and y_i (i=1,2,3,4) are forecast longitude and latitude obtained by four sub-models: Japanese numerical model, SD-85 method, CLIPER method and Shanghai Composite Statistical method. a_i and b_i (i=1,2,3,4) are regression coefficients obtained by canonical correlation method. b. Domain: West of the Northwest Pacific area from 15°N-40°N, 115°E-140°E c. Frequency of forecast: Twice a day 06Z, 18Z up to 72-hr	

REPUBLIC OF KOREA
WEATHER FORECAST AREAS



Report on the status of implementation in 2006 of the TOM performance measures for the analysis and forecast of tropical cyclones

Member:

TOM performance measures		Status of the implementation in 2006
Section	Contents	
2.1.2	The radiosonde/radiowind observation carried out at 0000UTC and 1200UTC should reach the 30hPa level for more than 50 percent of the ascents. Upper-air stations in the areas affected by tropical cyclones of TS intensity or higher should also make radiowind observations at 0600 and 1800UTC which should aim at reaching the 70hPa level.	
2.3	It is essential that radar observations continue as long as a tropical cyclone of TS intensity or higher remains within the detection range of the radar.	
2.6	Each Member's tropical cyclone forecast center should compile reliable passage, landfall, near-buoy passage, near-ship passage data, tabulate that data and send it to the Typhoon Committee Secretariat (TCS) a day after cyclone passage for distribution to the other Members.	
6.3	After the end of each typhoon season, each Member will conduct the verification for its analyses and forecasts and send the report to the RSMC Tokyo-Typhoon Center in accordance with the standard procedure as shown in Appendix 6-D.	

APPENDIX IX

ACTIVITIES OF THE MEMBERS, UNESCAP AND WMO ON HYDROLOGY IN 2006

China

1. Overview of Hydrological Conditions

In 2006, there was no basin-scale floods occurred in China. However, frequent severe local flood events occurred in the southern part of the Yangtze River, and some other rivers. Therefore, some stations in some medium- and small-sized rivers and east coast exceeded the historical records. On the other hand, the water income in 2006 was much less than normal years. Severe drought occurred in middle-west part of China, especially in Chongqing area.

2. Progress in Member's Regional Cooperation and Selected RCPIP Goals and Objectives

In 2006, China has taken active part in the activities of RCPIP of hydrological component and DPP. China continued to lead two projects. Also China has been taking part actively in the projects led by other TC members.

2.1 Project on Extension of Flood Forecasting System to Selected River Basins

In 2006, China has done as follows: 1) A brochure and DVD of Hydrological Information and Forecasting in China have proved to TC members; 2) A brochure of Chinese National Flood Forecasting has provided to TC members; 3) The outline of Guidelines for establishment of flood forecasting system was distributed in 39th TC session; 4) The training course of operational flood forecasting was proposed to be host by China in September or October in 2007 as requirement of WGH of TC.

2.2 Project on Evaluation of Hydrometric and Telecommunication Equipment

At Workshop held in Malaysia in Sept. 2005, China submitted the review of the Projects on the evaluation and improvement of hydrological instruments and telecommunication equipment (draft) and Application of the Automatic Telemetry System for Hydrological Data Collection in Real-time Flood Forecasting in Chin. Because of the limitation of information and interesting of members, the project has been stopped since the workshop held in Malaysia in 2005. The 38th TC session held in Vietnam approved to close this project. China might submit the final report of this project to WGH of TC.

2. 3 Project of Flood Risk Maps

In recent years, China continuously does its work in the respect of flood risk maps and has achieved in success. Since 2005, the State Headquarters of Flood Control and Drought Relief ask various river basin authorities select 2-3 provinces as pilots to draw flood risk maps. The main objects of drawing flood risk maps are important rivers, reservoirs and flood storage areas. Meanwhile, a specific website has been put up to provide a platform for studying, discussing and exchanging experience in drawing flood hazard maps.

2.4 Project of Flash flood Forecasting and Warning System

In recent years, China continuously does its work in the respect of mud-rock flow and has achieved in success. 1) Continuously perfect landslide forecasting in Xuanhan Region of Sichuan Province. 2) Several central government departments have together finished the

plan and design of the study on mudflow and landslide monitoring technology, with main aim of building mudflow and landslide monitoring system with higher and new technology combined with traditional technology for monitoring, building static and dynamic models for monitoring and forecasting mudflow and landslide, and offering prevention measures to avoid and decrease the losses from mudflow and landslide.

3. Progress in Member's Important, High-Priority Goals and Objectives

China has to develop hydrology from traditional way to the modern way, including conception, management mode, technique and etc. In recent years China will be bended itself to enhance the establishment of laws and regulations such as the National Hydrological Statute, to enhance the strategic planning such as the National Hydrological Development Plan and the 11th 5-years Plan for Hydrological Development and to enhance the capacity building and speed up hydrological modernization.

In the aspect of hydrological observation network, China is perfecting and adjusting hydrometric networks and optimizing the function of the networks.

In the aspect of hydrological monitoring, China has being applied itself to enhance the hydrological measuring capacity building by applying advanced facilities and to enhance the capacity building on tour gauging by establishing hydrological bases.

In the aspect of data transmission and management, China has being bended itself to improve the data reporting equipments and communication instrument from stations to sub-center, to gather all data all over the country within 30 minutes and to promote the data sharing platform and capacity.

In the aspect of hydrological service to both professional and public, China continues to perfect the hydrological operational systems including FFS, FDSS and etc, to research and apply new models and methods, like DHM using DEM, to enhance service platform and automatic information issuing system by using mobile phone and PAD technique.

Hong Kong, China

Since 1997, about HK$6.7 billion worth of major river-training works and flood-control projects have been completed in the New Territories (NT) over the northern part of Hong Kong. As a result, the flooding situation in NT had improved significantly. The rainfall threshold criteria for the issuance of the Special Announcement on Flooding in the northern New Territories were revised in March 2006, taking into account the improvement work of the drainage systems in flood prone areas.

To effectively and precisely alert the residents in a low-lying urban district for possible flooding due to coincidence of high tide and heavy rainstorm, an automated flooding information dissemination system has been implemented since the 2006 wet season. When the forecast or recorded hydrological data reach the triggering criteria, advisory flood alerts would be sent to registered users via mobile phone SMS messages or pre-recorded voice phone calls.

Macao, China

"Workshop on Integrating Activities of the Hydrology, Meteorology and DPP components of the Typhoon Committee into the Related International Frameworks for Disaster Risk Management for Better Impacts and Visibility" was held in Macao, China from 4 to 9 September 2006. The Workshop was attended by 65 participants from 13 out of 14 Members of the Typhoon Committee, namely: Cambodia; China; Democratic Peoples Republic of Korea; Hong Kong, China; Japan; Lao People's Democratic Republic; Macao, China; Malaysia; Philippines; Republic of Korea; Thailand; the Socialist Republic of Viet Nam; and the United States of America (USA). The Workshop was also attended by representatives from the Economic and Social Commission for Asia and the Pacific (ESCAP), the World Meteorological Organization (WMO) and Typhoon Committee Secretariat (TCS).

Malaysia

The flood forecasting system in Malaysia was further enhanced to take care of both seasonal foods and flash floods. In December 2005 the country experienced one of the worst monsoon floods in the States of Kedah, and Perlis since the 1950s. From December 2005 to February 2006, moderate to severe floods also occurred in the states of Kelantan, Trengganu and Pahang. For the hydrology component, under the RCPIP, the Drainage and Irrigation Department (DID), Malaysia has developed a web-based online early warning system, "Debris and Mudflow Warning System" for Cameron Highlands, Pahang based on empirical relationship between observed landslide occurrences and corresponding rainfall events. The online web-based flood warning system for the country (InfoBanjir http://infobanjir.water.gov.my) continued to be improved. The SMS flood warning system for DID flood operation managers was also expanded to other disaster management and relief personnels, A SMS flood warning system and services (SMSSFWS) for the public was also developed for the Damasara River Basin, Selangor.

Republic of Korea

UNESCAP/WMO TC Workshop(Macau, from Sep. 4, to Sep.7 2006) was held as one of new regional cooperative program among Asia-Pacific TC members. In this place, Ministry of Construction and Transportation (MOCT) made a presentation regarding two leading projects & activities in 2006 and actively participated in the discussion of regional cooperative plans in coming 5 years. Also MOCT support traveling fund to 7 participants from members.

MOCT has been doing flood forecasting system by establishing TM observatories in 5 major rivers and 8 middle scale rivers since 1974. Also in the beginning of setting up the first rainfall radar in Ganghwa-do island in July 2000, the sustainable upgrade of system is proceeding aiming at establishing rainfall radar observatory system of 5 major rivers by 2011. From the late of 1990's, to prepare for the damage of flash flood in small streams and mountain areas Korea is developing flash flood forecasting system.

Recently, flood disaster have increased due to heavy storm rainfall and typhoon induced by abnormal climate change. Korea has performed the various strategies and technology for prevention and preparedness of flood disaster in order to protect economic loss and human beings. For example, "Digitalizing river map" such as flood hazard map, main river map and RIMGIS(River Management Geographical Information System) flash flood forecasting system, etc. has been developed.

Singapore

The development of Singapore's national Tsunami Early Warning System (TEWS) was one of the high priority projects in the year 2006. The objective was to enable Singapore to better assess potential impacts of tsunamis on the country, enhance its national preparedness and contribute to regional and international efforts to monitor and mitigate potential disasters. The development includes upgrading of software and hardware to enable real time exchange of data with countries in the region including tide data from the new tidal guage network. The Meteorological Service Division, National Environment Agency (MSD-NEA) is also collaborating with local educational institutions to develop tsunami modelling capabilities, targeted to be completed by August 2008. The establishment of TEWS has also enhanced the overall preparedness of Singapore for natural disasters through organization change and tighter operational cooperations between various agencies in Singapore.

The development has resulted in some organization change. MSD-NEA has now a "Specialized Services" section whose staff are on development tasks normally and can be deployed to support the surge of operational duties when needed.

Thailand

The telemetering system project under the TMD's responsibility has been established in 12 river basins. There are 161 automatic rainguage/hydrometeorological stations altogether so far. The project has been carried out in 3 phases covering the period from 1999 to 2006. In this project, the Mike11 Model will be implemented to simulate the hydrological behaviors for forecasting and warning floods in 5 river basins : Tapee, Kok, Nan, Pasak and Prachinburi.

After the end of last year, the Royal Irrigation Department still continues its three ongoing telemetering projects in the Ping, Lam Pao and Chantaburi river basins. The project is on test run and expected to finish next year.

For Department of Water Resources, it has cooperated with MRCS and other Mekong River Countries (Lao's PDR, Cambodia and Vietnam) to improve the hydro-meteorological monitoring network in Mekong Mainstream.

At this moment, the forecasted results from other finished telemetering projects, implemented by the Royal Irrigation Department, are disseminated to the concerned agency and warning is via internet, radio and television. Part of data collected from ongoing project also gives good support to flood warning in the command areas.

This year, a research on Utapao river basin, with a catchment size of 1,740 km^2, in the southern part of Thailand had been conducted by the Royal Irrigation Department. The derived unit hydrograph was derived from last year flood and then will be applied to compute flood hydrograph this year. The progress will be reported next year.

At Department of Water Resources, 3 researches had done as listed below :

- The Study on Antecedent Precipitation index for Flood and Landslide Early warning System.
- The Study on the Impact of Tsunami on Inland Water Resources.
- The Study in the Data Linkage system and the spatial Analysis on Flood Forecast and Early warning system in Upper Ping River Basin.

The Royal Irrigation Department has three telemetering systems under installment and planed to be complete next year. Some data has been collected and applied in the command area this year. The model gives reasonable result but still needs more data to calibrate.

In case of Department of Water Resources, it has developed and improvement in the hydrological and meteorological monitoring network in Penninsula-East Coast. And telemetering hydro-meteorological stations was established in Upper Mun and Chi river basin for Flood forecasting and management. Department of Water Resources continued to develop and set up a flood and landslide warning system in mountain and upland area cover 64 villages, dealing with system alerts activated heavy rainfall and rising of river levels to monitor at appropriated site, early warning signal were sent to subscribers and communities in real time in advance of the impact of disaster s which provide time for people to take response actions.

United States of America

UN Economic and Social Commission for Asia and the Pacific (ESCAP)/ WMO Typhoon Committee Integrated Working Groups Meeting. The Director and Warning Coordination Meteorologist (WCM) of RSMC Honolulu and the Meteorologist in Charge (MIC) of WFO Guam attended the first ever integrated workshop of the Typhoon Committee's Working Groups on Meteorology (WGM), Hydrology (WGH), and Disaster Prevention and Preparedness (WGDPP) and the Advisory Working Group (AWG) in Macao, China, 4-9 September 2006. The MIC and WCM addressed Pacific Island interests in several WMO projects including flood hazard mapping, flash flooding and debris flow, and user requirements for hydrology and disaster prevention and preparedness products within the plenary sessions and within the separate breakout meetings of the WGDPP and WGH respectively. The RSMC Director attended the plenary sessions and the WGM breakout meetings. The working groups provided inputs into the Typhoon Committee's 2007-2011 and Beyond strategic plan, 2007 annual operating plan, and the 2007 budget goals. The AWG then took these inputs, clarified some of the issues, and developed an integrated Strategic Plan, Annual Operating Plan, and budget for consideration of the Members at their annual Typhoon Committee Session (39th) Meeting to be held in Manila 4-8 December.

Viet Nam

- *Improvements of software in data processing and analysis:* Continued to develop the software for the preservation of hydro-meteorological database, for hydrological data collection, processing and timely transmitting hydrological information and forecasts to end-users.

- Develop some softwares for automatically input and output of the new hydrological models MARINE, FIRR, Hydraulic model and model for reservoir's regulation.

- *Improvements in hydrological forecast models were made for the following:* Empirical method, Mike-11 model (Danish model), Marine model (French), TANK model, NAM, FIRR model (Vietnamese), 1-D Hydraulic model (TL2) (Vietnamese), Reservoir Flood Routing (Vietnamese), HydroGIS (Vietnamese), WETSPA (Belgium model).

- By the July of 2006 year, the research of guideline for operation 3 reservoirs: Hoa Binh, Thac Ba, Tuyen Quang has been complete (6/2006) and it is implemented for flood season of this year (2006).

- Improvement of hydrological products to meet users' requirements and expectation:

Research Progress

- Continued project "The guideline for the operation 4 hydropowers in Da and Lo rivers". Its deadline is expected to be by the end of March 2007. Currently, in Vietnam were being built 30 hydropower dams at upstream of the main rivers, especially the multipurpose ones such as:

  - Son La Reservoir in Da River is expected to be commissioned by the year 2008.

  - Ban Trac, Quang in Da River, Na Le (Chay River), Bao Lac (Gam River), Lai Chau (Da River) reservoirs (2013).

- 2 projects are being implemented:

  - Flash flood mapping Project with purposes: drawing up of flash flood map and establishing flash flood warning system in the North Viet Nam (the first phase 2006-2008 in Ha Giang provinces with more than 70 automatically rainfall stations)

  - Establish the alerts system of water level in Vietnam.

UNESCAP

In 2006, ESCAP continued to extend its technical support to the Typhoon Committee's activities in several areas of its work, apart from its regular activities related to water resources management. The additional activities included those implemented in support of the participation of the Typhoon Committee's experts at the Fourth World Water Forum, held in Mexico City, in March 2006 and those related to the regional workshop on "Integrating activities of the hydrology, meteorology and DPP components of the Typhoon Committee into the related international frameworks on disaster risk management for better impacts and visibility", held in Macao, China in September 2006. With respect to water resources management, UNESCAP published a special publication on its experiences to assist countries in the region, including several members of the Committee, in their efforts to integrated water resources management (IWRM) plans, as recommended by the World Summit on Sustainable Development, held in Johannesburg in 2002, in continuation of the project on "Capacity-building in strategic planning and management of natural resources in Asia and the Pacific".

APPENDIX X

REPORT OF THE PARALLEL SESSION ON HYDROLOGICAL COMPONENT

Report of WGH meeting

The WGH meeting was held from 11:00 to 12:10 on 4 Dec. 2006 at Room 2 in The Manila Hotel, as one of parallel sessions of three working groups. The meeting was attended by over 20 participants from China, Japan, Republic of Korea(ROK), The Philippines, Thailand, Viet Nam, UNESCAP and TCS.

The meeting was requested to mainly discuss on following issues:

a) Review of the activities (achievements)
b) Recommendations for the coming years
c) Possibility of raising funds
d) Strategic Plan
e) Annual Operating Plan for 2007
f) Budget

I. Review of the activities (achievements) in 2006

Three categories of activities were conducted during 2006 by WGH members, as follows.

1) Implementation of Projects under current RCPIP

9 projects have been under promotion by WGH under current RCPIP scheme. Taking the opportunity of the Integrated WS in Macao, the progress and future plans of these projects were reviewed by participants in collaborative manner. One of outcomes from Macao WS is the revised milestone for the future, based on which the AOP for 2007 was elaborated, as shown under 2. below.

2) Participation in Conferences/Meetings

During the last inter-sessional period, for showing activities under TC/WGH, some of WGH members attended two international conferences as follows.

IAHR (Intl. Association of Hydrological Research) Conference – Seoul in Oct. 2005

A session was organized by Dr. Ti (ESCAP) where Mr. Katsuhito Miyake and Ms. Norlida Mord Dom participated from TC WGH.

Organization of the session at Fourth World Water Forum (WWF4) - in Mexico City in March 2006.

- On 18 March 2006, TC WGH (Dr. Ti as session co-organizer) organized a session at WWF4 jointly with IFNet Secretariat. In this session, Mr. Katsuhito Miyake and Dr Hong Il-Pyo made presentations introducing ongoing TC activities.

3) Organization of WS: 4-8 Sep. 2006 in Macao, China

WGH participants, also participated by two other component members, could conduct fruitful discussions on ongoing and planned activities.

The detailed discussion record has been provided as “Macao WS report of WGH” as submitted to the Committee.

II. Annual Operating Plan for 2007

These topics were reviewed and discussed project by project, using the PP slides prepared by K. Miyake, and with small revisions, the AOP for 2007 for each project was agreed as follows.

1) Project on Flood Hazard Mapping

- Deepening of collaboration with TC members and JICA FHM trainees in each member country
- Opening of Technical Help Desk and providing technical consultation (by IDI, Japan)
- Collection and provision of good practices, etc. through HD system (Japan)
- Preparation and publication of several model FHMs in member countries (Philippines and other members)
- Documentation of history of legal/regulatory development in Japan that led wide use of FHMs, for reference to members (Japan)

2) Project on Flash Flood Warning including Debris Flow and Landslides

- Opening of Technical Help Desk and providing technical consultation (by NILIM, Japan in cooperation with International Sabo Association)
- Setting Critical Lines in pilot area (Philippines, Thailand), increase of locations where CLs are set (Malaysia, China)
- Analysis of data from pilot areas and provision of results to members (Japan)
- Documentation of history of legal/regulatory development in Japan that led wide adoption of related methodology, for reference to members (Japan)

3) Project on Evaluation and Improvement of Operational Flood Forecasting System focusing on Model Performance

- Provision of Flood Forecasting models to MOCT/KICT of ROK along with info. on their applications
- MOCT/KICT will do comprehensive analysis of models provided and discuss the results with TC members
- Members make necessary improvements of their Flood Forecasting Models
- Provision of revised MOFFS (Management & Overview of Flood Forecasting Systems) to members (ROK)

4) Project on the Development of Guidelines for Reservoir Operation

- Distribution of draft Guideline for Reservoir Operation to members for comments (MOCT/KWATER of ROK)
- Consultation with experts among TC members on reservoir operation (ROK)
- Publication of final standerdized reservoir operation Guideline (ROK)
  (Members will do necessary modifications for their own dam operation, using reservoir operation GL)

5) Project on Extension of Flood Forecasting Systems to Selected River Basins

- China will conduct training on FFS (on condition that funding to support international travel for international participants will be made available)
- China will provide draft Guideline on Flood Forecasting System to members and invite comments
- China will publish final GL on FFS

6) Project on Evaluation and Improvement of Hydrological Instruments and Telecommunication Equipment

- Preparation and provision of review report on hydrological instruments and telecommunication system (China)

7) Project on the Establishment of Community-based Flood Forecasting System

- Production of draft Guideline on “Community-based flood forecasting and warning system” to members (The Philippines)
- Provide comments on the draft GL (members)
- Modification and provision of the GL on Community-based Flood Forecasting and Warning System to members (The Philippines)
- (Members to test the GL at model areas)

8) Project on Improvement of Hydrological Products in response to User’s Needs

- Provision of various examples on “User-friendly data provision to residents” (members)
- Philippine will compile collected information and together with Philippine experiences, provide all those examples in a CD for reference to TC members (The Philippines)

9) Project on Socio-economic Impact Assessment of Typhoon-related Disasters (to be launched and led by The Philippines)

- Members evaluate and analyze ECLAC methodology on socio-economic impacts
- Members select and collect information on typhoon disaster cases to be tested
- Members run the ECLAC methodology model test cases and report the results to ESCAP
- ESCAP compiles and analyzes results of test cases. Application of proposed assessment tool (Disaster Impact Calculator) to each country’s real disaster events, share the results and validate the usefulness of the methodology.

10) Project on the Management of Floods in Urban Areas (to be launched and led by China)

- China will compile its experiences and latest achievement in this area
- In cooperation with other Members and UNESCAP will carry out a regional survey and prepare the report
- China will propose a detailed programme for regional cooperation including possibility to collaborate with ICHARM to prepare for the Asia-Pacific Water Summit.

11) (Pending) On-the-job Training on Flood Forecasting between TC members

(- Preparation and provision of OJT to members)
(Need coordination with China and need external funding)

III. Strategic Plan

Participants quickly reviewed, within the proposed Strategic Plan, the list of "Associated Activities" under each proposed "Strategic Goal" and agreed the list as written in the draft paper. Subsequent working session revised the list of activities associated with all the strategic goals.

IV. Recommendations

1. Budget

Considering China's sincere intention to organize one-week training course on operational flood forecasting system and its application, where the Government of China will bear local costs for participants, funding support from TCTF to finance international airfare for participants, is to be requested. Japan and ROK will not be included in the requests for TCTF. For this training, in addition to local cost of required for the training of 25,000 UDS that will be born by China, it is estimated that a sum of 5,000 USD is required to support 6 international participants.

Furthermore, in relation to planned OJT on Flood Forecasting Models in Malaysia, which will be 3-week training inviting 2 international participants, and where also all the domestic costs will be borne by Malaysia, it is estimated that a sum of 2,000 USD be required for supporting 2 international airfare for 2 participants.

Regarding WGH WS in 2007, it is estimated that, as proposed in draft budget plan, a sum of 13,000 USD will be necessary.

Totally, a total of 20,000 USD will be necessary to perform WGH-related activities as planned.

2. Possibility of raising funds

Participants felt that even though each member's self-help effort is basically necessary, for further promoting local model activities or for conducting trainings inviting international participants, support from external funding is highly desired.

For this purpose, it was felt that making appeals to potential donors such as JICA, KOICA, ADB, USAID, ESCAP, IDI, International Flood Network(IFNet), International Sabo Association, will need to be made. It was desired that the new TCS in Macao would actively tackle this issue of fund raising, which will be cooperated by members.

It was also agreed that for fund raising purpose, etc, documentation of projects will need to be prepared, stressing the usefulness and expected benefits out of proposed activities.

3. Other Issues

a) Establishment of information sharing system among HC members

It was agreed that well-organized and efficient information sharing system need to be established among HC members for sharing of useful information, conducting consultation, making reports. etc.

The WGH appreciates the proposal made by Macao to provide an electronically space in server of the new TCS for each WG.

b) Participation in Asia Pacific Water Forum (APWF)

The meeting was briefed by Mr. Kuriki, representative of ICHRM(International Center for Water Hazard and Risk Management, Japan) that recently a new network of APWF was launched which promotes sharing of useful information, etc. related to water, and one of APWF's three main themes is "Disaster Management". Considering also that several WGH members are already working actively under the framework of APWF, it was agreed that WGH would actively take part in APWF by assisting the ICHARM for the strong establishment of APWF. Dr. Hong Il-Pyo (KICT of ROK) will serve as liaison between WGH and ICHARM/APWF.

APPENDIX XI

TERMS OF REFERENCE OF THE WORKING GROUP ON HYDROLOGY

In order to coordinate efforts on the implementation of various activities under the Hydrological Component with the aim to better support the socio-economic development process in the Typhoon Committee Area and to help accomplish the hydrological related goals and objectives in the Strategic Plan, the Typhoon Committee has established the Working Group on Hydrology (WGH) with the following Terms of Reference and operational modalities.

Terms of Reference

The WGH will promote cooperation among the Members in the implementation of activities under the Hydrological Component of the Committee's Strategic Plan with the aim to support the socio-economic development process and enhance cooperation among the Members in all three components. Towards this end, the WGH is expected to advise and assist the Committee in:

- Identifying priority issues and areas of cooperation in the Hydrological Component;
- Facilitating the exchange of experiences and knowledge on latest developments and techniques related to the above issues and areas;
- Undertaking priority activities and programmes of the Committee aiming at strengthening capacity of the Members in hydrology and water resources;
- Mobilizing resources to carry out priority activities of the Committee related to the Hydrological Component;
- Reporting overall progress in the implementation of the hydrological component of the Strategic Plan; and
- Recommending to the Committee priority areas, programmes and activities for cooperation in research by related experts of the Members.

Membership

The WGH will consist of the following members:

- Mr Katsuhito Miyake, Japan as Chairperson
- Dr Hong Il-pyo, Republic of Korea as Vice Chairperson
- Mr Liu Jin-ping, China as Vice Chairperson
- Dr Liu Zhiyu, China as Secretary
- Members' representatives

The Committee also requested other interested Members to take part in the Working Group and invited ESCAP, WMO and TCS Hydrologist to involve in this Working Group. The term in service of the WGH is one year subject to extension authorized by the Committee.

Operation modalities

In view of the limited financial resources of the TC Trust Fund, the WGH is expected to communicate through email and other means which require no financial resources from the Trust Fund.

Reporting requirements

The Chairperson of the WGH is required to submit an annual report on hydrological activities to implement Strategic Plan hydrology priority goals through the TCS to the TC Chairperson and the TC Members for their consideration under the framework of the Committee. This report will include recommendations related to priority activities to be undertaken in the coming years.

APPENDIX XII

ACTIVITIES OF THE MEMBERS, UNESCAP, WMO AND UN-ISDR ON DISASTER PREVENTION AND PREPAREDNESS IN 2006

China

1. Progress in Member's Regional Cooperation and Selected RCPIP Goals and Objectives

CMA organized a revision for China National Grade Standard of Tropical Cyclone from 2005 to the beginning of 2006. The revised standard has been put into operational TC forecasting and warning since 15 June 2006. The disaster data caused by tropical cyclones from 1980 to 2004 have been collected and checked. Currently, the software about impact assessment of typhoon on society and economy is being developed in National Climate Center (NMC). In order to provide more useful information to relative departments for disaster mitigating and preventing, Meteorological services strengthen the report system at real time on the impact assessment of typhoon.

China marked the World Meteorological Day by asking people around the world to come up with new names for typhoons, as Longwang was retired from the traditional list of 140 names. More than 34,000 people took part in it. The campaign also is an important way to publicize and disseminate the knowledge about prevention and preparedness against TCs to the public and promote the public awareness of TCs.

The 275th Xiangshan Science Conference entitled 'Scientific Issues on Landing Typhoon and Disaster Prevention and Reduction' was held from 18 to 20 April 2006 in Beijing. This is a routinely-held high-level meeting sponsored by the Ministry of Science and Technology of China and Chinese Academy of Sciences, aiming at exploring scientific fronts and promoting knowledge innovation on basic scientific issues and future directions of the theory and forecast techniques for landfall typhoons, theories for typhoon warning efficiency and reliability, and scientific issues related to typhoon disaster prevention and reduction. Over 40 experts from 20 domestic or overseas institutions attended the conference.

2. Progress in Member's Important, High-Priority Goals and Objectives

On May 26th 2006, National Meteorological Disasters Monitoring, Forewarning and Evaluation Center was established in CMA. Its main objectives will focus on such as reinforcements on monitoring, forewarning and evaluating meteorological disasters, establishments and perfection for meteorological disasters forewarning emergency mechanism, enhancements on capacities of monitoring, forewarning and evaluating meteorological disasters, improving in services for prevention and preparedness against meteorological disasters in different governmental departments.

Since this typhoon season, China central and local governments have been planning to construct safety shelters in high risk regions over which typhoons often land, such as coastal areas in Zhejiang and Fujian provinces.

For the facts that the intensities of landing typhoon become more intensive within recent years, some local coastal governments have also been planning to revise on construction standard for public houses to prevent from destructive disasters to public houses.

An investigation for typhoons landing over China from 1996 to 2006 was initiated by CMA among operational departments or sectors concerned in Sep. 2006. The output would be a checklist describing the degree in disasters or loss related to different level typhoons.

Meteorological Disasters Yearbook of China has been published since 2004. The Yearbooks collect and contain the main meteorological disasters took place in China in a past certain year such as typhoons, rainstorm and flood, drought, hail, tornadoes, dust storm, frozen disasters in low temperature, snowstorm, gales, dense fog, lighting strike, high temperature and heat wave etc. The Yearbooks also include severe meteorological disasters in the globe. Mobile phone messages have become a key tool for Chinese authorities who need to alert millions of villagers and fishermen during this year's unusually powerful typhoon season. In Fujian, authorities sent 18 million short messages service with storm information during five typhoons this year.

In addition, CMA still has been improving in its typhoon warning issue system with enhancing the relationship other media such as radio, TV, websites, 96121 phone line, electronic display screens, and newspaper.

Chinese authorities have been attaching importance to forecasting and warning information related to typhoon at all times. During this typhoon season, those local authorities of provinces affected by typhoons urgently and timely organized population evacuation of 8.1458 million people in total. These measures effectively reduced casualties and mitigated losses induced by typhoons to a minimum degree.

During the affecting time of Super Typhoon Saomai (0608), CMA issued Emergency Response Signal No. 1 at 09:30UTC Aug. 10. NMC (National Meteorological Center, CMA) added detecting frequency and updated forecasting and warning information every half hour. All levels of authorities both in Zhejiang and Fujian provinces timely organzied population evacuation of 1.6213 million people and over 70,000 fishermen in total return into some safety harbors to avoid strong gale caused by Saomai. These measures effectively mitigated casualtyies and properties losses.

d. Research Progress

- The Mechanism Research on Disasters Related to Typhoon
- The Evaluation Method on Disasters Related to Typhoon

Hong Kong, China

As a continuing effort to promote awareness and preparedness of natural disasters, HKO conducted several courses for members of the public and staff from other government departments. The topics included tropical cyclone warning, public weather information services, weather and outdoor work, and weather observation. From October 2005 to September 2006, around 600 participants attended the courses.

The year-long public education campaign entitled “Safer Living - Reducing Natural Disasters”, launched in March 2005, comprised a range of community education programmes, including TV programmes on safer living and meteorological topics, a tropical cyclone name nomination contest, slogan and bookmark design contests, a series of popular science lectures, and a seminar on “Safer Living – Reducing Natural Disasters”. The final activity of the campaign was a one-month exhibition and rescue drill demonstrations in April 2006.

To promote public awareness and preparedness on the threats and potential devastating impact of tropical cyclones, interviews for the press, TV and radio programmes were conducted in September 2006 to highlight the damage and casualties of the most deadliest typhoon in 1906 in Hong Kong. An 8-episode radio programme series on the weather in

Hong Kong, including the impact of tropical cyclones, was broadcast on a local radio station from August to October 2006.

As weather, in particular severe weather during the passage of tropical cyclones and heavy rain, is a crucial element in flight safety, HKO organized the first training course on aviation meteorology in March 2006, specifically designed for airline dispatchers and pilots to facilitate their planning during inclement weather. A total of 57 dispatchers and pilots attended the training course.

A training course on "Safety Precautions for Container Handling Operations in Adverse Weather Conditions" was conducted for container operators in April 2006. The objective was to enhance their understanding of meteorological conditions, with emphases on hazardous weather associated with tropical cyclones and relevant safety precautions.

Macao, China

The following major activities were carried out in 2006:

1. Amendment of the strategic plan for civil protection and establishment of the concepts and guidelines for action planning, including those related to operation strategy for main holidays or large-scale activities to the relevant departments of each Security Force and distribute to them after getting the approval from the Chief Secretary for Security.
2. Meeting with all members of Civil Protection, including discussion of the 2006 exercise of civil protection from the tropical cyclone and its details.
3. Exercise of Civil Protection for tropical cyclone.
4. Promotion of the Protection Measures
5. Undertaking other targeted exercises, such as the exercise for Macao harbor to test safety of facilities and response of accident, the exercise for testing the security of the Macao container terminal, the exercise for the security management of Macao fuel depot, the exercises for various accidents and security of Macao International Airport (e.g. hijack, bomb threat to the airport), the exercise for the accident and emergent rescue of underpass of the Sai Van Bridge, the exercise for rainstorm warning and the exercise for evacuation during the fire alarm in the schools, and the exercises for various fire alarm and emergent rescues etc, so as to testing the management and the capability to deal with contingency and emergence of each members of Civil Protection System. The goals of the exercise are to enhance the efficiency and capability of the members of civil protection in managing and executing affairs related to civil protection, to draw public awareness of the importance of civil protection and to promote individual consciousness of civil protection. Thus, it acts as a key function to the future work in early warning, disaster reduction and disaster elimination.

Malaysia

In relation to the disaster prevention and preparedness component, the existing mechanism for disaster management and relief continued to be improved. Several programs and activities were implemented by governmental agencies to improve the facilities and enhance preparedness in relation to natural hazards at all levels of the management (federal, state and local levels). To increase public awareness on natural hazards and disaster risk reduction, the government has declared Dec 26 each year as Disaster Awareness Day. Malaysia is also putting greater emphasis on disaster risk reduction than disaster management through reviewing of existing regulations and legislation and taking into account disaster risk reduction in development planning and implementation.

Philippines

The Philippines thru PAGASA, the nation's National Meteorological and Hydrological Service contribute to a higher level of disaster prevention and preparedness of the population by adopting an aggressive and sustained public awareness program on natural hazards such as typhoons, floods, severe climate events such as El Nino and La Nina phenomena. This involves utilizing advances in Information and Communication Technology (ICT) for the production of science-based information material such as hazard maps presented in an attractive and easily understood manner for the media, the general public, decision makers and other development partners. Development of radio and TV plugs, multi-media presentations and conduct of lectures for community disaster preparedness and planning are some of the essential activities. Information and communications systems was also developed such that the PAGASA's principal beneficiaries and clientele, through various media are not only updated of impending disasters but also of alerting them of what to do and how to react to these calamitous events.

To augment the IEC programs, PAGASA has its own Quick-Response Team called the STRIDE Team which stands for Special Tropical Cyclone Reconnaissance, Investigation and Damage Evaluation Team. The Team's is a mobile group whose objective is to be in the path of a Tropical Cyclone one to two days in advance to warn the community thru their LGUs regarding the impending danger of the landfalling typhoon in their area and advising them to activate their disaster and management plan. The team is also responsible in reporting the actual weather condition in the area for forecasting guidance.

Research studies on risk assessment, vulnerability analysis and related components of disaster management have also been completed and future activities have been established in connection with national and international cooperation.

Republic of Korea

During the period of October 1 to December 31 in 2005, 27 people died and cause approximately $6 million property damage by strong winds. During the period of January 1 to September 31 in 2006, 65 people died and approximately US$ 2 billion worth of property damage was incurred due to major disasters such as heavy rains and typhoons. For the effective countermeasures, eight implementation plans are the top priorities that the Korean government is pursuing, i.e., Implementation of Pre-Disaster Impact Assessment System, Research and Development of Natural Disaster Mitigation Technologies, Strengthening Natural Disaster Forecast and Early Warning, Providing Evacuation System, Maintenance of Disaster-Prone Areas, Improvement of Small Creeks, Introduction of Insurance Program for Wind and Water Related Disasters, and Systematic Recovery Support System.

In the 38th session, DPP members have discussed strategic plans, RCPIPs and future activities of DPP. During the session, DPP Database has been selected as the first project of DPP. The goal of the database is to share disaster related information of member countries and to enhance the disaster reduction capability. In May 2006, the first DPP meeting has been held in Seoul, Korea. 15 experts from members and international organizations gathered to discuss purpose, items, construction and methodology of the database and formulized the 'TC DPP DB work plan'. In Macao, September 2006, case studies of the database have been overviewed and database contents have been discussed. The members formulized DPP work plan and roadmap for future activities including set up of the database.

Singapore

The development of Singapore's national Tsunami Early Warning System (TEWS) was one of the high priority projects in the year 2006. The objective was to enable Singapore to better assess potential impacts of tsunamis on the country, enhance its national preparedness and contribute to regional and international efforts to monitor and mitigate potential disasters. The establishment of TEWS has also enhanced the overall preparedness of Singapore for natural disasters through organization change and tighter operational cooperations between various agencies in Singapore. The development has resulted in some organization change. MSD-NEA has now a "Specialized Services" section whose staff are on development tasks normally and can be deployed to support the surge of operational duties when needed.

Thailand

The Department of Water Resources implemented the following activities related to flood management and drought protection.

1. The Integrated of Flood Mitigation in Chiang Rai Province Project including the construction of 21 reservoirs
2. Flood Mitigation in the North Project including construction of 21 reservoirs, Check Dam and improving the village water supply in respond to the Royal Initiative
3. Flood and Landslide Early Warning System
4. The Establishment of War Room phase II Project to cope with water crisis Focusing on the flood, drought and water pollution monitoring and assessment.
5. The Telemetering of Hydrological Network and regional center for Flood forecasting in Chi and Mun Basin

+ *The continuation of Community-Based Disaster Risk Management Project*
In the fiscal year 2006, Department of Disaster Prevention and Mitigation has conducted the Community Based Disaster Risk Management training course for people in local communities in order to enhance their disaster risk reduction capacity.

+ *Project on "Advisory Assistance to DDPM in Disaster Risk Management"*
"Advisory Assistance to DDPM in Disaster Risk Management" project, with the support from Germany's GTZ, is conducted with the main aim to reduce the loss of lives and properties from future disaster. This project is also targeted to strengthen the community awareness in disaster prevention and mitigation. Two pilot areas in tsunami and flooding in two provinces were selected for the field study. Trainers from DDPM and GTZ introduced the CBDRM practices, followed by the handover of needed equipment to both villages.

+ *OTOS Project*
DDPM has envisioned to have a search and rescue team in every tambon of Thailand or "One Tambon One SAR : OTOS". Each OTOS team will be saving not only the lives of those who face road accident but also those who are hit by any type of disaster. The objectives of the OTOS include : a) to bring the life safety to the people b) tonsure rapid and efficient search and rescue operation though 5 days extensive training and c) to setup of SAR teams in every tambon (Thailand has 7,255 tambons). The target group of OTOS programme is government officials in provincial and local government who work in the disaster management field. Volunteers working in similar environment are also welcome to join the OTOS.

+ *The new "Mr. Disaster Warning" project*
Department of Disaster Prevention and Mitigation (DDPM) launched a new project called "Mr. Disaster Warning" in July 2006. This project was jointly implemented by various government agencies related to landslide disasters, i.e Department of Provincial Administration, the Meteorological Department, Department of Mineral Resources, National Park, Wildlife and Plant Conservation Department and National Disaster Warning Center. At the initial stage the mentioned agencies jointly drafted the training course in order to review the policies from July 31st - Aug 1st, 2006 at Department of Disaster Prevention and Mitigation. Furthermore, the trainers were dispatched to train the 2 selected villagers in the flood and mudslide prone areas and assigned them as Mr. Disaster Warning. Their responsibilities are to keep close watch at water level situation, the amount of rainfalls and to report emergency by using telecommunication utilities to alert and warn people to evacuate to the safe areas immediately. The training courses were launched in the north of Thailand from August 7th, 2006 as first priority.

+ *Civil Defense Volunteers (CDVs)*
CDVs play an important role in disaster management in Thailand. Authorized by the Civil Defense Act 1979 and MOI's Civil Defense Regulations 2005, Local governments can recruit local residents with age over 18 years to have 5-days trainings and then grant them the CDV status. Roles of CDVs can be found in disaster response, relief, recovery, prevention, mitigation and preparedness. In other words, all activities in disaster management have been involved by the volunteers. CDVs have been also engaged in general activities organized by government agencies at national, provincial and local level. Normally, CDVs are not paid by the governments. They work on a voluntary basis. At present, there are around 835,000 CDVs in the country (about 1.3% of the total population). But due to the increase in number, scale and complexity of disaster, MOI has planed to increase the number of CDV to 2 millions (2% of the population) within the year 2007.

d. Training Progress

+ Many DDPM officials have attended the workshops, meetings and conferences in a number of countries in Asia, Europe and elsewhere.

+ The DDPM has sent their staffs to attend the "Disaster Management" training course in such as chemical disaster prevention and Disaster Management by Thai government fund and foreign countries.

+ DDPM's Disaster Prevention and Mitigation Academy (DPMA) has conducted a number of disaster management training courses for DDPM officials, local government staffs and volunteers. Since its establishments, DPMA has trained more than

e. Research Progress

DDPM has planned to implement a research program on landslide and mudslide in collaboration with Chiang Mai University. It is projected that the project can be launched in the fiscal year 2007.

UNESCAP

Since the December-2004 Tsunami, UNESCAP has intensified its activities on DPP on top of its ongoing and regular activities in its regional programme on water-related disasters reduction. The regular and ongoing activities of UNESCAP included the following:

a. UNESCAP in cooperation with the Asian Disaster Preparedness Centre (ADPC), the Secretariat of the United Nations International Strategy for Disaster Reduction [ISDR], and the Asian Disaster Reduction Center [ADRC] organized on 11 October 2006 the Annual Forum on Disaster Reduction to commemorate the International Day for Disaster Reduction. In this year event, other members of the ISDR Asia Partnership (IAP) participated in the commemoration.

b. In cooperation with ADPC, UNESCAP implemented and completed the third phase of the project on Partnership for Disaster Reduction in South-East Asia from 1 February 2005 to 30 April 2006 to assist five developing countries in the region: Cambodia, Indonesia, Lao PDR, Timor Leste and Viet Nam. The main focus of this phase is to assist the target countries in their efforts to institutionalize community-based disaster risk management (CBDRM) and to promote efforts to create a conducive environment in the region for these efforts. At the national level, the project has assisted respective national disaster management offices in establishing their strategic plans to institutionalize CBDRM and in developing partnership with the media and possibly the private sector. At the regional level, efforts have been made to establish a regional database on CBDRM with relevant information on the target countries, to promote the integration of CBDRM into the policies and programmes of donors on disaster risk management, and to encourage synergy among inter-governmental organizations working in the region on this subject. In this context, the Chairman of the Committee Advisory Working Group for 2006 participated in a regional consultation workshop on this subject in February 2006 along with senior officials of the ASEAN Committee on Disaster Management, the ASEAN Task Force on Haze Monitoring and Control, and the Mekong River Commission.

c. UNESCAP in cooperation with UNDP and ECLAC has agreed to extend their joint project aiming at enhancing capacity of the countries in region on applying the ECLAC methodology to assess socio-economic impacts of hydro-meteorological disasters to routine assessment. Representatives of several Committee Members participated in the Regional Workshop on Application of UNESCAP Template for Assessment of Socio-Economic Impacts of Natural Disasters, held in Bangkok in November 2006. The findings of the Regional Workshop and subsequent applications will be disseminated to all Committee Members to support their efforts in the implementation of the Committee Strategic Plan.

d. The ISDR Asia Partnership (IAP) has reiterated its intention to undertake its joint efforts to assist developing countries in the region in the formulation of their respective strategic national action plans on the implementation of the Hyogo Framework for Action (HFA). It is expected that several Members of the Committee would be included as priority targets for implementation. UNESCAP has been requested to assist in the implementation of this joint programme.

Extra activities generated by the Tsunami included the following:

e. Government of the Republic of Korea has provided a trust fund up to US$ 1 million to UNESCAP to implement pilot projects related to tsunami and other disaster preparedness to the tsunami-affected countries. Under this trust fund, a pilot community-based multi-hazard early warning system is being implemented in Sri Lanka.

f. A regional multi-donor trust fund has been established with an initial contribution of US$ 10 million by Thailand to support regional efforts in the establishment of multi-hazard early warning systems for the Indian Ocean and South China Sea. This trust fund is being administered by UNESCAP. Efforts are being made to enable the Typhoon Committee to make use of the Trust Fund to support its activities related to reduction of socio-economic impacts of typhoon-related disasters.

UN-ISDR

A representative of the UN/ISDR expressed his appreciation to the Typhoon Committee for its commitment to implement the Hyogo Framework for Action through concrete projects.

He introduced the Committee that the secretariat of the UN/ISDR will organize a first session of the Global Platform for Disaster Risk Reduction in Geneva 5-7 June 2007. The Global Platform is expected to become the main consultative forum on disaster risk reduction at the global level. It will bring together a wide range of actors in the various development sectors, humanitarian, environmental and scientific fields involved in disaster risk reduction. The Global Platform is a key component of the institutional arrangements of the International Strategy for Disaster Reduction (ISDR) system, which supports the implementation of the Hyogo Framework for Action.

The Global Platform expands on the pre-existing Inter-agency Task Force on Disaster Reduction (IATF/DR). The Global Platform broadens membership of the IATF/DR, enabling the involvement of a wider range of partners, including Governments, to participate in providing guidance for the ISDR system.

APPENDIX XIII

REPORT OF PARALLEL SESSION OF THE WGDPP

1. The WGDPP meeting was held from 11:00 to 12:00 on Dec. 4, 2006 in Manila Hotel, Manila, Philippines. The meeting was attended by 20 participants and convened by Dr. Roh Sam-Kew reviewing the activities of the Members during the past year.

2. Priority activities within the DPP component among the Members include Typhoon Committee database set up, which is agreed to called as TCDIS (Typhoon Committee Disaster Information System) as the first RCPIP of DPP, the 1st DPP meeting in Seoul and Joint Workshop in Macao, collaboration for the formulation of the session's Strategic Plans 2007-2011, and annual operation plans in 2007

3. On the basis of the information provided by the Members and the Republic of Korea, the WGDPP made plans for TCDIS and agreed to set up TCDIS using database equipment for disaster status analysis and response focusing on the early warning information. The WGDPP agreed to expand TCDIS and to make network with other organizations and related systems in the future.

4. The WGDPP expressed its appreciation to the Republic of Korea and Hong Kong, China for various efforts to promote visibility of the WGDPP and for resources mobilization including the 1st DPP meeting in Seoul and the TCDIS project.

5. The WGDPP recognized the need to implement activities of the DPP component of RCPIP in close collaboration with WGM and WGH and expressed its appreciation to UN/ISDR and ADRC for the support it provided to the Working Group on DPP during the past year and especially to the TCDIS project.

7. The Coordination Meeting is agreed to be held to finalize the TCDIS concept, design layout, application method, and enter statistics from 2005 and 2006 in the first and second quarter of 2007 and the Members' experts are to be invited to NIDP, NEMA, Korea to help develop TCDIS in the first or second quarter of 2007.

8. It was agreed to begin collecting and compiling basic statistics on early warning systems and disaster management information from the Members, then develop and implement pilot web site by the second quarter of 2007.

9. It was also agreed that a pilot web site will be needed to begin collecting and compiling disaster management information from the Members, especially focusing on the early warning systems, then developed and implemented by the second quarter of 2007.

10. The working group agreed to, if necessary, implement Expert Mission by dispatching 2-3 experts to help 2-3 Members' actual set up of TCDIS to promote the project and encourage active participation, after the Coordination Meeting and before 40th Session in 2007.

11. Fund for the TCDIS is appreciated which will be come from the Republic of Korea in kind and the working group recognize that it is necessary to promote additional DPP projects lead by the Members to enhance DPP activities and cover cross-cutting issues.

APPENDIX XIV

TERMS OF REFERENCE OF THE WORKING GROUP ON DPP

In order to coordinate efforts on the implementation of various activities under the Disaster Prevention and Preparedness Component to better support the socio-economic development process in the Typhoon Committee Area and to help accomplish the DPP related goals and objectives in the Strategic Plan, the Typhoon Committee has established the Working Group on Disaster Prevention and Preparedness (WGDPP) with the following Terms of Reference and operational modalities.

Terms of Reference

The WGDPP will promote cooperation among the Members in the implementation of activities under the Disaster Prevention and Preparedness Component of the Committee's Strategic Plan with the aim to support the socio-economic development process and enhance cooperation among the Members in all three components. Towards this end, the WGDPP is expected to advise and assist the Committee in:

- Identifying priority issues and areas of cooperation in the Disaster Prevention and Preparedness Component;
- Promoting and facilitating the exchange of experiences and knowledge on latest developments and techniques related to the above issues and areas;
- Coordinating and implement priority activities and programmes of the Committee aiming at strengthening capacity of the Members in Disaster Prevention and Preparedness;
- Mobilizing resources to carry out priority activities of the Committee related to the Disaster Prevention and Preparedness Component;
- Reporting overall progress in the implementation of the DPP component of the Strategic Plan; and
- Recommending to the Committee priority areas, programmes and activities for cooperation in Disaster Prevention and Preparedness research by related experts of the Members.

Membership

The WGDPP will consist of the following members:

- Dr Roh Sam-Kew, Republic of Korea as Chairperson
- Dr M.C. Wong, Hong Kong, China; as Vice Chairperson
- Members' representatives

The Committee also requests other interested Members to take part in the working group and invite ESCAP and WMO representative to be involved in the work of this Working Group. The term of service on the WGDPP is 1 year subject to extension authorized by the Committee.

Operation modalities

In view of the limited financial resources of the TC Trust Fund, the WGDPP is expected to perform its work through email and other means. If possible without financial support, the WG members should meet during the pre-session period before the TC Session.

Reporting requirements

The Chairperson of the WGDPP is required to submit an annual report on Disaster Prevention and Preparedness activities to implement Strategic Plan DPP priority goals through the TCS to the TC Chairperson and the TC Members for their consideration under the framework of the Committee. This report will include recommendations related to priority activities to be undertaken in the coming years.

APPENDIX XV

TYPHOON RESEARCH COORDINATION GROUP

ACTIVITY REPORT IN 2006

Recent Research Activities of Members

1. Wide ranges of research activities has been carried out by Members during the intersession period, including topics associated with composite analysis of typhoon structure, intensity measurements, satellite interpretation, air-sea interaction, storm surge, numerical modeling and simulation experiment, application of ensemble, seasonal prediction of tropical cyclone. Summaries of major activities, as collected from the Member countries, are compiled in ANNEX I.

Visiting Lecturer Program

2. Roving seminars, focused on the operational meteorologists at NMHSs, have been arranged for the capacity building. The roving seminars are intended to introduce the latest technology and expertise in operational forecasting and associated services to Typhoon Committee Members, and to promote their application to reduce the disasters caused by tropical cyclone. In these roving seminars, knowledgeable experts travel to Member countries and deliver lectures focused on the subjects of current interest to operational centers. Six roving seminars were held under the visiting lecturer program in the Typhoon Committee region since 2003, which reached more than 300 participants from both the host countries as well as from overseas (Table 1).

3. Latest one was held in Hanoi Vietnam in 4-7 September 2006 on the subject of the factors to determining tropical cyclone intensification, its movement, and associated heavy rainfall and/or other local impacts, with the financial support of 14,000 USD (see Table 2) from the Typhoon Committee Trust Fund (TCTF) and voluntary support from Members. More than seventy meteorologists were attended at the seminar, including NW Pacific meteorologists from Cambodia, Hong Kong China, Korea, Laos, Malaysia, Philippines, and Thailand. The 30 forecasters came from regional and provincial offices and about 15 forecasters from the National Hydromet Forecasting Center of Vietnam. All the participants expressed their appreciation of the significance and helpfulness of the seminar. The summary of the seminar is presented in ANNEX II.

The recommendation from the lecturers and the local host are summarized as follows;

Various subjects are recommended for the future seminar, which include (1) use of Microwave data, Quickscat, TRMM with much practice or tutorial sessions, (2) quantitative precipitation forecast (QPF) technique and methodology to develop model output statistics (MOS), (3) consensus forecasting.

Practice is important element for the training, which need to stressed, for instance on the utilization of satellite imagery,

If the Typhoon Committee Trust Fund has more money, it should provide more available opportunities for forecasters from other countries to attend so that more people will benefit.
Having a small team of typhoon experts visit a national warning system and conduct an audit of their warning system. This could include systems, forecaster expertise and resources.

Utilizing forecaster exchange programs. It is very useful to visit an operational centre during an event to see how someone else goes about forecasting typhoons.

More online training options. The COMET program (http://meted.ucar.edu/topics_hurricane.php) is very good but could be encouraged to expand and focus upon what are the most important elements and perhaps have a NW Pacific component.

The competency guidelines for forecasters need to be regularly maintained to improve the skill and expertise for the warning centre.

5. It was noted from the seminar at Hanoi that there is lack of capability at some of the warning centers where MTSAT is not directly accessed. In addition, there were concerns that much of the nitty gritty of the fundamentals such as the 6h vs. 12 h weakening lag issue was not completely understood and the participants had little data to practice on.

6. The participants supported the seminars to be continued for the sharing of the benefit to more Members. TRCG propose to hold a roving seminar for 3-4 days in 2007 under the visiting lecturer program (ANNEX IV). Based on the recommendation from the roving seminar at Hanoi, the subjects for the seminar in 2007 would be (1) use of Microwave data, Quickscat, TRMM with tutorial sessions, (2) QPF technique and methodology to develop MOS, (3) consensus forecasting. Roughly USD 14,000 is requested for the invitation of two lecturers and for the support of 5-7 attendants from the neighboring countries of local host.

Table 1. Summary of major elements for the roving seminars under the visiting lecturer program. Seminar in 2006 is highlighted in bold

Venue/ Period	Topic	Lecturers & sponsor	
Seoul 20-21 Oct. 2003	1. Interpretation of typhoon forecasts provided by RSMC Tokyo; 2. Typhoon analysis and bogus vortex surgery in NWP models 3. Typhoon forecasting from short to seasonal range	Dr. Nobutaka Mannoji (Japan) Dr. H-J Kwon (Korea, Rep.)	TCTF Korea (Rep.)
Hong Kong 22-24 Oct. 2003	1. Interpretation of satellite data including microwave imagery for tropical cyclone intensity and rainfall forecasts 2. Interpretation of Doppler weather radar products; radar applications in tropical cyclone forecasting particularly for landfall cases 3. Water vapor and rain retrievals from infrared and microwave measurements; potential applications of satellite retrievals of water vapor and rain to tropical cyclone forecasting.	Dr. Mark A. Lander (USA) Dr. P.W. Li (Hong Kong China) Dr. B.-J. Sohn (Korea, Rep.)	Hong Kong China Hong Kong China Hong Kong China
Shanghai 27-29 Oct. 2003	Same as above	Dr. Mark Lander Dr. P.W. Li	TCTF TCTF
Beijing 22-24 Nov. 2004	Operational application of multi-model ensemble typhoon forecasts - Operations of the RSMC Tokyo Typhoon Center - Typhoon and Disaster - Ensemble Forecast - Storm Surge Prediction in JMA - Summary of the 2004 Typhoon Season - Understanding and Predicting Tropical Cyclone Formation in Western North Pacific - Ensemble Forecasting of Tropical Cyclones- A Review and Current Approaches	Dr. Nobutaka Mannoji Dr. Johnny Chan	TCTF TCTF
KuaraLumpur 25-27 Nov. 2004	Same as above	Same as above	Same as above
Viet Nam, 4-7 September 21, 2006	**- Physics of Tropical Cyclone Motion** **- Structure Changes of a Tropical Cyclone** **- Convection, Track and Wind Changes Associated with Tropical Cyclone Landfall** **- Principles of the Dvorak Method** **- Microwave Imagery Interpretation & Scatterometer Winds** **- Consensus Track Forecasting & BoM Tropical Cyclone Warning Centre Operations** **- Understanding and Forecasting TC Intensity**	**Dr. Johnny Chan (City University of Hong Kong, China)** **Mr. Joe Courtney (BoM, Australia)** **Dr. B.-J. Kim**	**TCTF** **TCTF** **Korea Meteorological Administration**

Table 2. Break down of financial support including TCTF (USD 13,600) for the roving seminars during 4-7 September 2006 at Hanoi Vietnam

Activities	Funding source	Rough estimate
Support six overseas participants with priority to be given to participants from neighboring countries of Vietnam such as Cambodia, China (southern city), Laos, Malaysia, Philippines, and Thailand	TCTF	Travel cost + per diem ≅ 6*($600+$500) ≅ $6,600 (may cost more up to $7,000)
Support expert services for two lecturers from neighboring country and region V (Oceania) (Dr. Johnny Chan, Hong Kong China; and Mr. Joe Courtney, Bureau of Meteorology)	TCTF	- A lump sum support of $2,500 (including a round air-ticket Hong Kong-Hanoi-Hong Kong) - A lump sum support of $3,500 (including a round air-ticket Perth-Hanoi-Perth)
Voluntary support for lecturer service from Korea Meteorological Administration (KMA), Dr. Baek Jo Kim	Korea Meteorological Administration	

TC Research Fellowship Scheme

7. The Typhoon Committee research fellowships have been awarded to researchers of Member countries to promote joint research through the exchange of visiting scientists for a short term with voluntary support by donor countries. Nine fellowships were awarded during 2001-2005, and six papers so far have been published in international journals or Typhoon Committee Annual Review (Malano et al., 2006; Peng et al., 2005; Servando et al., 2003; Wang et al., 2005; Xue, 2002; and Yu, 2005).

8. Two research fellowships have been awarded in 2006 by the Hong Kong Observatory and Korea Meteorological Administration respectively. A fellowship is offered by China Meteorological Administration. The status of the TC research fellowship scheme is summarized in Table 3. The summary of the activity of the TC fellow Mr. Hoa Van Vo from the Vietnam Meteorological Service is given in Annex III, who conducted a three-month attachment programme at the Korea Meteorological Administration from June to August 2006 on the numerical simulation of typhoon RUSA with a very high resolution mesoscale model, and calibration of intensity of typhoon with Kalman filtering.

9. One of the merits of the fellowship scheme is that the fellow has a chance to co-work with the scientists in the host center, which may provide an opportunity to transfer knowledge and latest findings to operation. The fellowship has worked well on the basis of bilateral cooperation between the host and the applicant. TRCG propose to continue the scheme, and to extend the participation to more fellows from more countries.

Table 3. TC research fellowship awarded during 2001-2006 with that of 2006 highlighted in bold

Subject	Fellow	Host	Period
Analysis of evolution of landfalling tropical cyclones with a view to developing forecast guidance for wind and rain	Mr. Xue Jianjun (China)	Hong Kong Observatory	1 Feb. – 31 Mar. 2001 (2 months)
TC track forecasting with use of superensemble	Dr. Peng Taoyong (China)	Korea Meteorological Administration	15 JUN- 15 NOV 2001 (5 months)
Near real-time analysis of the wind structure of tropical cyclones	Dr. Nathaniel T. Servando (Philippines)	Hong Kong Observatory	5 May- 5 JUL, 2002 (2 months)
Numerical modelling on typhoon intensity change	Miss Yu Hui (China)	Typhoon Research Center, Kongju Nat'l University / Korea Meteorological Administration	15 Jul.-15 Sept. 2002 (2 months)
Tropical cyclone track forecasting method	Dr. Bom Jin Kang, Dr. Tae Jin Kim (State Hydrometeorological Administration, Korea DPR)	Shanghai Typhoon Institute	FEB - MAR 2001（2 months） OCT- NOV 2002（2 months）
Analyses on the responses of extratropical transition of tropical cyclone to its environment	Dr. Vicente Malano (PAGASA)	Korea Meteorological Administration	JUN –AUG, 2004 (3 months)
Effect of tropical cyclone bogusing on model analysis and forecasts	Ms. Wang Dongliang, Shanghai Typhoon Institute	Hong Kong Observatory	11 Oct. – 10 Dec. 2004
Evaluation of the model performance in typhoon prediction in the high-resolution global model (T426L40)	Ms Sugunyanee Yavinchan, Thai Meteorological Department	Typhoon Research Center, Kongju Nat'l University / Korea Meteorological Administration	1 Aug. – 30 Oct. 2005
Impact study of Moisture Data on TC Forecasting in South China Sea and Western North Pacific	Dr. Vicente B. Malano, PAGASA	Hong Kong Observatory	20 Sept. – 19 Nov. 2005
Using ensemble prediction system (EPS) information in tropical cyclone forecasting	**Ms. Chen Peiyan, Shanghai Typhoon Institute, China**	**Hong Kong Observatory (HKO)**	**13 Oct - 12 Dec 2006**
numerical simulation of typhoon RUSA with a very high resolution mesoscale model, and calibration of intensity of typhoon with Kalman filtering	**Mr. Vo Van Hoa , Viet Nam**	**Korea Meteorological Administration**	**June-August 2006**
Consensus forecasting or analysis of typhoon structure, etc.		**China Meteorological Administration**	**3 months**

Update of Research Priorities

The priorities of research subjects in the Typhoon Committee region are regularly updated through the annual planning process of Typhoon Committee, and through the E-mail surveys and regional workshops. They cover a wide range of areas and will be pursued in the coming years. The Major subjects are presented in Table 4.

Table 4. Major research subjects considered as high priorities by Typhoon Research Coordination Group as of 2005, which need to be updated

Meteorology

(1) conduct an intensive observing experiment and its application
(2) improve application of Dvorak technique extending to blend microwave imagery
(3) utilize ensembles of guidance from dynamical models, conceptual models, and statistical models
(4) conduct experiment with high resolution numerical models and data assimilation
(5) investigate intensity problem associated with storm-surge, heavy rainfall and interacting with other circulation system such as monsoon, formation and extratropical transition, and relation with ENSO

Meteorology and Hydrology

(6) apply Ensemble Prediction System methods on flood forecasting
(7) conduct experiment with hydrological model coupled with land surface model
(8) apply soil water index

Meteorology and DPP

(9) develop technical procedures to convert probabilistic information into deterministic instruction
(10) conduct disaster impact study
(11) integrate GIS with forecast information

Proposed Activities in 2007

The Committee is invited to review the proposal for the roving seminar in 2007, as discussed under the paragraph 6 of this document.

The Typhoon Committee fellowship scheme has been maintained since 2002. It is desired to continue the scheme in the current format. The Members are encouraged to offer or to participate on short or long term fellowships under the scheme.

The list of resource person is useful to stimulate researchers to exchange knowledge and expertise with experts in the field through Internet or other communication channels. The list of resource person or contact point has been updated, and summarized in Appendix IV. The Members are invited to confirm and to update the list for the exchange of information among experts in various fields on tropical cyclone.

14. The regional views, as identified from the workshop on effective tropical cyclone warning (Shanghai, 24-28 April 2005), would be addressed to the IWTC-6 (Costa Rica, 20-30 November 2006) by the Chair of TRCG.

Membership

15. The TRCG was set up in 1996 following the decision of the 28th session of Typhoon Committee. A number of membership changes have been notified to the TRCG chairman since 2003. The current composition is:

Chair: Mr. Woo-Jin Lee, Rep. of Korea

Vice Chair: Mr. Edwin S.T. Lai, Hong Kong, China

Members: Ms. Seth Vannareth, Cambodia
Ms. Tian Cuiying, China
Mr. Kang Bong Jin, DPR Korea
Mr. Mitsuru Ueno, Japan
Mr. Manoloth Soukhanouvong, Lao PDR
Mr. Ku Chi Ming, Macao, China
Mr. Subramaniam Moten, Malaysia
Dr. Vicente B. Malano, Philippines
Ms. Yihong Hu, Singapore
Mr. Sampan Thaikruawan, Thailand
Mr. Joel Cline, USA
Ms. Duong Lien Chau, Vietnam

References

Malano, V.B., W.K. Wong and E.S.T. Lai 2006: Effect of Moisture Data to the Numerical Simulation of Tropical Cyclone in the Western North Pacific. Submitted to Typhoon Committee Annual Review 2005.

Peng, T.-Y., H.-J. Kwon, W.-J. Lee, and J.-H. Lim, 2005: A systematic approach to tropical cyclone track. *The International Journal of Systems & Cybernetics.* **34**, 681-693.

Servando, N.T., P.W. Li and E.S.T. Lai, 2003: Near Real-time Analysis of the Wind Structure of Tropical Cyclones. Typhoon Committee Annual Review 2002 (in CD form)

Wang, D.L., W.K. Wong and E.S.T. Lai, 2005:A Study on Tropical Cyclone Bogussing Strategies in NWP Model Analysis and Forecast. Typhoon Committee Annual Review 2004.

Xue, J.J., 2002: Structural and Diagnostic Analyses of Landfalling Tropical Cyclones near Hong Kong in 1999 and 2000. Typhoon Committee Annual Review 2001, pp. 153-161

Yu, Hui and H. Joe Kwon, 2005: Effect of TC–Trough Interaction on the Intensity Change of Two Typhoons. *Weather and Forecasting.* **20**, 199–211.

China Meteorological Administration (CMA) Research Activities in 2006

The research progresses made in past year focus on typhoon structure, typhoon rainfall and typhoon climate etc.

Various high resolution data were applied to reveal typhoon structure in the past year. For example, with real-time intensive data, the boundary layer turbulence structures of three typhoons were investigated during their landfalling processes. And based on TRMM satellite remote sensed data, the cloud system structure of a typhoon and its different rainfall particle distributions were displayed in detail. Moreover, using the Penn State University/National Center for Atmospheric Research mesoscale model MM5 with 3 km grid horizontal spacing on the finest nested mesh, typhoon Winnie(1997) was successfully simulated and the dynamic and thermal structure of its concentric eyewalls was studied based on the model output.

Typhoon heavy rainfall and its distribution are very difficult to predict correctly in operational forecasting. Drawing on the experiences of Adler-Negri,Goldenberg etc.al and combining GMS-5 IR1 TBB characteristics as well as hourly precipitation features, a preliminary method of quantitative precipitation estimation(QPE) for landfall typhoon was found. On the basis of landfalling typhoon Utor(2001), the ability of the QPE method was examined. It was found that QPE method could display the asymmetric feature of typhoon rainfall. Meso scale numerical models were implemented to study the impacts of sea-air and land-air interaction on typhoon precipitation. The MM5v3 with its TC Bogus scheme was employed to perform several sets of numerical simulation to investigate the impact of saturated wet land-air flux transfer in the boundary layer on TC sustention and rainfall. The results show that the vertical transfer of the physical quantities of the boundary layer over saturated wet land would affect the structure, intensity and rainfall of a landfalling typhoon obviously. On the other hand, two typhoons were simulated using a Mesoscale Coupled air-sea Model(MCM). It is found that the sea-air interaction throw a negative feedback function on typhoon heavy rainfall.

More attentions also were paid to the impacts of global warming on typhoon activity. Statistics show that under global warming, the decreasing trend of the frequency of landfalling typhoons in China is weaker than that in the western North Pacific. Based on analysis of the earth's surface temperature in Southern Hemisphere and the typhoon activities in the western North Pacific, the relationships between climatic warming and the frequency and intensity of tropical cyclone were investigated. Result shows that with the climatic warming in Southern Hemisphere, the frequency of tropical cyclone in the western North Pacific decreases and the intensity of the cyclone reduces in the same time. A possible mechanism is attributed to the reduction of cold wave coming from Southern Hemisphere over the western North Pacific.

Hong Kong Observatory (HKO) Research Activities in 2006

A paper on the trends in tropical cyclone intensity and potential destructiveness over the western North Pacific was accepted by Transactions of the American Geophysical Union EOS.

The results of a study on variations in tropical cyclone activity in the South China Sea were presented at the Workshop on Meteorology and Climate over South China, held in December 2005 at the City University of Hong Kong.

A report entitled "The impact of moisture data in the numerical simulation of tropical cyclones using a non-hydrostatic model", prepared by Dr. Vicente B. Malano from PAGASA after the completion of his attachment at HKO under the Typhoon Committee Research Fellowship Scheme, was submitted to the Typhoon Committee Annual Review 2005.

The following tropical cyclone related research projects were undertaken in 2006:

(a) A cooperative research project between HKO and JMA on the utilization and verification of JMA EPS tropical cyclone data for tropical cyclones over the South China Sea.

(b) A joint research project between HKO and the Physics Department of the Chinese University of Hong Kong was set up to develop a prediction scheme for tropical cyclone intensity forecast.

(c) Generation of turbulence intensity map at HKIA using LIDAR data, with application to a tropical cyclone case with turbulent flow at the airport.

(d) Large eddy simulation of turbulence intensity at HKIA, including application to a tropical cyclone episode with the largest number of turbulence reports from the pilots at HKIA.

(e) A research project on the exploration of an optimal weighting scheme for multi-model ensemble forecasting of tropical cyclone track was conducted in collaboration with the Chinese University of Hong Kong.

Tropical Cyclone Related Publications

Chan, P.W., 2006: Generation of eddy dissipation rate map at the Hong Kong International Airport based on Doppler LIDAR data. 12th Conference on Aviation, Range, and Aerospace Meteorology, American Meteorological Society, Atlanta, GA, U.S.A., 29 January – 2 February 2006.

Chan, P.W., 2006: Super-high-resolution numerical simulation of atmospheric turbulence in an area of complex terrain. 12th Conference on Mountain Meteorology, American Meteorological Society, Santa Fe, NM, U.S.A., 28 August – 1 September 2006.

Chan, P.W., C.M. Shun, and K.C. Wu, 2006: Operational LIDAR-based system for automatic windshear alerting at the Hong Kong International Airport. 12th Conference on Aviation, Range, and Aerospace Meteorology, American Meteorological Society, Atlanta, GA, U.S.A., 29 January – 2 February 2006.

Lam, C.C. and H. Lam, 2006: Analysis of high wind gusts associated with thunderstorms, tropical cyclones and monsoons. 20th Guangdong-Hong Kong-Macao Seminar on Meteorological Science and Technology, 18-20 January 2006, Macao, China.

Li, P.W. and E.S.T. Lai, 2005: Typical Characteristics of Heavy Rain over the Coastal Areas of Guangdong – A Radar Perspective. Workshop on Weather and Climate over South China, 5-7 December.

Leung, Y.K., M.C. Wu and W.L. Chang, 2005: Variations in Tropical Cyclone Activity in the South China Sea. Workshop on Meteorology and Climate over South China, City University of Hong Kong, Hong Kong, China, 5-8 December, 2005.

Malano, V.B., W.K. Wong and E.S.T. Lai, 2006: The impact of moisture data in the numerical simulation of tropical cyclones using a non-hydrostatic model, submitted to the Typhoon Committee Annual Review 2005.

Wu, M.C., K.H. Yeung and W.L. Chang, 2006: Trends in Western North Pacific Tropical Cyclone Intensity and Potential Destructiveness. Accepted by EOS.

Wong, C.F. and K.L. Kwan, 2006: Use of SLOSH Storm Surge Prediction Model in Hong Kong. The 20th Guangdong-Hong Kong-Macau Seminar on Meteorological Science and Technology, 18-20 January 2006, Macau, China.

Japan Meteorological Agency (JMA) Research Activities in 2006

1. Targeting observation sensitivity experiments for a 2004 DOTSTAR case using a singular vector method

Japan Meteorological Agency (JMA) has performed several Observation System Experiments (OSEs) for DOTSTAR (Dropsonde Observation for Typhoon Surveillance near the Taiwan Region) data of typhoon CONSON, in order to investigate the usefulness of a sensitivity analysis based on a moist singular vector method, which has been developed for typhoon ensemble forecasts planned to be operational in 2007.

Four predictions with JMA Global Spectral Model (TL319L40) were performed starting from the initial time of 12UTC 08 June 2004 when totally 16 dropsondes were dropped. The four predictions were different only in the use of the DOTSTAR data in the global 4D-Var analyses; (I) all dropsonde observations were used for making the initial condition, (II) no dropsonde was used, (III) only eight observations within a sensitive region were used, and (IV) only observations outside of the sensitive region were used.

The result shows that (I) and (III) gave similarly good forecasts while those from (II) and (IV) were not good, which suggests that the dropsonde data within the sensitive region are enough to improve the typhoon track forecasts, and that a sensitivity analysis using JMA singular vector method may be useful for targeting observations.

2. Numerical study on the heavy rainfall associated with Typhoon Meari (2004)

A heavy rainfall event occurred in the mountainous Kii Peninsula Japan, associated with Typhoon Meari in 2004, has been investigated using the JMA nonhydrostatic model (JMA-NHM) with a horizontal resolution of 1 km. It is found from the numerical study that the heavy rainfall is produced in a synergistic manner from three precipitation systems. And the following are identified as the key factor for the formation and/or maintenance of each precipitation system: a) orographic lifting of the low-level humid easterly flow over the eastern slope of the mountains in the Peninsula, b) horizontal wind shear along the boundary between two different low-level flow regions over the sea to the east of the Peninsula, and c) cold pool along the edge of precipitation system, acting as an obstacle to the low-level inflow into the system.

3. Impact of ocean heat content on the maximum intensity of typhoons

The relationship between typhoon maximum intensity and ocean heat content (OHC) is examined for all the typhoons from 1998 to 2004 using the RSMC-Tokyo best-track archived by JMA and TRMM data. In the study OHC is accumulated along the path of each typhoon during its deepening stage. It is found from the study that the correlation coefficient between the two is higher than that calculated from the sea surface temperature in place of OHC, demonstrating the importance of OHC in the development of typhoons. Furthermore, the case study of Typhoon Songda in 2004 suggests that the intensity evolution of the storm is partly attributable to the increase of OHC under its path occurred as a baroclinic ocean response to the left side of a typhoon preceding to Songda.

4. Sensitivity of simulated typhoon intensity to the formulation of momentum flux in an atmosphere-wave coupled model

In order to investigate the effect of sea state (ocean wave) on typhoon intensity, numerical experiments are carried out with an atmosphere-wave coupled model. For the study the JMA-NHM is coupled with the third generation wave model MRI-III. Since it is still unknown about the sea state dependency of momentum flux, a number of formulations for drag coefficient have been proposed so far to account for the momentum exchange between ocean and atmosphere. In the numerical study some selected formulations are tested and compared each other. The comparative study shows a strong dependency of simulated storm intensity and structure on the formulation of drag coefficient. In the coupled calculations drag coefficients largely scatter at moderate wind speeds while the scatter is relatively small at high wind speeds. It is also found that a typhoon at the mature stage is simulated weaker in the coupled system although sometimes stronger during the developing stage, compared to uncoupled simulations.

5. Characteristic evaluation of storm surge in Seto Inland Sea

Typhoon Chaba in 2004 caused large storm surges in Seto Inland Sea. The mechanism responsible for the occurrence of the storm surge has been investigated using a storm surge model. As a result, the wind set-up turned out to be a key factor in causing the storm surge. In addition, the model reasonably simulated the high surge area moving eastward along with the typhoon when the wind set-up was included in it. A close examination of the wind set-up effect on the storm surge showed a large contribution of sea topography as well as the typhoon-associated wind. The time of peak surge in Takamatsu city, where the highest storm tide was recorded during the passage of the typhoon, was about 2 hours after the typhoon was at its closest to the city and when the tide was in. The close correspondence in time between the typhoon passage and high tide is identified as the main reason why the record-breaking storm tide was observed.

6. A statistical study on extratropical transition of typhoons

Tropical cyclones (TCs) often move poleward and undergo extratropical transition (ET) in the midlatitude, associated with asymmetric wind and rainfall distributions. We examined ET events in the western North Pacific, classifying them into three categories in terms of the lower-tropospheric frontal patterns. Approximately 40% of them were organized into a warm seclusion pattern when they completed ET. Some typical events in this category occurred in the downstream of intense upper-tropospheric short wave troughs interacting with the TCs; consequently these TCs moved northward with their warm-core structure, having large impacts on relatively high latitudes including all the Japan Islands. About 10% of the ET cyclones rapidly lost their tropical characteristics in strong cold advection, apparently absorbed into vigorous pre-existing fronts. The other ET cyclones were organized into open wave frontal cyclones, although they had more characteristics of midlatitude cyclones in comparison with the TCs that were organized into the warm-seclusion pattern.

7. Statistical analysis of organized cloud clusters developed or not-developed to tropical cyclones in the western North Pacific and their warm core structure

As Early stage Dvorak analysis (EDA), Meteorological Satellite Center of Japanese Meteorological Agency has routinely watched organized cloud clusters (OCCs) in the western North Pacific with the possibility to develop into tropical storms, which are defined in Tsuchiya (2001), and logged their locations and T-numbers from 2002.

In this study, using the results of EDA, OCCs were classified into three groups such as OCCts, OCCtd and OCCl. OCCts are OCCs, which finally developed into tropical storms. OCCtd and OCCl are OCCs that stayed at the stage of tropical disturbance and low-pressure area, respectively, and finally disappeared. At first, their frequency, geographical genesis locations, their durations, and so on were statistically analyzed. In addition to the analysis, their environmental parameters were also investigated according to Zehr (1992) with the re-analysis data of JRA-25.

The three dimensional air temperature structures of OCCs in 2004 were retrieved from observational data of Advanced Microwave Sounding Unit. From case studies, it was discovered that OCCts had warm core structure with the air temperature anomaly more than 0.9 K before they became tropical storms. Considering warm core structure in OCC as precursor of tropical storm, the lead-time was 26.5 hours. On the other hand, 90 % of OCCl had no clear warm core structure.

Korea Meteorological Administration (KMA) Research Activities in 2006

A Tide/Storm Surge Model (TSSM) has been on operation at KMA since July 2006. Its horizontal resolution is 1/4 degree by 1/5 degree. It provides surge height for up to 48 hours in advance, incorporating bathymetry, ocean current, and other local effects. Various sensitivity experiments were carried out to understand the role of convective parameterization on the track and intensity of tropical cyclone under the high resolution mesoscale model framework. Kalman filtering techniques has been applied on the statistical interpretation of model tracks and intensity. The relationship between SST and change of TC intensity are analyzed, and used for the design of seasonal prediction tools for tropical cyclone. Typhoon genesis parameter has been developed and applied to the forecast of formation of typhoon since this summer. The parameter is determined from the combination of ten factors including sea surface temperature, upper level divergence, and vertical shear. A post analysis study is going on to decide the critical value of the parameter for the formation of tropical depression and for the genesis of tropical cyclone.

SUMMARY OF ROVING SEMINAR 2006

Dr. Duong Lien Chau

(Ha Noi, Viet Nam, 04-07 September 2006, ESCAP/WMO Typhoon Committee)

I. Organization

1. The Roving Seminar of ESCAP/WMO Typhoon Committee was held in The Hall of Sunway Hotel, Ha Noi, Socialist Republic of Viet Nam, from 04-07 September 2006

2. The Seminar was attended by a total 75 participants, which included 3 lecturers from Hong Kong, China, Australia, Republic of Korea, 07 participants from Cambodia; Hong Kong, China; Lao PDR; Malaysia; Philippines; Thailand and 65 local participants. (The list of participants is given in Appendix I

II. Opening

The opening ceremony was declared open by Dr. Bui Van Duc, Director – General of the National Hydro – Meteorological Service, Ministry of Natural Resources and Environment, Socialist Republic of Viet Nam at 8.40 hrs on Monday, 04 September 2006 in Sunway Hotel, Ha Noi. (Appendix II)

The following statement was delivered by Dr. Johnny Chan, City University of Hong Kong, Hong Kong, China.

III. Adoption of the Program

The Seminar adopted the Program as shown in Appendix III

IV. Working Seminar

1. 07 participants presented the hydro - meteorological forecasting status of their countries.

2. After the Country Reports, Professor Johnny Chan presented 3 lectures aimed at enhancing the participants understanding on the theoretical aspects of tropical cyclone formation. These lectures included topics on the physics of tropical cyclone motion; Structure Changes of a Tropical Cyclone; and Convection, Track and Wind Changes Associated with Tropical Cyclone Landfall.

3. Mr. Baek Jo Kim, Head of Typhoon Research Team, Korea Meteorological Administration gave the lecture on Understanding and Forecasting Tropical Cyclone Intensity Change – Recent Operational and Research Activities.

4. The last lectures were given by Mr. Joe Courtney from the Australian Bureau of Meteorology. The lectures included topics on Dvorak interpretation, Microwave imagery interpretation; Quickscat interpretation; Consensus Track forecasting techniques and Operational Tropical Cyclone Procedures in the Bureau of Meteorology.

The participants expressed their thanks to the lecturers for their high standard presentations which helped to improve their knowledge on tropical cyclones. The combination of theoretical and practical techniques was highly appreciated by participants.

V. Discussion and Recommendations

Mr Chan: City University of Hong Kong: suggested the next roving seminar include hands-on practical use of remote sensing techniques for tropical cyclone forecasting. He also suggested a focus on the formation of tropical cyclones close to land.

Mr Kim: Suggested that the next roving seminar include training on use of surface observations and radar to locate the tropical cyclone position. He also suggested that the lecture notes be distributed in the native language of participants.

Mrs Chau: In addition to Dr Chan's suggestion of practical use of remote sensing techniques, suggested training on the use of all available information for tropical cyclone forecasting in general.

Mrs Phuong: Asked for more roving seminars to be held in Vietnam.

Mrs Vennereth: Suggested to include in roving seminar topics on tropical cyclones in the Indian Ocean and ENSO phenomena relationship with tropical cyclones and rainfall.

Mr Courtney: Suggested topics on forecasting rainfall associated with tropical cyclones and the monsoon.

VI. Closure of the Seminar

The participants from the Members of the Typhoon Committee expressed their thanks and appreciation to the Government of Viet Nam, the national Hydro-Meteorological Service (NHMS) of Viet Nam for the successful hosting of the Roving Seminar and staff of NHMS for the excellent arrangements made to ensure the success of the Seminar

The Seminar was closed by 5pm on Wednesday 7 September 2006.

Fig. 1. Group photo of the lecturers and participants of the Typhoon Committee Roving Seminar in Hanoi(4-7 September 2006).

RESEARCH ACTIVITY UNDER THE TYPHOON COMMITTEE RESEARCH FELLOWSHIP SCHEME DURING JUNE - AUGUST 2006 BY MR. HAO VAN VO

APPLICATION OF KALMAN FILTER FOR ADJUSTING TRACK AND INTENSITY FORECASTS OF TYPHOON EWINIAR (0603)

Hoa[1] Van Vo, Baek-Jo Kim[2]
[1]Research and Application Division, National Center for Hydro-Meteorological Forecasts, Viet Nam
[2]Typhoon Research Team, Meteorological Research Institute, Korea

Abstract

Recently, Kalman Filter (KF) technique has been used widely for applications in many disciplines. In meteorology, particularly in post-processing sections, Kalman filter has been used mainly for adjusting forecasted temperature and the surface wind magnitude, which are essentially scalar quantities. However, in this work, we attempt to assess the effectiveness of a simple Kalman filter to adjust the track and intensity forecasts from numerical models and guidance from international meteorological centers. The physical basis of this approach is that the error patterns of models and/or the interpretation of forecasters in representing the effects of environment on storm motion and intensity as well as the tropical cyclone itself are likely to evolve gradually from one base time to another for the same cyclone. The main content of this article includes a brief description of our method for applying KF for tropical cyclones track and intensity and some preliminary results for typhoon EWINIAR (0603) that directly affected Korea peninsula in 2006. The analysis on these first results showed some encouraging signs that KF may be used to improve the predictions of tropical cyclone track and intensity.

A sensitivity of the simulations of typhoon Rusa (0215) to cumulus parameterization schemes in WRF modeling system

Hoa[1] Van Vo
[1]Research and Application Division, National Center for Hydro-Meteorological Forecasts, Viet Nam

The purpose of this report is to estimate the sensitivity of simulation of the typhoon to cumulus parameterization (CP) schemes by using WRF modeling system. In this report, we studied three cases on typhoon Rusa. The simulation is based on the analysis data obtained at three base times including 00UTC August 29 2002, 12UTC August 29 2002 and 00UTC August 30 2002. A number of experiments were carried out using three CP options , namely, the Bett-Miller-Janjic, Kain-Fritsch and Grell-Devenyi schemes. The major finding of this research is that the track and intensity along with predicted rainfall and wind field of the typhoon Rusa is more sensitive to the choice of CP schemes. The analysis results of the initial field error showed that the analysis vortex in the initial field of KMA global model is weaker than the observation. In term of track forecast, the BMJ and KF scheme is better than GD scheme. In average, the track forecast error of BMJ scheme is the smallest than another ones, specially is long forecast range. The intensity forecast of all scheme is incorrect due to the initial error and it is difficult to recognize which is the best experiment. The verifications of rain rate forecast indicated that the BMJ and KF is over-estimated. While, the predicted rain rate from GD scheme is under-estimated. In general,

the rain forecast skill of BMJ and KF is better that GD scheme, specially is in forecast of heavy rain area. For wind speed forecast, the predicted wind speed from BMJ and KF scheme is usually stronger than the observation at an average rate of 4-20m/s. Otherwise, the predicted wind field of GD scheme is often under-estimated. In summary, the BMJ scheme can be chosen as the best experiment in this study.

VISITING LECTURER PROGRAM

Definition

The visiting lecturer program may consist of several roving seminars taking place at different countries, and each roving seminar may consist of number of lectures given by number of lecturers from overseas and/or local services.

Objective

The aim of the visiting lecturer program is to stimulate research and development activities in the region by providing lectures focused on the regional perspective in operational environment from knowledgeable experts visiting the region.

Guideline for Implementation

Approach

A few knowledgeable experts could visit Members in the region and provide lectures on topics with common regional interest. The program can be extended such that those interested gathered together to a common place to receive the lectures.

Lecture Service, Duration, and Topics

Depending on the circumstances and resources available, number of lecturers would be invited to visit operational centers in the region for a few days, preferably about 2-3 days, and to give lectures on the urgently needed topics based on the research priorities under Regional Cooperation Programme Implementation Plan. For instance, (a) interpretation of satellite data including microwave imagery for intensity forecasting including rainfall amount, (2) use of radar data in operational tropical cyclone forecasting particularly for landfall case, (3) interpretation of NWP model output for typhoon analysis and forecasting, (4) operational application of multi-model ensemble technique, and (5) quantitative precipitation forecasting

Resource

In principle, the Typhoon Committee Trust Fund (TCTF) is devoted to the expert services and possibly extended to the support for the limited number of participants. The hosting organization provide venues and other facilities and possibly for the invitation of some experts or trainees in the neighboring countries. The participating Members may also contribute part of the traveling cost or per diem.

Hosting organization

Members are invited to host a roving seminar turn by turn, considering the efficiency and effectiveness with moderate investment for the benefit of all Members.

CD-ROMs

It is desired that the CD-ROMs of the lecture note be distributed to the members as an information particularly for those who could not attend the roving seminars.

List of Resource Persons or Contact Points (as of 2 March 2004)

Field	Specialties	Name	E-mail	Affiliation	Members
Data Assimilation	TC vortex initialization	Xuedong Liang	Liangxd@mail.typhoon.gov.cn	Shanghai Typhoon Institute/CMA	China
	TC intensity estimation by rarad,satellite,SSMI and Quikscat	Gao Shuanzhu Zhou Bing	gaosz1129@sina.com bingz@cma.gov.cn	National Meteorological Center/CMA National Meteorological Center/CMA	China China
	Radar data quality control and assimilation scheme	Gong Jiandong	gongjd@cma.gov.cn	National Meteorological Center/CMA	China
	Tropical cyclone data assimilation	Linus H.Y. Yeung	hyyeung@hko.gov.hk	Hong Kong Observatory	Hong Kong China
	TC vortex initialization	Mitsuru Ueno Masaru Kunii	mueno@mri-jma.go.jp mkunii@mri-jma.go.jp	MRI/TRD	Japan
	satellite data analysis	Tetsuo Nakazawa	nakazawa@mri-jma.go.jp	MRI/TRD	
	TC intensity estimation	Tetsuo Nakazawa	nakazawa@mri-jma.go.jp	MRI/TRD	
	Data analysis related to extratropical transition	Naoko Kitabatake	nkitabat@mri-jma.go.jp	MRI/TRD	
	typhoon bogusing	Hee-Dong Yoo	hyoo@kma.go.kr	Typhoon Forecast Div. /KMA	Korea (Rep.)
	Typhoon bogusing	Kwon, H. Joe	hjkwon@kongju.ac.kr	Prof. Kongju National University	
	satellite data analysis	Kim, Kum-Lan	kkl@kma.go.kr	Remote sensing Div./KMA	

Field	Specialties	Name	E-mail	Affiliation	Members
	radar data analysis	Lee, Jong-Ho	jhlee@kma.go.kr	Observation Div./KMA	
Modelling	Numerical schemes of TC model	Yihong Duan	duanyh@mail.typhoon.gov.cn	Shanghai Typhoon Institute/CMA	China
	TC model physics and bogussing schemes	Ma Suhong	mash@cma.gov.cn	National Meteorological Center/CMA	China
	Ensemble track forecasting	Xiaqiong Zhou	zhouxq@mail.typhoon.gov.cn	Shanghai Typhoon Institute/CMA	China
	Typhoon modelling	Xudong Liang	Liangxd@mail.typhoon.gov.cn	Shanghai Typhoon Institute/CMA	China
Modelling	Tropical cyclone modelling and bogussing schemes	W.K. Wong	wkwong@hko.gov.hk	Hong Kong Observatory	Hong Kong China
	numerical schemes of TC model	Wataru Mashiko	wmashiko@mri-jma.go.jp	MRI/TRD	Japan
	physical processes of TC model	Mitsuru Ueno Akihiko Murata	mueno@mri-jma.go.jp amurata@mri-jma.go.jp	ditto	Japan
	TC-ocean interaction (incl. mixed-layer ocean modeling and ocean surface wave modeling)	Nadao Kohno Akiyoshi Wada	nkohno@mri-jma.go.jp awada@mri-jma.go.jp	ditto	Japan
	storm surge modeling	Nadao Kohno	nkohno@mri-jma.go.jp	MRI/TRD	Japan
	typhoon modelling	Hee-Dong Yoo	hyoo@kma.go.kr	Typhoon Forecast Div.	Korea (Rep.)
	ensemble track forecasting	Hee-Dong Yoo	hyoo@kma.go.kr	ditto	
	global NWP model tracks	Hee-Dong Yoo	hyoo@kma.go.kr	ditto	

Field	Specialties	Name	E-mail	Affiliation	Members
	Typhoon modelling	Kwon, H. Joe Baik, Jong-Jin	hjkwon@kongju.ac.kr jjbaik@snu.ac.kr	Prof. Kongju National University Dept. Atmos., Seoul National University	
Forecasting	Track and intensity forecasting	Xiaotu Lei	Leixt@mail.typhoon.gov.cn	Shanghai Typhoon Institute/CMA	China
	Long-range prediction of typhoon	Ming Xu	Xum@mail.typhoon.gov.cn	Shanghai Typhoon Institute/CMA	China
Forecasting	Tropical cyclone climatology and best track analysis	T.C. Lee	tszclee@hko.gov.hk	Hong Kong Observatory	Hong Kong China
	Tropical cyclone intensity, structure and landfall impact	Edwin S.T. Lai	stlai@hko.gov.hk	Hong Kong Observatory	
	Long-range forecasting of tropical cyclones	S.M. Lee	smlee@hko.gov.hk	Hong Kong Observatory	
	Tropical cyclone motion, intensity, size, modelling and seasonal prediction	Johnny C.L. Chan	Johnny.Chan@cityu.edu.hk	Department of Physics & Material Sciences, City University of Hong Kong.	
	track and intensity forecasting	Hee-Dong Yoo	hyoo@kma.go.kr	Forecast Management Div./ KMA	Korea(Rep.)
	long-range prediction of typhoon	Kwon, H. Joe	hjkwon@kongju.ac.kr	Dept. Atmos., Kongju National University	
	track and intensity forecasting	Kwon, H. Joe Baik, Jong-Jin Sohn, Keon-Tae	hjkwon@kongju.ac.kr jjbaik@snu.ac.kr ktsohn@pusan.ac.kr	Dept. Atmos., Kongju National University Dept. Atmos., Seoul National University Dept. of Statistitcs, Pusan National University	

Field	Specialties	Name	E-mail	Affiliation	Members
	long-range prediction of typhoon	Sohn, Keon-Tae	ktsohn@pusan.ac.kr	Dept. of Statistitcs, Pusan National University	
	seasonal prediction of typhoon	Lim Tian Kuay	LIM_Tian_Kuay@nea.gov.sg	Meteorological Services Division, National Environment Agency	Singapore
Application	Tropical cyclone warning system	Hilda Lam	hildalam@hko.gov.hk	Hong Kong Observatory	Hong Kong China
	Tropical cyclone warning operations	M.C. Wong	mcwong@hko.gov.hk	Hong Kong Observatory	
	Tropical cyclone information visualization and display systems	C.M. Tam	cmtam@hko.gov.hk	Hong Kong Observatory	
	To be extended to cover hydrology & disaster prevention and preparedness				

KMA: Korea Meteorological Administration
METRI: Meteorological Research Institute
MRI : Meteorological Research Institute
TRD : Typhoon Research Division

APPENDIX XVI

TERMS OF REFERENCE OF THE TRAINING AND RESEARCH COORDINATING GROUP (TRCG)

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

Terms of Reference

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

- Identifying scientific and technical problems in the analysis and forecasting of tropical cyclones and their impacts on water resources and measures for disaster prevention and preparedness;
- Facilitating the exchange of experiences and knowledge on latest development and techniques related to the above problems;
- Initiating activities and programmes aiming at improving the technical capacity and capability of Members to better serve the people in the region; and
- Recommending to the Committee priority areas and long-term plans for cooperation in research and training in support of the various KRAs of the Committee's Strategic Plan.

Membership

The TRCG will consist of a focal point of all the Members. The Director of the RSMC and all of the Chairpersons of the TC Working Groups can take part in the deliberations of the TRCG in their ex-officio capacity. The current Chairman of the TRCG is Mr. Edwin S.T. Lai of Hong Kong, China and Vice Chair is Mr. Mitsuru Ueno of Japan. The term of service of the TRCG is one year subject to extension authorized by the Committee.

Operation modalities

In view of the limited financial resources of the TC Trust Fund, the TRCG is expected to communicate through email and other means which require no financial resources from the Trust Fund. All submission for consideration by TRCG will have to be made through the focal point of each Member or through the Chairmen of the Working Groups established by the Committee. The TCS is requested to transmit all materials related to TRCG to the Working Group Chairmen. If possible without financial support, the TRCG members should meet during the pre-session period before the TC Session.

Reporting requirements

The Chairperson of the TRCG is required to submit an annual report on research and training activities to implement RCPIP three components priority goals through the TCS to the TC Chairperson and the TC Members for their consideration under the framework of the Committee. This report will include recommendations related to priority activities to be undertaken in the coming years.

APPENDIX XVII

SUMMARY OF THE 2006 TYPHOON SEASON

As of 6 November, 19 tropical cyclones of tropical storm (TS) intensity or higher formed in the western North Pacific and the South China Sea in 2006. The total number is less than the 30-year average* frequency of 23.0 by the end of October. Out of 19, 12 cyclones reached typhoon (TY) intensity, three severe tropical storm (STS) intensity, and four TS intensity (see Table 1).

Table 1 List of tropical cyclones which attained TS intensity or higher in 2006

Tropical Cyclone			Duration (UTC)			(UTC)	Minimum Central Pressure (UTC)	(N)	(E)	(hPa)	Max Wind (kt)
TY	CHANCHU	(0601)	091200 May	-	190000 May		150000	14.1	115.4	930	95
TS	JELAWAT	(0602)	271200 Jun	-	290000 Jun		280600	19.6	111.8	996	40
TY	EWINIAR	(0603)	301800 Jun	-	101200 Jul		041200	16.8	132.2	930	100
STS	BILIS	(0604)	090600 Jul	-	150600 Jul		130600	23.7	123.1	970	60
TY	KAEMI	(0605)	191200 Jul	-	260000 Jul		211200	16.1	131.7	960	80
TY	PRAPIROON	(0606)	010600 Aug	-	050000 Aug		021200	19.2	113.7	970	65
TY	MARIA	(0607)	051800 Aug	-	100600 Aug		061800	28.8	139.7	975	70
TY	SAOMAI	(0608)	051200 Aug	-	110000 Aug		091200	25.4	125.3	925	105
STS	BOPHA	(0609)	061200 Aug	-	090600 Aug		080000	23.3	125.1	980	55
STS	WUKONG	(0610)	130000 Aug	-	191200 Aug		141800	27.6	138.2	980	50
TS	SONAMU	(0611)	140000 Aug	-	150600 Aug		140600	18.8	131.4	992	35
TY	IOKE	(0612)	271200 Aug	-	061800 Sep		300000	16.6	171.3	920	105
TY	SHANSHAN	(0613)	101200 Sep	-	181200 Sep		151500	23.6	123.8	919	110
TY	YAGI	(0614)	170600 Sep	-	250600 Sep		211200	21.5	146.2	910	105
TY	XANGSANE*	(0615)	260000 Sep	-	020000 Oct		270600	12.9	124.6	940	90
TS	BEBINCA*	(0616)	030000 Oct	-	060000 Oct		060000	29.0	139.0	986	40
TS	RUMBIA*	(0617)	031200 Oct	-	060600 Oct		040600	21.9	152.5	985	45
TY	SOULIK*	(0618)	091800 Oct	-	161200 Oct		140600	24.8	140.9	955	75
TY	CIMARON*	(0619)	270600 Oct	-	060000 Nov		290300	16.2	124.1	910	105

*results based on operational analysis data (not post-analysis data).

The tropical cyclone season of this year began in May with the formation of CHANCHU (0601). While convective activity was slightly inactive around the Philippines mostly in June, it turned active over the sea east of the Philippines from late June to early August. In addition, subtropical high was more enhanced than normal over the south of Japan from May to early August. Consequently, most tropical cyclones formed over the sea east of the Philippines after late June, and many of them moved westwards to China (shown in Figure 1). CHANCHU (0601), BILIS (0604), KAEMI (0605), PRAPIROON (0606) and SAOMAI (0608) brought damage to China, the Philippines, and Vietnam. On the other hand, EWINIAR (0603) moved northwards and hit the Republic of Korea, causing damage to the country.

From late August to early September, convective activity was temporarily inactive over the sea east of the Philippines. However, it turned active again after late September. Subtropical high was weak over the south of Japan after late August. Therefore, most tropical cyclones formed over the sea east of the Philippines and moved northwards (shown in Figure 2). WUKONG (0610) and SHANSHAN (0613) hit Japan to bring damage to the country. On the other hand, XANGSANE (0615) and CIMARON (0619) moved westwards in the South China Sea, causing damage to the Philippines, Thailand, and Vietnam. In addition, IOKE (0612) was the first named cyclone formed in the central North Pacific and moved westwards across longitude 180 degrees east after HUKO (0224).

Figure 1 Tracks of named cyclones formed before 10 August

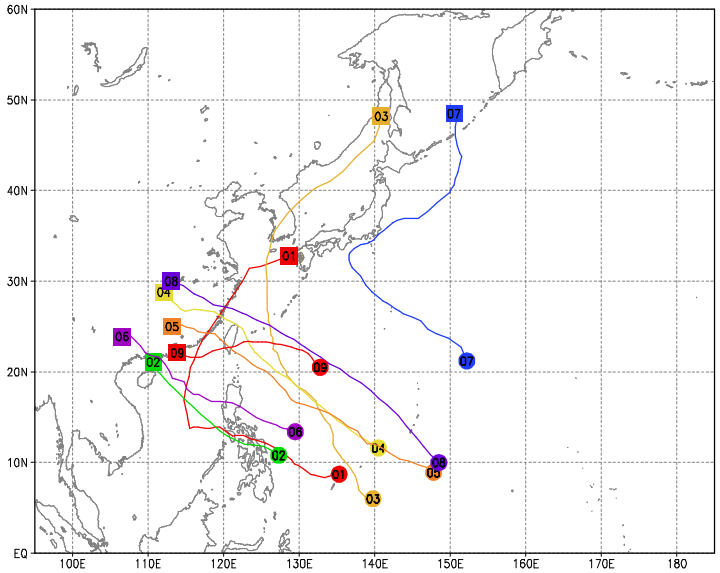
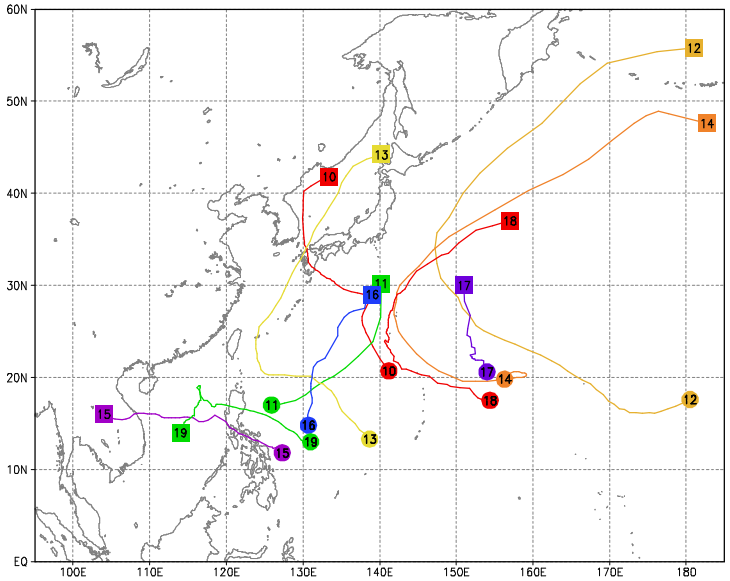


Figure 2 Tracks of named cyclones formed after 10 August

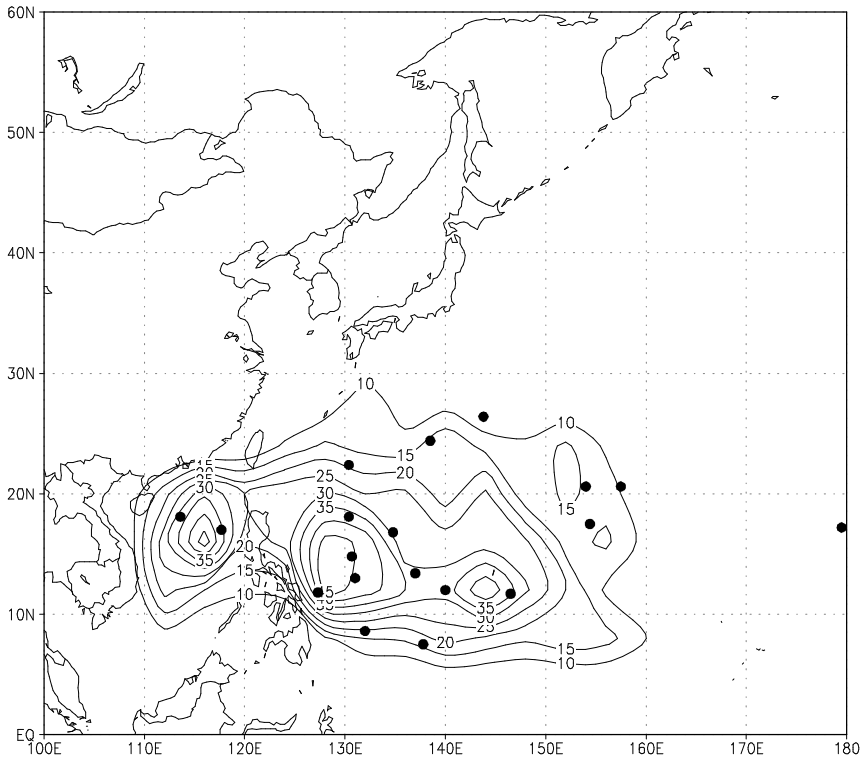


In 2006 (as of 6 November), the mean formation latitude and longitude**, calculated excluding IOKE (0612), was 16.4ºN and 136.5ºE, almost the same as the 30-year average* of 16.2ºN and 136.9ºE, respectively.

Figure 3 Genesis points of 19 TCs generated in 2006 (dots) and frequency distribution of genesis points for 1951-2005 (lines)

* *30-year average from 1971 to 2000*

** *Mean formation latitude (longitude) here is defined as arithmetic average of latitudes (longitudes) of formation points of all the tropical cyclones of TS intensity or higher.*



NARRATIVE ACCOUNTS OF TROPICAL CYCLONES IN 2006

Accounts of 14 named tropical cyclones from CHANCHU (0601) to YAGI (0614) and 5 cyclones from XANGSANE (0615) to CIMARON (0619) are prepared using post-analysis data and operational analysis data, respectively. Operational analysis data are limited to ones during the period of tropical cyclone of TS intensity or higher.

CHANCHU (0601)

CHANCHU formed as a tropical depression (TD) over the sea west of the Caroline Islands at 06UTC on 8 May 2006. Moving westward, it developed into a tropical storm (TS) over the sea east of Mindanao Island at 12UTC, 9 May. It moved to the west-northwest and then was upgraded to severe tropical storm (STS) intensity over the same waters at 12UTC, 10 May. From late 11 to 12 May, it crossed the Philippines with STS intensity. CHANCHU moved westward in the South China Sea, and was upgraded to typhoon (TY) intensity at 18UTC, 13 May. Soon after it turned abruptly to the north, it attained the peak strength with maximum sustained wind of 95kt and central pressure of 930hPa over the same waters at 00UTC, 15 May. Gradually turning to the north-northeast, it was downgraded to STS intensity over the same waters at 18UTC, 17 May. Keeping the north-northeastward track along the coast of China, it was downgraded to TS intensity at 00UTC, 18 May. Then it transformed into an extratropical cyclone in the East China Sea at 00UTC, 19 May. It moved eastwards over the same waters, and then dissipated off the western coast of Kyushu at 18UTC, 19 May.

JELAWAT (0602)

JELAWAT formed as a tropical depression (TD) east of the Philippines at 06UTC on 24 June 2006. It moved west-northwestward and passed through the Philippines from 24 to 25 June. Then it turned to the northwest and developed into a tropical storm (TS) in the South China Sea at 12UTC, 27 June. Keeping the northwestward track, JELAWAT attained the peak intensity with maximum sustained wind of 40kt and central pressure of 996hPa at 06UTC, 28 June. Then it weakened into a TD and then dissipated off the coast of the southern China at 00UTC and 06UTC on the next day, respectively.

EWINIAR (0603)

EWINIAR formed as a tropical depression (TD) over the sea around the Caroline Islands at 06UTC on 29 June 2006. Moving northwestward, it developed into a tropical storm (TS) over the same waters at 18UTC, 30 June. Keeping the track to the northwest, it was upgraded to typhoon (TY) intensity and then attained the peak strength with maximum sustained wind of 100kt and central pressure of 930hPa over the sea east of the Philippines at 00UTC, 3 July and 12UTC, 4 July, respectively. EWINIAR gradually turned to the north and approached the Nansei islands with TY intensity on 8 July. It moved to the north and was downgraded to severe tropical storm (STS) intensity in the East China Sea at 18UTC, 9 July. Crossing the Korean Peninsula to the northeast, it was downgraded to TS intensity and then transformed into an extratropical cyclone at 06UTC and 12UTC on the next day, respectively. It kept the track to the northeast in the Japan Sea, and dissipated over the same waters at 00UTC, 13 July.

BILIS (0604)

BILIS formed as a tropical depression (TD) over the sea northeast of Yap Island at 06UTC on 8 July. It moved west-northwestwards and developed into a tropical storm (TS) over the sea north of Yap Island at 06UTC, 9 July. Keeping the track to the west-northwest, it was upgraded to severe tropical storm (STS) intensity over the waters east of the Philippines at 18UTC, 10 July. BILIS reached the peak intensity with maximum sustained wind of 60kt and central pressure of 970hPa south of Yonagunijima Island at 06UTC, 13 July. After passing off the northern coast of Taiwan Island, it made landfall on the southern China on 14 July. Keeping the same track, it weakened into a TD and dissipated in China at 06UTC, 15 July and 00UTC, 17 July, respectively.

KAEMI (0605)

KAEMI formed as a tropical depression (TD) over the sea west of the Truk Islands at 18UTC on 17 July 2006. Moving west-northwestward, it developed into a tropical storm (TS) over the sea north of Yap Island at 12UTC, 19 July. Keeping the west-northwestward track, it was upgraded to typhoon (TY) intensity and then attained the peak strength with maximum sustained wind of 80kt and central pressure of 960hPa over the same waters at 18UTC, 20 July and 12UTC, 21 July, respectively. KAEMI turned to the northwest on 22 July and then hit Taiwan with TY intensity on 24 July. Crossing Taiwan, it was downgraded to severe tropical storm (STS) intensity at 18UTC, 24 July. After it made landfall on the southern China, it was downgraded to TS intensity at 12UTC on the next day. Moving to the west, KAEMI weakened into a TD and dissipated in the southern China at 00UTC, 26 July and 06UTC, 27 July, respectively.

PRAPIROON (0606)

PRAPIROON formed as a tropical depression (TD) over the sea east of the Philippines at 06UTC on 28 July 2006. It moved west-northwestward and passed through Luzon Island on 31 July. Then it developed into a tropical storm (TS) in the South China Sea at 06UTC, 1 August. Gradually turning to the northwest, PRAPIROON was upgraded to typhoon (TY) intensity and attained the peak intensity with maximum sustained wind of 65kt and central pressure of 970Pa at 12UTC, 2 August. It made landfall on the southern China on 3 August with TY intensity and was quickly downgraded to severe tropical storm (STS) and TS intensity there at 12UTC, 3 August and 06UTC, 4 August, respectively. It weakened into a TD and then dissipated in the same area at 00UTC and 12UTC on the next day, respectively.

MARIA (0607)

MARIA formed as a tropical depression (TD) over the sea southwest of Minamitorishima Island at 18UTC on 3 August 2006. Moving northwestward, it developed into a tropical storm (TS) over the sea east of Chichijima Island at 18UTC, 5 August. Keeping the track to the northwest, it was upgraded to typhoon (TY) intensity and then attained the peak strength with maximum sustained wind of 70kt and central pressure of 975hPa over the sea northwest of Chichijima Island at 09UTC and 18UTC on the next day, respectively. During recurvature over the sea south of Kii Peninsula early 8 August, MARIA was downgraded to severe tropical storm (STS) intensity. Then it moved east-northeastward off the southern coast of Honshu. It weakened to TS intensity at 06UTC on the next day and then transformed into an extratropical cyclone over the sea east of Japan at 06UTC, 10 August. It turned to the north and dissipated in the sea of Okhotsk at 18UTC, 14 August.

SAOMAI (0608)

SAOMAI formed as a tropical depression (TD) over the sea southeast of Guam at 00UTC on 5 August. It moved west-northwestwards and developed into a tropical storm (TS) over the same sea 12 hours later. Keeping the track to the west-northwest, it was upgraded to typhoon (TY) intensity over the waters east of the Philippines at 06UTC, 7 August, reached the peak intensity with maximum sustained wind of 105kt and central pressure of 925hPa north of Miyakojima Island at 12UTC, 9 August, and then made landfall on central China with TY intensity on the next day. Keeping the same track, it abruptly weakened into a TD and dissipated in the same area at 00UTC, 11 August and 00UTC, 12 August, respectively.

BOPHA (0609)

BOPHA formed as a tropical depression (TD) over the sea south of Minamidaitojima Island at 06UTC on 5 August 2006. Moving northwestwards, it developed into a tropical storm (TS) over the same waters at 12UTC on the next day. Then it moved to the west, it was upgraded to severe tropical storm (STS) intensity and attained the peak strength with maximum sustained wind of 55kt and central pressure of 980hPa over the sea south of the Nansei Islands at 00UTC, 7 August and 00UTC, 8 August, respectively. It moved westward weakening the intensity over the same sea, and then hit Taiwan with TS intensity late 8 August. After it crossed the southern part of Taiwan, it weakened into a TD in the South China Sea at 06UTC on the next day. Keeping the westward track, it dissipated around the coast of the southern China at 06UTC, 11 August.

WUKONG (0610)

WUKONG formed as a tropical depression (TD) over the sea south of Chichijima Island at 06UTC on 12 August 2006. Moving to the north-northwest, it developed into a tropical storm (TS) over the waters southwest of Chichijima Island at 00UTC, 13 August. After it turned to the north-northeast, it reached the peak intensity with maximum sustained wind of 50kt and central pressure of 980hPa over the sea west of Chichijima Island at 18UTC, 14 August and then abruptly turned to the west-northwest. Turning to the northwest, WUKONG made landfall on Kyushu late 17 August. After it turned to the north, it weakened into a TD in the Japan Sea at 12UTC, 19 August. It turned to the northeast and dissipated in the same sea at 12UTC, 21 August.

SONAMU (0611)

SONAMU formed as a tropical depression (TD) over the sea east of the Philippines at 00UTC on 13 August 2006. Moving eastward, it developed into a tropical storm (TS) over the same waters at 00UTC on the next day. It moved northeastward keeping the TS intensity, and then weakened into a TD over the sea around Okinotorishima Island at 15UTC, 15 August. Turning to the north, it dissipated over the sea south of Hachijojima Island at 15UTC, 16 August.

IOKE (0612)

IOKE moved west-southwestwards and crossed longitude 180 degrees east with typhoon (TY) intensity over the sea far east of Wake Island before 12UTC on 27 August 2006. It turned to the west and attained the peak intensity with maximum sustained wind of 105kt and central pressure of 920hPa over the sea southeast of Wake Island at 00UTC, 30 August. Keeping the peak intensity, it moved west-northwestwards and approached Wake Island around 12UTC on the next day. Then keeping the west-northwest track and gradually weakening the intensity, IOKE approached Minamitorishima Island before 00UTC,

3 September. After recurvature over the sea east of Japan on 5 September, it was downgraded to severe tropical storm (STS) intensity and then transformed into an extratropical cyclone at 00UTC and 18UTC, 6 September, respectively. Moving to the east-northeast, IOKE crossed longitude 180 degrees east again over the sea north of the Aleutian Islands after 06UTC on the next day.

SHANSHAN (0613)

SHANSHAN formed as a tropical depression (TD) over the sea north of Yap Island at 00UTC on 9 September 2006. Moving northwestwards, it developed into a tropical storm (TS) over the sea east of the Philippines at 12UTC on the next day. Keeping the northwestward track, it was upgraded to typhoon (TY) intensity over the same waters at 12 UTC, 11 September. Then SHANSHAN moved westwards keeping TY intensity south of Okinawa Island. Turning to the north, it developed again and attained the peak intensity with maximum sustained wind of 110kt and central pressure of 919hPa before it approached Iriomotejima Island late 15 September. After recurvature, it gradually weakened the intensity in the East China Sea and made landfall on Kyushu with TY intensity around 09UTC, 17 September. Keeping the northeastward track, SHANSHAN entered into the Japan Sea, was downgraded to severe tropical storm (STS) intensity late on the same day, and then transformed into an extratropical cyclone there at 12UTC on the next day. Moving to the east-northeast, it dissipated over the sea west of Hokkaido at 00UTC, 22 September.

YAGI (0614)

YAGI formed as a tropical depression (TD) over the sea southeast of Minamitorishima Island at 12UTC on 16 September 2006. Moving to the east, it developed into a tropical storm (TS) over the same sea at 06UTC, 17 September. After it changed the track from the east to the west, it was upgraded to typhoon (TY) intensity over the same sea at 00UTC, 19 September. Turning to the northeast, it attained the peak intensity with maximum sustained wind of 105kt and central pressure of 910hPa over the sea southeast of Chichijima Island at 12UTC, 21 September. During recurvature, it approached Chichijima Island with TY intensity late on the next day. Moving northeastwards, YAGI was downgraded to severe tropical storm (STS) intensity and then transformed into an extratropical cyclone over the sea east of Japan at 06UTC, 24 September and 06UTC, 25 September 2006, respectively. After it moved northeastwards and then abruptly turned to the east-southeast, it crossed longitude 180 degrees east over the sea south of the Aleutian Islands after 00UTC, 27 September.

XANGSANE (0615)

XANGSANE formed as a tropical storm (TS) over the sea east of Samar Island at 00UTC on 26 September 2006. It quickly developed into a typhoon (TY) over the same waters at 06UTC on the next day. After it passed west-northwestwards through the Philippines with TY intensity from 27 to 28 September, it attained the peak intensity with sustained wind of 85kt and central pressure of 950hPa in the South China Sea at 18UTC, 29 September. Keeping the westward track and the almost same intensity, it made landfall on Vietnam on 1 October. XANGSANE was quickly downgraded to TS intensity in Laos at 18UTC, 1 October and then a TD in Thailand at 00UTC, 2 October.

BEBINCA (0616)

BEBINCA formed as a tropical storm (TS) over the sea east of the Philippines at 00UTC on 3 October 2006. Moving northwards, it attained the peak intensity with maximum sustained wind of 40kt and central pressure of 990hPa over the same waters at 18UTC on the day. Then it moved northeastwards and weakened into a TD over the sea south of Japan at 00UTC, 6 October.

RUMBIA (0617)

RUMBIA formed as a tropical storm (TS) over the sea south of Minamitorishima Island at 12UTC on 3 October 2006. Moving northwards, it attained the peak intensity with maximum sustained wind of 45kt and central pressure of 990hPa over the same sea at 00UTC on the next day. Keeping the northward track, it weakened into a TD over the sea north of Minamitorishima Island at 12UTC, 6 October.

SOULIK (0618)

SOULIK formed as a tropical storm (TS) over the sea south of Minamitorishima Island at 18UTC on 9 October 2006. Moving to the west-northwest, it was upgrade to typhoon (TY) intensity over the sea south of Iwojima Island at 12UTC, 12 October. During recurvature near Chichijima Island, SOULIK attained the peak intensity with maximum sustained wind of 75kt and central pressure of 955hPa at 06UTC, 14 October. Moving to the northeast, it was downgraded to severe tropical storm (STS) intensity and then transformed into an extratropical cyclone over the sea east of Japan at 00UTC and 12UTC, 16 October, respectively.

CIMARON (0619)

CIMARON formed as a tropical storm (TS) over the sea east of the Philippines at 06UTC on 27 October 2006. Moving to the west-northwest, it was upgraded to typhoon (TY) intensity at 06UTC, 28 October. Keeping the west-northwestward track, it developed rapidly to attain the peak intensity with maximum sustained wind of 110kt and central pressure of 910hPa over the same waters at 06UTC on the next day. CIMARON hit Luzon Island keeping almost the same intensity after 12UTC on the same day. Though it crossed Luzon Island westwards to weaken on the same day, it turned to the north on 31 October, and then decelerated the movement and redeveloped over the sea west of Luzon Island on 1 November. After 2 November, CIMARON turned to the southwest with gradual weakening. It was downgraded to severe tropical storm (STS) intensity and TS intensity over the same waters at 18UTC, 2 November and 18UTC, 3 November, respectively. It weakened into a topical depression (TD) over the same waters at 00UTC, 6 November.

APPENDIX XVIII

TYPHOON COMMITTEE STRATEGIC PLAN

2007-2011

AN INTEGRATED, REGIONAL APPROACH TO IMPROVE THE QUALITY OF LIFE FOR MEMBERS' POPULATION THROUGH MITIGATING TYPHOON-RELATED IMPACTS

Executive Summary

From 1950 to 2005, 54 percent (approximately 3 million people) of the worldwide deaths produced by natural disasters occurred in the Asia/Pacific region. These are staggering numbers and a tragedy almost beyond comprehension, because many of these deaths are from typhoon-related impacts. The only slight hope is that in the Asia/Pacific area, the loss of lives has decreased from 100,000 per year in last five decades (1955-2005) to 42,000 per year in last 15 years (1990-2005). However, 42,000 deaths per year during the past 15 years and the personal and family impacts are still too much.

In the Asia/Pacific area, annual economic losses increased from US$10.6 billion per year in the last five decades (1950 -2005) to US$29 billion per year in the last 15 years (1990-2005). From 1950 – 2005, 57 per cent (approximately US$33.5 billion) of the economic loss in the Asia/Pacific region was from wind storms and floods many of them associated with typhoon-related impacts.

For less developed countries, in addition to the tragic personal loss of life and property, natural disasters, especially typhoons, severely threaten and impact their sustainability, capacity building, debt repayments, poverty reduction and even the basic necessities of life – clean drinking water, food, and shelter.

During its 39 years of existence, the Typhoon Committee has been repeatedly recognized as an outstanding regional body who has integrated the actions and plans of the meteorological, hydrological, and DPP components to produce meaningful results. The purpose of this Strategic Plan is for the Typhoon Committee to identify regional areas, goals, and activities which the Committee wants to achieve in 2007-2011 to continue to produce meaningful results for saving lives, mitigating damage, and decreasing social and economic effects from typhoon-related events.

The development of the Strategic Plan has been based on various international and regional frameworks, protocols, and action and strategic plans pertaining to tropical cyclone activities within the region such as the UN Millennium Development Goals, International Strategy for Disaster Reduction's Hyogo Framework for Action, WMO Long Term Plan, ESCAP Thematic Areas, Hashimoto Action Plan, Beijing Declaration on Disaster Reduction, and the Statute of the Typhoon Committee.

Typhoon Committee's Vision: The Typhoon Committee is the World's best intergovernmental, regional organization for improving the quality of life of the Members' populations through integrated cooperation to mitigate impacts and risks of typhoon-related disasters.

Typhoon Committee's Mission: To integrate and enhance regional (meteorological, hydrological, and disaster prevention and preparedness) activities of Members within international frameworks to reduce the loss of lives and minimize social, economical, and environmental impacts by typhoon-related disasters.

The Typhoon Committee has identified seven Key Results Areas (KRAs) for special emphasis in the next five years (2007-2011). These KRAs are defined as the critical, overarching, priority areas of special interest for the Typhoon Committee. The Committee must complete the Strategic Goals (see pages 7-8) associated with these KRAs to achieve its vision and mission through regional, integrated actions. The seven KRAs are:

KRA 1: Reduced Loss of Life from Typhoon-related Disasters.

KRA 2: Minimized Typhoon-related Social and Economic Impacts.

KRA 3: Enhanced beneficial typhoon-related effects for the betterment of quality of life.

KRA 4: Improved Typhoon-related Disaster Risk Management in Various Sectors.

KRA 5: Strengthened Resilience of Communities to Typhoon-related Disaster.

KRA 6: Improved capacity to generate and provide accurate, timely and understandable information on typhoon-related threats.

KRA 7: Enhanced Typhoon Committee's Effectiveness and International Collaboration.

It should be noted that the Typhoon Committee along with its working groups can make major contributions in accomplishing these KRAs, but there are many other factors and influences which are not under the direct control of the Typhoon Committee. Therefore the Committee will need the assistance and support of other international organizations and funding sources.

The most important functions and responsibilities of Members' Governments are to protect their people's lives and to improve their people's quality of life. Through this Strategic Plan, the Typhoon Committee's 14 Members are meeting the most important government functions and responsibilities through regional cooperation and collaboration. The last 39 years has shown how successful the Typhoon Committee has been in the area of in typhoon-related matters in improving the protection of their people's lives and in improving their people's quality of life. Building on this legacy of the past, this Strategic Plan provides the roadmap into the future.

Table of Contents

1. Introduction

From 1900 – 2005, 91 percent of the deaths worldwide caused by natural disasters occurred in the Asia/Pacific area. From 1950 to 2005, 54 percent (approximately 3 million people) of the worldwide deaths produced by natural disasters occurred in the Asia/Pacific region. These are staggering numbers and a tragedy almost beyond comprehension, because many of these deaths are from typhoon-related impacts. The only slight hope is that in the Asia/Pacific area, the loss of lives has decreased from 100,000 per year in last five decades (1950 - 2005) to 42,000 per year in last 15 years (1990 - 2005). However, 42,000 deaths per year during the past 15 years and the personal and family impacts are still too much.

The economic losses from world-wide natural disasters on average have been increasing exponentially in the last 15 years (1990 - 2005). Based on a best fit curve, the economic loses world-wide have increased from US$30B in 1990 to US$65B in 2005 (Munich Re Group, 2005). In 1900 - 2005, 49 per cent of the damages worldwide from natural disasters occurred in the Asia/Pacific area. In this area, annual economic loss increased from US$10.6 billion per year in the last five decades (1950 - 2005) to US$29 billion per year in the last 15 years (1990 – 2005). Private sector losses accounted for over 70 per cent of the total loss. From 1950 – 2005, 57 per cent (approximately US$33.5 billion) of the economic loss in the Asia/Pacific region was from wind storms and floods many of them associated with typhoon-related impacts.

For more developed countries, typhoon related impacts cause major social and economic disruptions through loss of lives and property. For less developed countries, in addition to the tragic personal loss of life and property, natural disasters, especially typhoons, severely threaten and impact their sustainability, capacity building, debt repayments, and even the basic necessities of life – clean drinking water, food, and shelter.

The Typhoon Committee, through its regional cooperation and collaboration has for the past 39 years, been working to help the people of the region through accomplishments and actions to reduce the loss of life and property due to typhoon-related effects.

2. Development of the Strategic Plan

The Typhoon Committee at its 37th Session held in Shanghai, China and at its 38th Session held in Hanoi, Vietnam decided to restructure the Committee's Regional Cooperation Programme Implementation Plan (RCPIP) to better reflect Key Results Areas and the required Strategic Goals and Activities needed to achieve these Key Results Areas.

In September 2006, a historical "International Workshop on Integrating Activities of Meteorology, Hydrology, and Disaster Prevention and Preparedness Components of the Typhoon Committee into the related International Framework for Disaster Risk Management for Better Impacts and Visibility" was held in Macao, China. For the first time, the Typhoon Committee's Working Groups on Meteorology, Hydrology, and Disaster Prevention and Preparedness (DPP) along with the Advisory Working Group met jointly to define high priority regional actions required to reduce the loss of life and social and economic impacts from tropical cyclones.

During this September 2006 meeting, the Advisory Working Group (AWG) prepared the initial proposed draft of the Typhoon Committee's Strategic Plan based upon the impacts from all of the working groups. This initial proposed draft was circulated to the Members following the meeting for their review and comments. The AWG took these comments and incorporated then into the second proposed draft Strategic Plan for the consideration of the Members at the 39th Session of the Typhoon Committee held in Manila, Philippines.

The development of the Strategic Plan has been based on various international and regional frameworks, protocols, and action and strategic plans pertaining to tropical cyclone activities within the region such as the UN Millennium Development Goals, International Strategy for Disaster Reduction's Hyogo Framework for Action, WMO Long Term Plan, Beijing Declaration on Disaster Reduction, ESCAP Thematic areas, Hashimoto Action Plan, and the Statute of the Typhoon Committee.

The Typhoon Committee has been repeatedly recognized as an outstanding regional body who has integrated the actions and plans of the meteorological, hydrological, and DPP components to produce meaningful results. The purpose of this Strategic Plan is for the Typhoon Committee to identify areas, goals, and activities which the Committee wants to achieve in 2007-2011 to continue to produce meaningful results for saving lives and mitigation of damage from typhoon-related events.

3. Scope of the Typhoon Committee's Strategic Plan.

- A very important aspect of this strategic plan is the involvement of the Typhoon Committee **and** its Members. The Typhoon Committee alone could not achieve the strategic goals in the Key Results Areas by itself.
- The results will be achieved through the Members' regional and integrated activities with support and monitoring of the TCS, World Meteorological Organization (WMO), and the UN Economic and Social Commission for Asia and the Pacific (ESCAP).
- The critical part of this plan is the required regional cooperation and collaboration among Members and the integration of the meteorological, hydrology, and DPP components.
- This strategic plan directly support the functions of the Committee as described in the Statute of the Typhoon Committee:

    1. Review regularly the progress made in the various fields of typhoon damage prevention;
    2. Recommend to the participating Governments concerned plans and measures for the improvement of meteorological and hydrological facilities needed for typhoon damage prevention;
    3. Recommend to the participating Governments concerned plans and measures for the improvement of community preparedness and disaster prevention;
    4. Promote the establishment of programs and facilities for training personnel from countries of the region in typhoon forecasting and warning, hydrology and flood control within the region and arrange for training outside the region, as necessary; and
    5. Promote, prepare and submit to participating Governments and other interested organizations plans for coordination of research programmes and activities concerning typhoons.

4. Vision and Mission

Typhoon Committee's Vision:

The Typhoon Committee is the World's best intergovernmental, regional organization for improving the quality of life of the Members' populations through integrated cooperation to mitigate impacts and risks of typhoon-related disasters and to enhance beneficial typhoon-related effects.

Typhoon Committee's Mission:

To integrate and enhance regional activities in the areas of meteorological, hydrological, and disaster prevention and preparedness of Members within international frameworks to reduce the loss of lives and minimize social, economical, and environmental impacts by typhoon-related disasters and to enhance beneficial typhoon-related effects.

5. Key Results Areas (KRAs) and Strategic Goals (SG)

KRAs are defined as the critical, overarching, priority areas of special interest for the Typhoon Committee. The Committee must complete the strategic goals associated with these KRAs for it to achieve its vision and mission through regional, integrated actions. The Committee has identified seven KRAs for special emphasis in the next five years.

It should be noted that the Typhoon Committee along with its working groups can make major contributions in these KRAs, but there are many other factors and influences which are not under the direct control of the Typhoon Committee. Therefore the Committee will need the assistance and support of other international organizations and funding sources. The following are the KRAs and Strategic Goals (SG):

KRA 1: Reduced Loss of Life from Typhoon-related Disasters.

SG 1: To reduce the number of deaths by typhoon-related disasters by half (using the decade 1990-1999 as the base line to compare with the decade 2006-2015) in Typhoon Committee Region.

KRA 2: Minimized Typhoon-related Social and Economic Impacts.

SG 2: To reduce the socio-economic impacts of typhoon-related disasters per GDP per capita by 20 per cent (using the decade 1990-1999 as the base line to compare with the decade 2006-2015) in Typhoon Committee Region.

KRA 3: Enhanced beneficial typhoon-related effects for the betterment of quality of life.

SG 3a: To improve the beneficial use of typhoon-related effects of typhoons by 10 per cent in water management by selected Members (using the decade 1990-1999 as the base line to compare with the decade 2006-2015)

SG 3b: To promote increasing use of the typhoon-related beneficial effects among the Members in many different sectors.

KRA 4: Improved Typhoon-related Disaster Risk Management in Various Sectors.

SG 4a: To provide reliable typhoon-related disaster information for effective policy making in risk management in various sectors.

SG 4b: To strengthen capacity of the Members in typhoon-related disaster risk management in various sectors.

SG 4c: To enhance international and regional cooperation and assistance in the field of disaster risk reduction.

KRA 5: Strengthened Resilience of Communities to Typhoon-related Disaster.

SG 5a: To promote and enhance culture of community-based disaster risk management among the Members.

SG 5b: To promote education, training and public awareness of typhoon-related disasters among the Members.

KRA 6: Improved capacity to generate and provide accurate, timely and understandable information on typhoon-related threats.

SG 6a: To strengthen RSMC capacity to respond to the needs of the Members in forecasting and capacity building.

SG 6b: To improve capacity of Members to provide timely and accurate user-oriented and friendly TC products and information.

SG 6c: To enhance capacity of Members' typhoon-related observation and monitoring.

KRA 7: Enhanced Typhoon Committee's Effectiveness and International Collaboration.

SG 7a: To strengthen the capacity of TCS to effectively discharge its responsibilities and functions.

SG 7b: To strengthen the capacity for resources mobilization for the implementation of the strategic goals.

6. Strategic Goals and Associated Activities

KRA 1: Reduced Loss of Life from Typhoon-related Disasters.

Strategy Goal 1: To enhance cooperation among TC Members to reduce the number of deaths by typhoon-related disasters by half (using the decade 1990-99 as the base line compared to the decade 2006-2015)

Associated Activities[1]:

Integrated:

- Identify the primary causes of typhoon-related loss of life and identify location (which Members and where in the Members' area), gender, social status, and any other additional information available.

[1] Activities are listed under the headings of Integrated and the three components of Meteorology, Hydrology, and Disaster Prevention and Preparedness. However, it should be noted that although one component may have the lead on an activities, most activities include collaboration, coordination, and integration with the other components.

Meteorological Related:

- Update typhoon monitoring, forecasting, and warning system. (Also applicable to SG 2)
- Improve tropical cyclone forecast accuracy, including forecast of intensity and track of typhoon as well as typhoon induced wind and rainfall. (Also applicable to SG 2, SG 3a, SG 6b)

Hydrological Related:

- Preparation of inundation and water-related Hazard Maps. (Also applicable to SG 2, SG 4a, and SG 5b)
- Establishment on flash flood warning system including debris flow and landslides. (Also applicable to SG 2)
- Evaluation and improvement of operational flood forecasting system models. (Also applicable to SG 2)
- Establishment of flood forecasting systems to selected river basins. (Also applicable to SG 2)

Disaster Prevention and Preparedness Related:

- Identify Members' key agencies and sectors working on disaster preparedness and protection of vulnerable communities against typhoon-related disasters and encourage establishment of linkages, networking, and exchange of information among them.
- Assist as requested Members' policy development and strategic planning on disaster risk management with special emphasis on densely populated areas and vulnerable communities.
- Provide an effective framework for integrating early warning systems for vulnerable communities into development process.

KRA 2: Minimized Typhoon-related Social and Economic Impacts.

Strategic Goal 2: To reduce the socio-economic impacts of typhoon-related disasters per GDP per capita by 20 per cent (using of the decade 1990-1999 as the base line to compare with the decade 2006-2015).

Associated Activities:

Integrated:

- Collect, study, and catalog typhoon–related social and economic impacts.
- Standardize Members' the methodology to assess social and economic impacts/issues of typhoon-related disasters.
- Regionally increase Members' Human Development Index (HDI) as defined in the UNDP 2006 Human Development Report.

Meteorological Related:

- Produce users' oriented products. (Also applicable to SG 1)
- Assess the change of frequency and intensity of tropical cyclones. (Also applicable to SG 1)
- Evaluate relationship between socio-economic impacts and intensity of the tropical cyclones.

Hydrological Related:

- Development of guidelines for reservoir operation. (Also applicable to SG 3b)
- Assessment of socio-economic impacts of typhoon-related disasters. (Also applicable to SG 4a)
- Improve management of urban flood. (Also applicable to SG 1, SG 4a, SG 4b, and SG 5b)

Disaster Prevention and Preparedness Related:

- Provide reliable disaster statistics on socio-economic impacts of typhoon-related disasters for monitoring the progress achieved by the Typhoon Committee.
- Develop, establish, promote, coordinate and facilitate exchange of good practices on disaster risk management for socio-economic development of data for a regional-wide disaster information system which would be accessible to all Members' decision makers, disaster services, communities, and others designated by the Members.
- Develop an effective framework for integrating early warning systems to support socio-economic development into disaster management systems.
- Identify Members' key agencies and sectors working on beneficial effects of typhoons and encourage establishment of linkages, networking, and exchange of information among them.

KRA 3: Enhanced beneficial typhoon-related effects for the betterment of quality of life

Strategic Goal 3a: To improve the beneficial use of typhoon-related effects of typhoons by 10 per cent in water management by selected Members (using the decade 1990-99 as the base line to compare with the decade 2006-2015)

Associated Activities:

Integrated:

- Collect and distribute Members' studies and ideas on typhoon-related beneficial effects to other Members. Promote these studies and ideas via the Typhoon Committee's web site and the media.

Strategic Goal 3b: To promote increasing use of the typhoon-related beneficial effects among the Members

Associated Activities:

Disaster Prevention and Preparedness Related:

- Identify Members' key agencies and sectors working on beneficial effects of typhoons and encourage establishment of linkages, networking, and exchange of information among them.
- Provide reliable statistics on the benefits gained from typhoon-related effects for monitoring the progress achieved by the Typhoon Committee.

KRA 4: Improved Typhoon-related Disaster Risk Management in Various Sectors

Strategy Goal 4a: To provide reliable typhoon-related disaster information for effective policy making in risk management in various sectors.

Associated Activities:

Meteorological Related:

- Investigate and determine a policy regarding the naming of tropical depressions because of the possible associated impacts and to increase the awareness of the public and decision-makers on these possible impacts.
- Investigate and determine a policy on the intensity terms to be considered for tropical storms and typhoons.

Hydrological Related:

- Preparation of inundation and water-related Hazard Maps.

Disaster Prevention and Preparedness Related:

- Develop, establish, promote, coordinate and facilitate development of database on various sectors for a regional-wide disaster information system which would be accessible to all Members' decision makers, disaster services, communities, and others designated by the Members. (Applicable to SG 1, SG 2, SG 3b, SG 4b, SG 4c, SG 5a and SG 5b)
- Survey and document Members' legal framework for disaster Prevention and Preparedness policy, plans, and governance structure for priority sectors for sharing among Members.
- Establish and distribute an inventory of Members' existing disaster reduction techniques and management strategies.

Strategy Goal 4b: To strengthen capacity of the Members in typhoon-related disaster risk management in various sectors

Associated Activities:

Meteorological Related:

- Promote and facilitate the exchange and use of relevant data.
- Determine, analyze, and disseminate current status of Members' accuracy in forecasting tropical cyclone formation, track, intensity, and radius of significant winds, research or techniques which may improve the forecasts, and methodology to track the improvements in forecast accuracy.

Disaster Prevention and Preparedness Related:

- Assist as requested Members' policy development and strategic planning on disaster risk management in priority sectors.
- Identify priority areas for capacity building on disaster risk management of interested Members as may be required.

Strategy Goal 4c: To enhance international and regional cooperation and assistance in the field of disaster risk reduction.

Associated Activities:

Integrated:

- Identify Members whose risk management is efficiently structured and then promote visits of DPP experts from other Members to these Members.
- Strengthen cooperation and exchange of disaster early warnings among Members. (Also applicable to SG 1, SG 2 and SG 3b)

Disaster Prevention and Preparedness Related:

- Establish and distribute an inventory of Members' existing disaster reduction techniques and management strategies.

KRA 5: Strengthened Resilience of Communities to Typhoon-related Disaster

Strategy Goal 5a: To promote and enhance culture of community-based disaster risk management among the Members

Associated Activities:

Integrated:

- Increase the number of women regionally in meteorology, hydrology, disaster Prevention and Preparedness, and related sciences in support of the Millennium Development Goals. (Also applicable to SG 5b)

Meteorological Related:

- Provision of understandable and useful tropical cyclone impact information and materials to the public both before an approaching tropical cyclone and as a tropical cyclone approaches.

Hydrological Related:

- Establishment on the community-based flood forecasting and warning system. (Also applicable to SG 1, SG 2, and SB 4b)

Disaster Prevention and Preparedness Related:

- Develop, establish, promote, coordinate, and facilitate exchange of experience on community based risk management for a regional-wide disaster information system which would be accessible to all Members' decision makers, disaster services, communities, and others designated by the Members.
- Assist as requested Members' policy development and strategic planning on integration of community based risk management into development process.

Strategy Goal 5b: To promote education, training and public awareness of typhoon-related disasters among the Members

Associated Activities:

Integrated:

- Promote lectures in primary, secondary and high schools in order to sensitize students to typhoon-related social and economical impacts and to encourage them to choose earth sciences as a future field of study and work.
- Identify and distributed material (including photographs) on typhoons and related hazards and make available to Members' teachers and professors.
- Promote media and public campaigns to enhance awareness of tropical cyclone impacts and on preparedness activities the public should take to protect their lives and mitigate losses to property.
- Develop and implement a multi-hazard information web site to raise the level of public awareness of natural hazards and their impacts. Encourage users' participation in the development.
- Develop a library of outreach/education material based upon users' needs for Members to use during their outreach/educational activities.
- Establish protocols and agreements with the radio and TV broadcast stations in order to quickly disseminate typhoon-related information directly from NMHSs and DPP centres to the media outlets.

Meteorological Related:

- Provision of on-the-job training on typhoon forecasting systems. (Also applicable to SG 1 and SG 2)

Hydrological Related:

- Provision of on-the-job training on flood forecasting systems. (Also applicable to SG 1 and SG 2)

Disaster Prevention and Preparedness Related:

- Provide training and outreach activities to and face-to-face meetings with the people at the last kilometre/mile and the local first responders.

KRA 6: Improved capacity to generate and provide accurate, timely and understandable information on typhoon-related threats

Strategic Goal 6a. To strengthen RSMC capacity to respond to the needs of the Members in forecasting and capacity building

Associated Activities:

Meteorological Related:

- Identify regional tropical cyclone forecasting guidance requirements.
- Establish standard verification methods and procedures for track and intensity forecasts and exchange verification values with other Members.

Strategic Goal 6b. To improve capacity of Members to provide timely and accurate user-oriented and friendly TC products and information

Associated Activities:

Meteorological Related:

- Post each Member's typhoon model verification data on a web site which all Members would have access to via the Internet.
- Improve less developed Members' typhoon information processing system.

Hydrological Related:

- Hydrological products which meet users' requirements. (Also applicable to SG 1 and SG 2)

Strategic Goal 6c. To enhance capacity of Members' typhoon-related observation and monitoring

Associated Activities:

Integrated:

- Recruit volunteers to help observe, report, and distribute information on typhoon-related hazards.
- Enhance the understanding of the processes related to tropical cyclone formation and land falling through collection of real time, targeted observations in typhoons and analyze.

Meteorological Related:

- Participate in THORPEX-ASIA and organize other observational programmes and experimental studies as appropriate and funding allows.
- Improve regional in situ observations for monitoring typhoons.
- Assist relevant Members in receiving required satellite data from FY, MTSAT and others and in applying these data.

KRA 7: Enhanced Typhoon Committee's Effectiveness and International Collaboration.

Strategic Goal 7a: To strengthen the capacity of TCS to effectively discharge its responsibilities and functions described in the Terms of Reference and support the Members in the implementation of the strategic goals

Associated Activities:

Integrated:

- Participate in typhoon-related internal meetings and conferences and prepare written reports on proceedings to share with other members.

Disaster Prevention and Preparedness Related:

- Provide reliable disaster statistics for monitoring the progress achieved by the Typhoon Committee.

Strategic Goal 7b: To strengthen the capacity for resources mobilization for the implementation of the strategic goals

Associated Activities:

Integrated:

- Collect, collate, and make available to Members successful cases of project funding for their reference.
- Enhance resource mobilization to reduce the impacts of typhoon-related disasters on debt sustainability of Members.

Disaster Prevention and Preparedness Related:

- Facilitate resource mobilization for disaster Prevention and Preparedness projects among Members with assistance from international, regional, national, Typhoon Committee Resource Mobilization Group (RMG), and the TCS.

7. Annual Operating Plan and Budget

Each year during the 5 year period of this Strategic Plan, the AWG with input from the working groups, TRCG, RMG, and TCS will prepare a proposed draft Annual Operating Plan (AOP) to be approved at the next Typhoon Committee Session. The AOP which will contain detailed actions and success indicators to be conducted in that year as steps towards meeting the KRAs Strategic Goals. Thus, through the completion of the five AOPs, the Committee and its Members should accomplish all of the KRA Strategic Goals and Activities contained in this plan. The AWG will prepare a proposed draft budget (TC Trust Funds) for each year based upon the priority actions contained in the AOP and the successes achieved in the previous year's AOP. Activities and objectives which are successfully accomplishing Strategic Plan objectives and AOP actions and are producing positive results in accomplishing the vision and mission of the Typhoon Committee will be given due consideration when preparing the budget.

8. Conclusion

The most important functions and responsibilities of Members' Governments are to protect their people's lives and to improve their people's quality of life. World-wide, the Asia/Pacific region is the one most heavily impacted by natural disasters such as typhoons. In the last 15 years, an average of 42,000 people lost their lives and an average of US$29 billion property losses occurred each year in this region due to natural disasters. Regional coordination and collaboration is essential to reduce these tragic losses and resulting socio-economic impacts. Therefore through this Strategic Plan, the Typhoon Committee's 14 Members are building on the great legacies of the past and laying a path to meet the challenges of the future. With a focus on accomplishments in the seven identified KRAs, the Members have a plan to improve their abilities during typhoon situations to protect their people's lives and to improve their quality of life through regional coordination and cooperation.

APPENDIX XIX

TYPHOON COMMITTEE ANNUAL OPERATING PLAN 2007

APPENDIX XX

TERMS OF REFERENCE OF ADVISORY WORKING GROUP

Guidance

In establishment of the Advisory Working Group, the Typhoon Committee provided the following guidance for their assistance in planning and implementation of measures required for mitigation of typhoon-related disasters.

- To improve the efficiency and effectiveness of the Typhoon Committee, the TCS, and TCS Secretary.
- To promote international cooperation in the three components of Meteorology, Hydrology, and Disaster Prevention and Preparedness. Training and Research are incorporated as part of each of these three.
- To promote the use of advanced information technology and resource sharing among Members of the Typhoon Committee.
- To facilitate the implementation of the Strategic Plan, Annual Operating Plan, and Annual Budget.
- To enhance resources mobilization.

Terms of Reference

The Advisory Working Group (AWG) will assist the Chairperson of the Typhoon Committee and the TC Secretary to coordinate the implementation of TC decisions. The AWG will also act as a "Think Tank/Steering Group" function to advise and offer options or proposals, as required, to the Typhoon Committee Members, the Typhoon Committee, the TC Chairperson, TC Secretary.

To monitor, review, and evaluate the Strategic Plan's Key Results Areas, Strategic Goals, and Activities; the objectives/action of the Annual Operating Plan;

- and Annual Budget and make proposals concerning these documents and the evaluation of the results achieved to the Committee.
- To provide overall direction and oversight for the Associated Activities – Integrated listed in the Strategic Plan.
- To provide options and proposals to enhance the effectiveness of the Typhoon Committee, TC Chairperson, the TC Secretary, and the TCS.
- To assist in the consideration and coordination of prioritize project proposals and their budgets provided by the three components of TC. Training and Research are incorporated as part of each of these three.
- To provide options and assistance on collaborative activities among the three components and priority options to the Typhoon Committee.
- To provide options and assistance on mechanisms aimed at improving the implementation of the Strategic Plan and Annual Operating Plan.
- To assist in mobilizing resources to achieve the goals and objectives as determined by the Typhoon Committee in the Strategic Plan and Annual Operating Plan.

- Coordinate and harmonise activities among WGs, TRCG, RMG, and TCS.
- Monitor and ensure that the projects/activities authorized by the TC are being accomplished in a timely manner.
- Development, review and propose the format of the Members' written reports and Members' oral reports at the Typhoon Committee Sessions to focus on the results achieved on the Strategic Plan and Annual Operating Plan.
- To evaluate proposals for Typhoon Committee's Members attendance at international meetings funded by the TCTF.
- Perform missions as required on strategic planning and project/grant proposals to selected Members.

Members

- Dr Bui Van Duc, Viet Nam, TC Chair for 2005-2006 as Chairperson
- Mr James C. Weyman, USA as Vice-Chairperson
- Chairpersons of the TRCG, RMG, and the three working groups (meteorology, hydrology, and DPP) and the Head of RSMC Tokyo as core members; and
- Representatives of WMO and ESCAP (as ex-officio members)

The term of service on the AWG is 1 year subject to extension authorized by the Committee.

Operational modalities

AWG would conduct most of its work, coordination and communication through correspondence including e-mail, and would be supported by regular reporting from the TC Secretariat. As described in the above-proposed Terms of Reference of AWG, considerable amount of important issues and projects for TC and its Members will be discussed and accomplished by AWG. To enhance the efficiency of the operation of TC, it is recommended that an AWG meeting be held at least every year. At the request of the TC or TC Chairperson, the AWG will investigate and review issues, make recommendations and proposals, and if approved by the TC, assist in implementing approved projects, activities, etc.

APPENDIX XXI

SPEECH BY H.E. AMBASSADOR LI JINJUN ON THE SIGNING CEREMONY OF HOST COUNTRY AGREEMENT

December 7, 2006

Mr. Chairman,
Distinguished Guests,
Ladies and Gentlemen

Good morning! It is a great honor for me, on be half of the Chinese Government, to sign with the chairman of the Typhoon Committee the Host Country Agreement between the Government of the People's Republic of China and the Typhoon Committee Regarding the Typhoon Committee Secretariat. It is also a great pleasure for me to witness this historic moment with the representatives from the member states of the Committee.

Since its founding in 1968, the Typhoon Committee has been striving to reduce the losses caused by typhoon in Asia and Pacific Region and playing an important role in promoting the cooperation in this regard. China attaches importance to the role of the Typhoon Committee and is ready to strengthen the cooperation with the Committed so as to lessen the damage of typhoon and make contribution to the development of the region.

In view of the above considerations, Chinese government has rendered great support to the transference of the Typhoon Committee Secretariat to the Macao SAR, China. And the relevant agencies of the Chinese government and Macao SAR will continue to fully support the effective operation of the Committee. We hope that the Secretariat would reach consensus with Macao SAR on the Administrative, Financial and Related Arrangements as soon as possible so as to ensure that the Typhoon Committee will start operation at an early date.

Thank you!

APPENDIX XXII

SIGNING CEREMONY

TC Chairman Speech

Your Excellency Ambassador of the People's Republic of China to the Philippines,
Representatives of UNESCAP and WMO,
Distinguished delegates to the 39th Session of the Typhoon Committee,
Ladies and Gentlemen,

It is a great honor for me on behalf of the Typhoon Committee to sign the hosting agreement between the Typhoon Committee and the Government of the People's Republic of China for the hosting of the typhoon Committee Secretariat. This hosting agreement, which will be followed by the Administrative Arrangement Agreement to be signed between the government of the Macao Special Administrative Region of China and the Typhoon Committee in the near future, will provide a solid foundation for the Typhoon Committee as an inter-governmental organization to further develop the existing strong and effective regional cooperation framework among its Members to better serve the people in the sub-region.

This important agreement is in fact the fruit of a long process of consultation among the Members and efforts of the many individuals who have devoted their time and thoughts in searching for possible options to strengthen the framework of cooperation for the Committee. The efforts of these individuals, especially of the Committee's Advisory Working Group, enabled the Typhoon Committee to reach the consensus decision at its 38th Session held in Hanoi, Vietnam in November 2006.

On this occasion, I would like to express, on behalf of the Typhoon Committee and its 14 Members, our sincere appreciation to the Government of the Philippines for hosting the Typhoon Committee Secretariat during the past 35 years. I also wish to put on record the deep appreciation to the UNESCAP and WMO, the parent organizations of the Committee for the instrumental support provided to the Committee throughout its long history of 39 years and their sustained and unwavering support.

Finally, I would like to express on behalf of the Typhoon Committee our deep gratitude to the People's Republic of China for the generosity reflected in this hosting agreement offered to the Committee and also the Government of Macao, China, for the generosity in the provision of financial and technical support mentioned above. I am sure that this foundation for brighter future of cooperation among Typhoon Committee Members will soon bear fruit.

Thank you.

APPENDIX XXIII

World Meteorological Organization
Organisation météorologique mondiale

Temps Climat Eau
Weather Climate Water

Secrétariat
7 bis, avenue de la Paix
Case postale 2300
CH 1211 Genève 2
Suisse
Tél.: +41 (0) 22 730 81 11
Fax: +41 (0) 22 730 81 81
E-mail: wmo@wmo.int
Website: www.wmo.int

ESCAP/WMO TYPHOON COMMITTEE TRUST FUND
Statement of income and expenditure
For the period 1 January to 30 September 2006
Amounts in US dollars

1. Balance of fund at 1 January 2006					671,015
2. Income:					
2.1 Contributions received:					
2.1.1	28 Mar 06 (China)			12,000	
2.1.2	18 Apr 06 (Korea)			12,000	
2.1.3	20 Apr 06 (Hongkong, China)			12,000	
2.1.4	10 May 06 (Malaysia)			12,000	
2.1.5	10 May 06 (Thailand)			12,000	
2.1.6	11 May 06 (Vietnam)			12,000	
2.1.7	12 May 06 (Macau)			12,000	
2.1.8	Total contributions received			84,000	
2.2 Interest credited		a/		2,546	
2.3 Total income					86,546
3. Total available funds during reporting period					757,561
4. Expenditure:		Liquidated	Unliquidated	Total	
4 Direct project costs:					
4.1.1	Lumsp sum to TCS, Transfer to Macao, 21-24 Feb 2006	5,934	-	5,934	
4.1.2	Travel - Roving Seminar, Hanoi, 4-7 Sept 2006	4,575	-	4,575	
4.1.3	CD-ROM Typhoon Ctte Newsletter and Review	1,000	-	1,000	
4.1.4	Miscellaneous services	263	-	263	
4.1.5	Operating Costs of TCS	18,772	6,636	25,408	
4.1.6	Financial support to IWTC-VI ,Costa Rica, 21-30 Nov 2006	15,000	-	15,000	
4.1.7	Financial support to Reg. Workshop, Manila, 11-15 Sep 2006	4,098	-	4,098	
4.1.8	Total direct project costs	49,642	6,636	56,278	
4.2 Indirect project costs					
4.2.1	Support costs at 13%	6,453	863	7,316	
4.2.2	Bank charges	31	-	31	
4.2.3	Total indirect project costs	6,484	863	7,347	
4.3 Total project expenditure					63,625
5. Balance of fund at 30 September 2006					693,936

a/ Interest since 1 January - 30 April 2006

Certified correct:

Luckson Ngwira
Chief, Finance Division

13 November 2006

APPENDIX XXIV

LIST OF SCIENTIFIC LECTURES TO THE 39TH TC SESSION

Name of Lecturer	Title of Lecture
Shingo Kochi Researcher, Asian Disaster Reduction Center (ADRC)	Introduction of Total Disaster Risk Management (TDRM) approach, and ADRC's Activities
A.R. Subbiah Director of the Climate Risk Management Team, Asian Disaster Preparedness Center (ADPC) - Bangkok	Hazard Risk Based Early Warning System
Warawut Khantiyanan Director, Royal Rainmaking Section, Bureau of Royal Rainmaking and Agricultural Aviation - Thailand	Thailand Cloud Seeding Activities
Ti Le Huu Officer-in-Charge, Sustainable Development and Water Resources Section, Environment and Sustainable Development Division, UNESCAP	Assessment of Socio-Economic Impacts of Disasters in Asia: Towards Meeting Challenges
Gyo-Myung Choo Senior Researcher, Meteorological Research Institute, KMA, Republic of Korea	Recent Development of TC Prediction Models in KMA
Liang Xudong Shanghai Typhoon Institute/CMA - China	Progress of the Operation and Research of Regional Typhoon Numerical Model in China
Jae-Hyun Shim Ph.D., Senior Researcher, National Institute for Disaster Prevention, NEMA, Republic of Korea	Automated Disaster Assessment using Spatial Imagery Information
Nobutaka Mannoji RSMC Tokyo – Typhoon Center / Japan Meteorological Agency	Asian THORPEX and an Interactive Forecast System
Hideaki Mizuno Senior Researcher, National Institute for Land and Infrastructure Management, Ministry of Land, Infrastructure and Transport, Japan	Establishment of the Critical Line for Sediment Disaster Warning and the Plan to Establish a Help Desk to Support Typhoon Committee and Critical Lines Based on the Simplified Method
Edwin S.T. Lai and W.K. Wong, Hong Kong Observatory, Hong Kong, China	Quantitative Precipitation Nowcast of Tropical Cyclone Rainbands – Case Evaluation in 2006
Graciano P. Yumul, Jr., Undersecretary, Department of Science and Technology (DOST), Philippines	Super Typhoon "Durian": A Peek into Reality
Yuichi Ono International Strategy for Disaster Reduction (UN/ISDR)	Global Platform for Disaster Risk Reduction

APPENDIX XXV

LIST OF ABBREVIATIONS

ADPC	Asian Disaster Preparedness Center
ADRC	Asian Disaster Reduction Center
AOP	Annual Operating Plan
APWF	Asia-Pacific Water Forum
ARC	Asian THORPEX Regional Committee
ATOVS	Advanced TIROS Operational Vertical Sounder
AWG	Advisory Working Group
CIR	Committed Information Rate
CMA	China Meteorological Administration
CBS	Commission for Basic Systems
DPP	Disaster Prevention and Preparedness
ESCAP	Economic and Social Commission for Asia and the Pacific
EBT	Expanded Best Track Data
GTS	Global Communication System
HiRID	High Resolution Image Data
HRIT	High Rate Information Transmission
JMA	Japan Meteorological Agency
KOICA	Korea International Cooperation Agency
LRIT	Low Rate Information Transmission
MTSAT	Multi-functional Transport Satellite
NIDP	National Institute for Disaster Prevention
NEMA	National Emergency Management Agency
PAGASA	Philippine Atmospheric, Geophysical and Astronomical Services Administration
PVC	Permanent Virtual Circuit
RCPIP	Regional Cooperation Programme Implementation Plan
RMG	Resource Mobilization Group
RTH	Regional Telecommunication Hub
TAC	Traditional Alphanumeric Codes
TCDC	Technical Cooperation among Developing countries
TCDIS	Typhoon Committee Disaster Information System
TDCF	Table Driven Code Forms
TCS	Typhoon Committee Secretariat
TOM	Typhoon Committee Operational Manual
TRCG	Training and Research Coordination Group
UN/ISDR	United Nations International Strategy for Disaster Reduction
VCP	Voluntary Cooperation Programme
WEFAX	Weather Facsimile
WGDPP	Working Group on Disaster Prevention and Preparedness
WGM	Working Group on Meteorology
WGH	Working Group on Hydrology
WMO	World Meteorological Organization