

# ESCAP / WMO TYPHOON COMMITTEE NEWSLETTER

NO. 12

JULY, 2000

## Contents

- ◇ 32nd Typhoon Committee session in Seoul
- ◇ Sung-Eui Moon, Recipient of 1999 Typhoon Committee Natural Disaster Prevention Award
- ◇ Seminar on Development of non-Structural and Emergency Counter-measures for Sediment and Flood Disaster
- ◇ Kintanar gives WMD address 2000 in Melbourne
- ◇ TC Members news

The ESCAP/WMO Typhoon Committee Newsletter is published in English by the Typhoon Committee Secretariat, 8/F ATB Bldg., 1424 Quezon Avenue Quezon City 1104, PHILIPPINES

Fax: (632) 3733419  
E-mail: tcs@philonline.com

The newsletter is available on request to the Editor at the above address.

Editor: EFIGENIA C. GALANG  
Asst. Ed: Hannibal B. Marayag

### Staff Members:

Rosemarie Z. Anillo  
Bella U. Mendoza  
Marissa L. Evangelista  
Jaime R. Manlangit  
Roman O. Mendoza

## Thirty Second Session of the Typhoon Committee

Seoul, Republic of Korea, 23 - 29 November 1999



Participants at the thirty-second session of the Typhoon Committee pose for posterity during the session's opening ceremony.

Representatives from Typhoon Committee members set up a program of special activities to commemorate the coming of year 2000 when they converged at the thirty-second session of the ESCAP/WMO Typhoon Committee held in Seoul, Republic of Korea, from November 23 to 29, 1999. TC members China; Hong Kong, China; Macau, China; Japan; Malaysia; Philippines; Thailand; Viet Nam; U.S.A. and host Korea were joined at the weeklong session by observers from Brunei Darussalam and the International Federation of Red Cross and Red Crescent Societies (IFRCS), and officials of WMO, ESCAP, TCS, IDNDR Secretariat and other world organizations.

Sung-Eui Moon, Administrator of Korea Meteorological Administration, in his welcome address said that there was a need for more scientific meetings in order to bridge the critical gaps in knowledge among countries, adding that many tasks had to be undertaken in the future to find effective ways to mitigate the effects of typhoon disasters.

Cengiz Ertuna, ESCAP representative, in a message at the opening ceremony, reiterated the importance of natural disaster reduction for socio-economic development in the 21st century. The ESCAP endorsed to members of TC, three common goals for regional cooperation in natural disaster reduction, namely, realistic reduction of damage, increased disaster awareness, and improvement of forecasting systems.

Eisa Al-Majed, WMO representative, addressing the session said issues on globalization, rapid changes in technology, population pressure and human influences on the environment could pose considerable challenge to all nations and in turn on the management and development of National, Meteorological and Hydrological Services (NMHSs). He urged TC members to upgrade their capabilities where necessary to provide better tropical cyclone forecasts and warnings.



Opening the session, Dr. Jung Uck Seo, Minister of Science and Technology, called for more concerted actions worldwide to address climate change and global warming issues. He urged the TC to continue its role in promoting international cooperation in meteorology and related fields, adding that its dedication combined with collective efforts from the science community would be a great help in reducing the adverse impact of natural disasters.

At the session, the Committee agreed on a list of special activities to welcome the new millennium which included the conduct of intensive information drive by members on the work of the Committee; an expert exchange programme with other countries through bilateral agreement and TCDC; a technical conference on networking and scientific exchange with other Asia-Pacific tropical cyclone regional bodies to coincide with RA II and RA V activities; and the provision to ESCAP of exhibit materials on the celebration of International Day for Natural Disaster Reduction.

The members reported on their preparations to address the Y2K crisis even as Japan said it would continue operation of GMS-5 to provide satellite image data to users in the region as a result of the unsuccessful launching of the Multi-Transport Satellite in November. It also said that it would start the provision in 2000 of outlook information on El Nino with relevant oceanographic conditions such as monthly mean SSTs in the tropical Pacific and their anomalies for overseas users through the Distributed Data Base (DDB) Web Server.

The USA informed its co-members the completion of the modernization plan for its National Weather Service which focused on three high-tech systems: the Next Generation Weather Radar (NEXRAD), the Automated Surface Observing System (ASOS), and the Advanced Weather Interactive Processing System (AWIPS). In addition, construction of a new office building for WFO Guam operations and NWS Sub-regional Maintenance Depot was also underway.

Meanwhile, the Training Desk program, organized by U.S.A., will start middle of 2000 at the Honolulu Forecast Office in Hawaii. The training, under the auspices of WMO Voluntary Cooperation Program, will focus on capacity building in the meteorological services of small island states.

The Committee formed a working group to review the RCPPI (Regional Cooperation Programme Implementation Plan). The working group, composed of USA; China; Hong Kong, China; Japan; Malaysia and ROK, has been tasked to delete irrelevant items and to suggest features in the plan that should be actively pursued in the near term. The report of the group will be out for distribution in August and will be submitted for discussions in the next session of the Committee.

The Committee also agreed to establish a Typhoon Committee Research Fellowship Scheme proposed by the Typhoon Research Coordinating Group (TRCG). The Fellowship involves choosing of 2 to 3 topics each year on which research fellows, to be selected by the host center, would work for a period of time. The host center would provide the relevant facilities as well as a counterpart researcher to work with the TC research fellow (joint research work).

The Committee proposed that the exchange programme should form part of the Scheme designed to provide an environment and facilities to enable joint researchers to achieve pre-defined objectives which would have operational applications. The Committee urged the members to indicate through its member in the TRCG their intension to play host-center and provide funding support.

During the session, Dr. Moon was presented the 1999 Typhoon Committee Natural Disaster Prevention Award in simple ceremony. Moon bagged the award for his outstanding services as administrator of KMA, particularly, for his important role in the development of prompt forecasting and warning dissemination system, such as the expansion of automatic weather observation network, improvement of numerical weather prediction models, as well as strengthening of public awareness on disaster preparedness. Dr. Moon was also elected as Chairman of the Committee until its next session.

The next session of the Typhoon Committee will be hosted by the Government of Macau (Special Administrative Region) to be held from 28 November to 4 December 2000.



TOP OFFICIALS - (from left) Katsuhiro Abe, Chief, Tropical Cyclone Programme Division (WMO); HK Lam, Director of Hong Kong Observatory; Eisa H. Al-Majed, Director, Regional Office for Asia and the South-West Pacific; and Dr. R.L. Kintanar, TCS Coordinator.

## Sung-Eui Moon Recipient of Typhoon Committee Natural Disaster Prevention Award for 1999

Dr. Sung-Eui Moon, Administrator of the Korea Meteorological Administration, was presented the ESCAP/WMO Typhoon Committee Natural Disaster Prevention Award for 1999. Moon, chosen by a six-man KMA selection committee, received the award in simple ceremonies during the opening of the thirty-second session of the Typhoon Committee in Seoul.

Moon clinched the TC Award for his outstanding services as administrator of KMA, through his important role in the development of prompt forecasting and warning dissemination system, particularly, the expansion of automatic weather observation network; and improvement of numerical weather prediction models; as well as strengthening of public awareness in disaster prevention.

The annual TC Award, which was started by the Manila-based Typhoon Committee Foundation, Inc. (TCFI) in 1989, aims to promote greater awareness in disaster prevention and preparedness measures in Asia-Pacific countries by honoring distinguished contributions in this field.



Photo shows Dr. Moon accepting the 1999 TC Natural Disaster Prevention Award from Dr. Kintanar, TCFI Chairman.



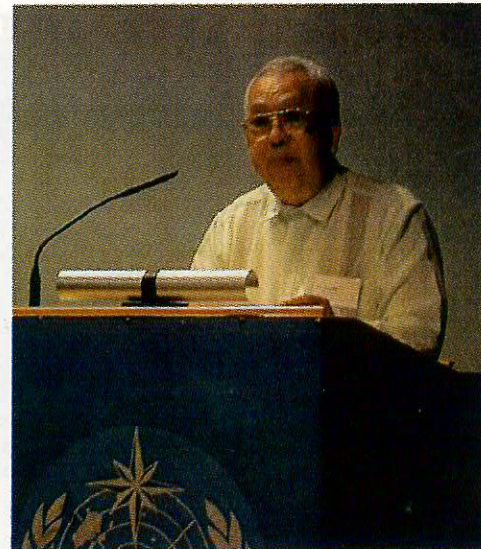
## Kintanar gives WMD address 2000

Dr. Roman L. Kintanar, Coordinator of the Typhoon Committee Secretariat, upon the invitation of the Bureau of Meteorology of Australia, delivered the World Meteorological Day (WMD) Address 2000 before an audience of government and business officials in Melbourne, Australia, on March 21, 2000. Every year, to mark WMD, the Australian Bureau presents a VIP Address to a select audience and then publish the Address for distribution all over the world.

World Meteorological Day is observed every 23rd of March in celebration of the establishment of the World Meteorological Organization (WMO). WMD 2000 has for its theme- The World Meteorological Organization - 50 Years of Service.

Kintanar, who served for two terms as President of WMO, cited in his Address, the Tropical Cyclone Program of WMO, the successful implementation of which by the regional cyclone bodies have resulted in the reduced destructive impact of hundreds of tropical cyclones that affected millions of people in the cyclone areas. He also noted WMO's active participation in the UN International Decade for Natural Disaster Reduction (IDNDR) which led to strengthening of early warning systems by Governments during the 1990s.

"Together with the rest of the world, we are commemorating the start, half a century ago, of an adventure in international cooperation and oneness. This adventure has been growing steadily in importance in the last fifty years and we all hope that this growth will continue into this new Century and new Millennium," Kintanar concluded in his message.



Dr. Kintanar during his WMD 2000 Address

## T Changes

### Galang is new meteorologist of TCS



Efigenia C. Galang

Ms. Efigenia C. Galang was designated new Meteorologist of the Typhoon Committee Secretariat (TCS) on May 1, 2000, succeeding Ms. Nanette Lomarda. Prior to her assignment to TCS, Galang was the Chief of the Atmospheric, Geophysical and Space Sciences Training Section (AGSSTS), under the Atmospheric, Geophysical and Space Sciences Branch (AGSSB), PAGASA component of the Regional Meteorological Training Center (RMTC).

Ms. Galang, who holds a B.Sc. in Chemical Engineering degree, also served as head of the Research and Astronomy group of AGSSB. To her name are various publications on Training and Human Resource Development and a book on a first course in meteorology. She has been an instructor, lecturer and resource person in meteorology and human resource development.

## CHINA

### 11th NWTC held

The 11th National Workshop on Tropical Cyclones (NWTC) was held in Suzhou City, Jiangsu Province, China, from 15-18 December 1999; attended by some 130 experts which included theoretic researchers and operational forecasters from various weather forecast centers, as well as disaster mitigation managers. The workshop was presided by co-chairmen Chen Lianshou, vice-president of China Meteorological Society and Hu Xingling, director-general of Meteorological Bureau of Jiangsu Province.

The NWTC is a series of nationwide academic conference on tropical cyclones, held every other year, similar to the International Workshop on Tropical Cyclones (IWTC). The workshop discussed the progress made since the 10th NWTC on matters such as landfalling issue, structure and intensity change, mechanism of abnormal TC motion, typhoon-caused strong wind and torrential rain, forecast technique of TC motion, numerical prediction for TC track, satellite and doppler radar data to typhoon analysis and forecast, TC disaster reduction, automatic operational system and tropical cyclone long range forecast.

The meeting identified key scientific problems for study in the coming 5 years. It also noted the following concerns: the need for a systematic study of TC landfalling issue, development of air-sea-land (including Taiwan) coupled typhoon numerical model, improved application of satellite and coastal radar techniques, improved monitoring capability for TC landfalling, study of the mechanism of TC landfalling, and establishment of its forecast system.

Other proposals were to enhance study of application of satellite data to make it more functional in TC forecasting; and to improve further current statistic forecast model, dynamic-statistic interpretation scheme, and the TC forecast error assessment technique. The workshop urged further study on the characteristics of various forecast methods, and introduction into forecast models of frontier progresses obtained in atmospheric sciences, relevant subjects, and high and new techniques.



Participants at the 11th NWTC



## CMA's private satellite communication network

The China Meteorological Administration (CMA) started operation of its private satellite communication network on January 1, 2000. The network, based on VSAT technology, was built to accommodate the expanding meteorological information technology. It uses Ku band transponder of AsiaSatII and occupies 15.5 MHz bandwidth. It combines three subnetworks, the Integrated Satellite Business Network (ISBN), the satellite telephony network (TES) and the satellite data broadcast network.

There are more than 300 remote stations of regional, provincial and city level weather divisions in the ISBN system. The outroute data rate is 512kbps, TDM mode, while inroute data rate is 128kbps using FDMA/TDMA.

Unlike the star topology of the ISBN system, the topology of TES system is mesh. It has over 300 remote stations throughout the country and uses DAMA/SCPC. Beside its basic telephone function, it can provide audio conference.

The satellite data broadcast network is a one-way system with about 2000 remote stations built all over the country. The data rate is 2048kbps, more efficient than the ISBN system.

The three subnetworks operate as a whole and are responsible for meteorological data and product collection, procession and dissemination.

## HONG KONG, CHINA

### HK's storm quartet - a record in 1999

1999 proved to be an extraordinary year for Hong Kong as far as tropical cyclones are concerned. Eight threatened Hong Kong and the eyes of four of them passed directly over the territory, making it a record that will be difficult to surpass.

On June 7, the passage of severe tropical storm Maggie over Hong Kong was closely monitored by a dense array of automatic weather stations, wind profilers and, most especially, by the Hong Kong Observatory's two S-band Doppler weather radars. The storm actually passed between the two radar sites, distanced only 11 kilometers apart. The close encounter provided probably the first dual-Doppler observations of a tropical cyclone in the tropics.

July and early August were relatively quiet. However, severe tropical storm Sam traversed Hong Kong on August 22. It brought a total of 616.5 mm of rain during its passage, making it the wettest tropical cyclone on record.

Typhoon York set another record in September. Hurricane Wind Signal No. 10 was hoisted for 11 hours on September 16, the longest on record. A maximum hourly wind of 151 km/h and gust of 234 km/h were recorded in the territory. The eye of York was clearly seen on the radarscope and was only about 20 kilometers south-southwest of the Observatory at its closest approach. Doppler observations of York were of particular significance and enabled the Observatory to accurately determine its intensity at 6-minute intervals.

Completing the quartet, tropical storm Cam crossed Hong Kong on September 26 and necessitated the hoisting of the Gale or Storm Signal No. 8. The dual-Doppler winds again helped to pinpoint the center of the rapidly decaying storm which was very difficult to locate on conventional radar imagery.

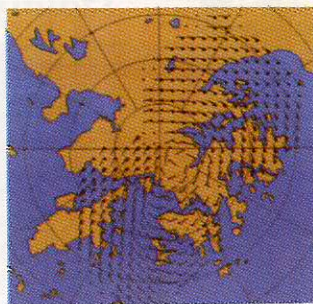
1999 with one of the most active typhoon season was a year to remember for the Observatory. With the advances in forecasting skills and instrumentation as well as an effective warning system, the Observatory was able to keep to a minimum the number of casualties, economic losses and disruption to social activities.

## First CINRAD radar of CMA installed

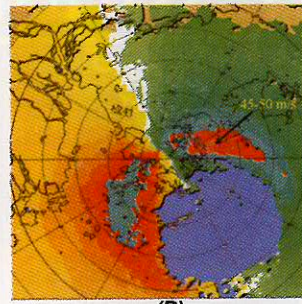
CMA's first CINRAD radar was installed at Anhui Province Meteorological Bureau in March 1999. The radar system, developed by Beijing Metstar Radar Company, was in quasi-operation during the flood season from May to August. In June, it observed continuously the weather process for 24-72 hours and showed good reliability and stability. Its location was proven to be accurate when tracing the strong hail weather at Huaibei region after checking by telephone the strong echo position of radar and the real hail-dropping area.

The CINRAD also displayed better detection ability. Its large detection radius reached about 250 km during the time large area of rainstorm fell in Yangtse River's middle and lower reaches from late June to early part of July. The radar provides rich observation materials and application products including Echo Intensity (Z), Mean Radial Velocity (V), Velocity Azimuth Display (VAD), other wind field information such as Wind Profile (VWP) and One-hour or Three-hour Precipitation Accumulation, etc.

Vertical Integral Liquid (VIL) product collected from Anhui CINRAD in July 1999 served as foundation for directing the route of artificial precipitation. In all, CINRAD has provided important and timely product materials for weather forecasting which has benefited the public.



(A)



(B)

(A) Dual-Doppler winds of Severe Tropical Storm Maggie at 3km above the sea surface when it was right over Hong Kong.

(B) Doppler velocities of Typhoon York indicating maximum winds speeds of up to 50 m/s at 3 km above the sea surface when York was about 50 km southeast of Hong Kong.

## ORSM implemented

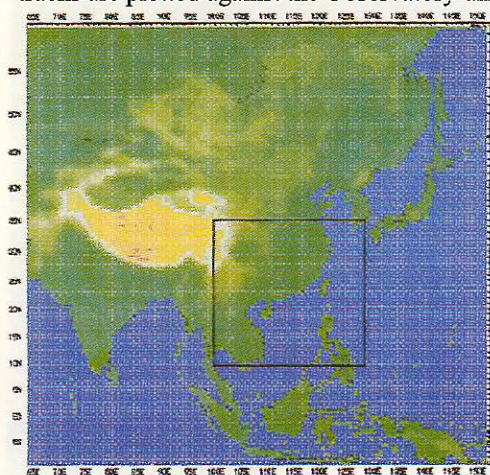
With the commissioning of the CRAY SV1 supercomputer, the Operational Regional Spectral Model (ORSM) was implemented at the Hong Kong Observatory in December 1999. The supercomputer is a vector machine with shared memory architecture. It consists of 16 CPUs with a theoretical peak performance of 19.2 GFLOPS. The computational speed makes possible the increase of model resolution and domain size in the current operational set-up.

The ORSM is run at 20-km resolution with 36 vertical levels. This finer model is one-way nested into a 60-km ORSM. 48 hour forecasts are generated four times a day from the outer 60-km ORSM while 24 hour forecasts are produced eight times a day from the inner 20-km model. Tropical cyclone bogussing technique is included in the model analysis to better represent the position and intensity of the cyclone in the model initial field. Rainfall information from radar and raingauges are routinely incorporated into the ORSM through a physical initialization process.

Various model outputs and post-processed products based on the ORSM forecasts are posted on the Observatory Intranet to facilitate the forecasters' interpretation of model results.



They include local forecast in text generated automatically, as well as time series of local precipitation, cloud amount, temperature, dew point temperature in the form of station circle and vertical cross section. Two-dimensional and 3-dimensional graphics animation over the model domain is also produced. For tropical cyclones, model forecast tracks are plotted against the Observatory-analyzed track for near-real-time verification.



(Left Photo) Model domains of the 20-km ORSM and outer 60-km ORSM.

(Right Photo) Numerical simulation of Typhoon York (9915) by 20-km ORSM at 6 a.m. on 16 September 1999. 3-dimensional iso-surface in blue shows constant wind speed of magnitude 20 m/s. Arrows represent the wind field at 925 hpa level. White contours depict the mean-sea-level pressure field and the colored regions on the sea surface show rainfall distribution associated with York.

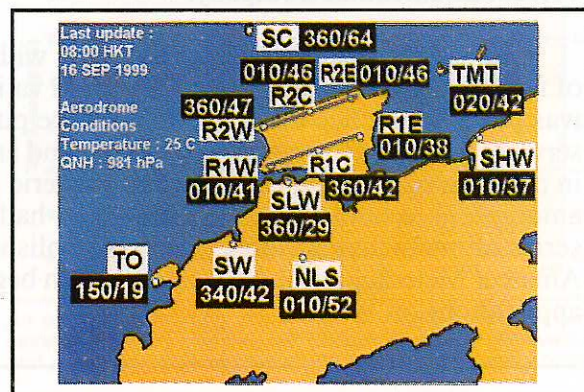


## Aviation weather information at pilot's fingertips

At the Hong Kong International Airport (HKIA), airlines obtain the latest weather information from a web-based Meteorological Information Dissemination System (MIDS) developed and operated by the Hong Kong Observatory. All they do is just connect their PCs to the MIDS using public telephone lines.

Weather information is crucial to aviation especially when there are tropical cyclones within the vicinity. Pilots and airline operators use such information for flight planning purposes. Over twenty airlines operating in Hong Kong are now using MIDS. One MIDS product is the track of an approaching tropical cyclone, together with forecast positions. Other information, such as Tropical Cyclone Warnings issued by the Observatory and other weather centers, WAFS (World Area Forecast System) products, radar and satellite pictures, winds around HKIA are also available.

Whereas before HKIA opened in 1998, users had to travel to the weather office in order to collect weather information, they now have up-to-minute weather information at their fingertips. A recent ICAO (International Civil Aviation Organization) regional meeting in 1999 specifically acknowledged that the Observatory's MIDS enables airlines to obtain WAFS products relevant to their operations with minimum investment in hardware, software and training.

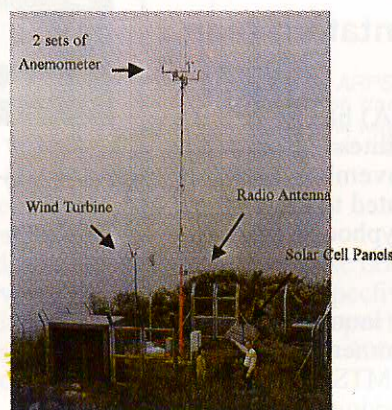


MIDS product. Winds around HKIA when York hit Hong Kong with hurricane force winds on 16 September 1999 (direction in degrees and wind speed in knots).

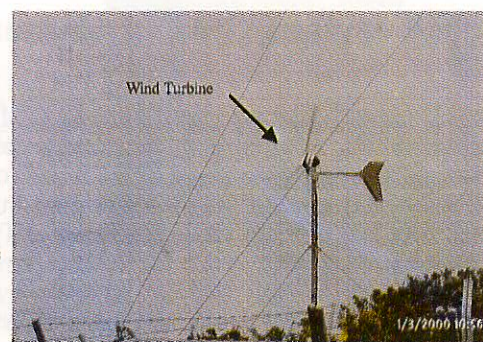
## Observatory harnesses wind power

Four tropical cyclones passed through Hong Kong in 1999 causing some damages to the south China coast. High wind, however, is not necessarily destructive. When properly harnessed, it can be used to protect people's lives and property.

The Hong Kong Observatory operates a number of automatic weather stations (AWSs), some of which are located in remote islands and hilltops to give early warnings of approaching weather, such as typhoons, heavy rain, squalls, windshear and turbulence. Such remote places are not always provided with city power. Hitherto, the Observatory has relied upon the use of solar cells to provide power for these stations. However, overcast skies during rainy or foggy days give cold comfort to the continuous availability of solar power, especially when these conditions last for a week or more. For this reason, the Observatory recently has turned to wind power as a complementary energy source.



Automatic Weather Station utilizing solar and wind power



A close-up view of the wind turbine

One wind turbine has been deployed for an AWS on a remote island. It has 3 blades with rotation radius of about 1 meter, generating a DC voltage of about 12 V. It is capable of delivering 800 kWh energy per year with average wind of 7 m/s. It costs less than US\$1,500 apiece. Initial results are very encouraging, with marked improvement in the power supply. The storage batteries at the stations remained at fully charged conditions for most of the time in early 2000.

The wind turbine has a self-protection mechanism, whereby under high wind conditions it will tilt back, thus reducing the surface area exposed to the wind and resulting in only a small force on the supporting structure. In hurricane winds, the rotation plane will be perpendicular to the wind.

More turbines are set to be installed in other remote stations which are invaluable to the Observatory in providing early alerts of impending weather disturbance to members of the public.



## MACAU, CHINA

### New weather systems inaugurated

The Macau Meteorological And Geophysical Bureau celebrated World Meteorological Day 2000 with the inauguration of two new weather systems, the mesoscale numerical weather prediction model - MM5 USNCAR and the Mobile Weather Information Service. WMD 2000 on 23 March marked the 50th anniversary of WMO.

The MM5 USNCAR was developed by the Bureau in cooperation with the University of People's Republic of China in 1997 and was then ready for automatic operation running twice a day. The information service uses mobile telephones with the cooperation of the Macau Telecommunication Company.

A new daily weather bulletin program, with the revision of information provided, issuing time and validity periods, was put into practice on WMD to enhance public weather service. In order to promote knowledge and arouse interest in meteorology, geophysics and atmospheric environment among high school students, the Bureau had organized a series of interactive lectures. It also established the Youth Amateur Meteorological Association which began accepting applications on WMD.



Photo shows Engr. Ao Man Long, Secretary of Transportation and Public Works, press ceremonial button inaugurating the Mobile Weather Information Service and the MM5 USNCAR.



Fong Soi Kun, Director of MMGB, delivers his WMD message.



Lectures for High School students

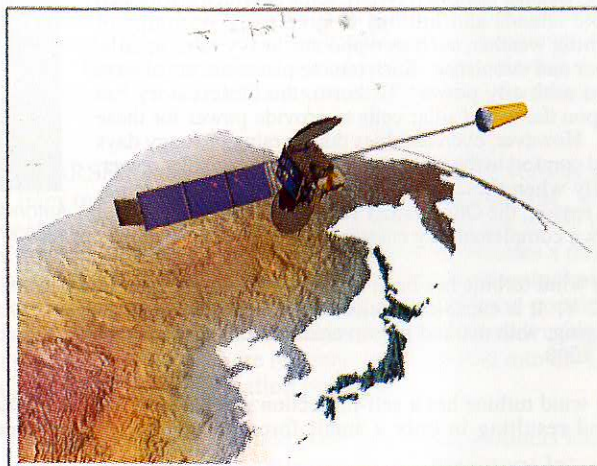
## JAPAN

### JMA revises GMS implementation plan

The Japan Meteorological Agency (JMA) has revised the implementation plan for geo-stationary satellites in light of the unsuccessful launching of MTSAT in November 1999. A detailed description of the plan was distributed to the national meteorological services including those of Typhoon Committee members in July 2000.

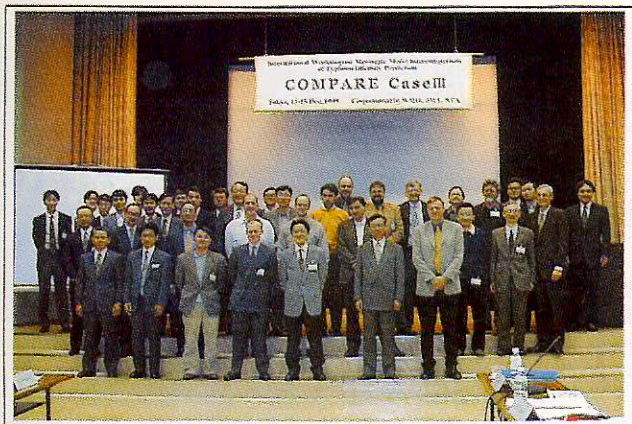
In the revised plan, MTSAT-IR will be launched in early 2003 to take over from GMS-5 in the summer of that year. MTSAT-IR is designed to be compatible with MTSAT to perform improved measurements and enhanced provision of information including meteorological data. It adopts such new transmission systems as HiRID (High Resolution Imager Data) and LRIT (Low Rate Information Transmission). MTSAT-IR carries an imager with a new infrared channel in addition to the current four channels (one visible, four infrared) of GMS-5.

A plan is for HiRID to be changed to HRIT (High Rate Information Transmission) in late 2007 during the operation of MTSAT-IR after both services are performed in parallel for three years. WEFAX service will be continued on MTSAT-IR to be provided in parallel with LRIT until March 2005.



MTSAT-IR





Participants in the COMPARE Case workshop

## Third COMPARE Case Workshop

The third Workshop on Comparison of Mesoscale Prediction and Research Experiments (COMPARE Case) was held at the Headquarters of the Japan Meteorological Agency (JMA) in Tokyo from 13 to 15 December 1999. COMPARE is one of the model inter-comparison projects conducted under CAS/JSC Working Group on Numerical Experimentation (WGNE). The workshop was attended by 54 experts from 11 participating countries and WMO.

The COMPARE Case, coordinated by JMA as the lead center, focused on the prediction of typhoon intensity with mesoscale numerical models, one of the challenging issues which has become increasingly feasible to address. Presented at the workshop for the inter-comparison were the predictions by 14 mesoscale models targeted at the explosive development of Typhoon Flo (9019). Special Observational data archived during the international observational experiments in 1990, i.e., SPECTRUM, TCM-90 and TYPHOON-90, were combined with conventional data to make re-analyses which were used as initial fields of the models in the experiments of COMPARE Case.

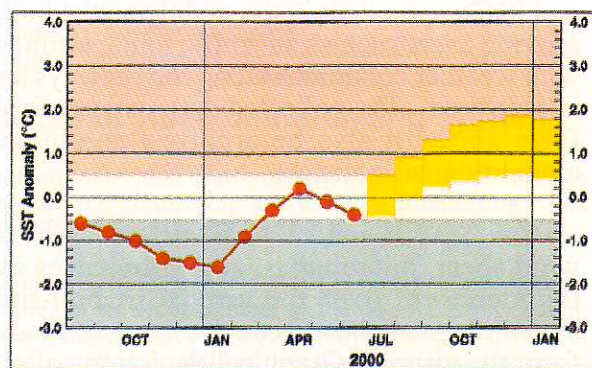
The discussion was centered on the impacts of models' initial fields and characteristic differences on their forecast performances. In conclusion, the workshop emphasized that it is essential in the improvement of typhoon intensity prediction to prepare more realistic initial fields and enhance horizontal resolution of the models.

## JMA publishes monthly El Niño Outlook

Since August 1999, JMA has started to issue El Niño Outlook for domestic users to meet the demands of national economies which are paying increased attention to the adverse effects of El Niño. The Outlook foresees the change of monthly mean SST (Sea Surface Temperature) over the El Niño Monitoring Region (40N - 40S, 150oW - 90oW) for six months and describes the perspective of El Niño and La Niña during the period.

El Niño Outlook is based on the objective analyses by the Ocean Data Assimilation System (ODAS) and the numerical predictions by the El Niño Forecast Model (a coupled atmosphere-ocean model), both of which were developed by JMA for the enhanced monitoring and prediction of this significant climatic event. The El Niño Forecast Model is run twice a month and perform ensemble predictions with six members. Model Output Statistics (MOS) is also introduced to reduce systematic errors of the model.

El Niño Outlook is published monthly as part of El Niño Monitoring Report. Although the report is for domestic use, all the figures and tables carried by the bulletin are also made available at the WMO-DDBs Web Server of JMA ([http://ddb.kishou.go.jp/climate/El\\_Niño/elmon.shtml](http://ddb.kishou.go.jp/climate/El_Niño/elmon.shtml)).



An outlook of monthly mean SST anomaly for the El Niño Monitoring Region. Red lines with closed circles show observations and yellow boxes show predictions with 70% probability range.

## REPUBLIC OF KOREA

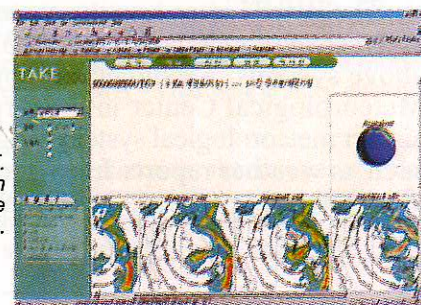
### Local severe weather forecasting system developed

The Korea Meteorological Administration (KMA) has established a local severe weather monitoring system, the input data of which consists of radar images, satellite images, and the automatic weather systems (AWS) of KMA. In addition to the monitoring system, KMA has also developed a severe weather forecasting system. The numerical weather prediction model of the system is the advanced regional prediction system (ARPS) developed by the Center for Analysis and Prediction of Storms (CAPS) of the University of Oklahoma.

KMA adapted the ARPS for the Korean Peninsula and has been operating the system twice a day using its supercomputer since June 1, 1999. The results of ARPS forecast (see figures) are displayed on the internet homepage of KMA for the use of forecasters.

KMA operates the ARPS in one-way nesting base. The horizontal resolution of the coarse domain is 27km and the fine domain is 9km. The number of east-west and north-south grids

SAMPLES OF ARPS OUTPUT. The result of fine domain forecasting. The variable in the images is the rain rate (mm/hr.).



in the coarse domain and of the vertical directions are 99, 107 and 53, respectively, and those of the fine domain are 155, 155 and 53, respectively. The mean vertical grid space in both domains is 400m and the depth of the sponge layer is 5km.

The initial conditions of the ARPS coarse domain come from the regional numerical prediction system of KMA, MM5.

The 12-hour forecast field of the MM5 is used as the first guess field of the ARPS data assimilation system. In the assimilation process, the AWS, surface and upper air data of GTS, IR and VIS data of GMS, and volume data from the five radar sites of KMA are imported as observation data. The boundary conditions of the coarse domain are influenced by the 3-hourly MM5 forecast field, and those of the fine domain are influenced by the 2-hourly coarse domain output of the ARPS. In both domains, the ARPS gives a 15-hour prediction.



## Modern meteorological systems to be installed at new Incheon Int'l Airport

The newly built Incheon International Airport (IIA) in the port city of Incheon, about 50km west of Seoul, aims to become one of the world's major leading airports and the hub of North-East Asia flight route.

Asia's newest airport, opening in March 2000, will feature modern meteorological systems to provide the best aeronautical meteorological services. For this purpose, KMA is installing at the airport the following: Aeronautical Meteorological Observation System (AMOS), Terminal Doppler Weather Radar (TDWR), Low Level Wind shear Alert System (LLWAS), and Integrated Weather Host Unit (IWHU).

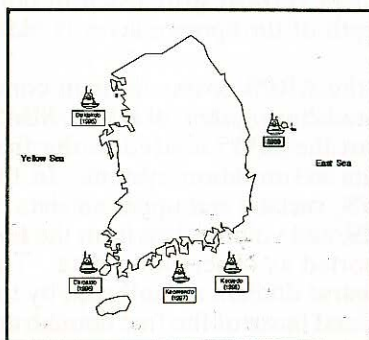
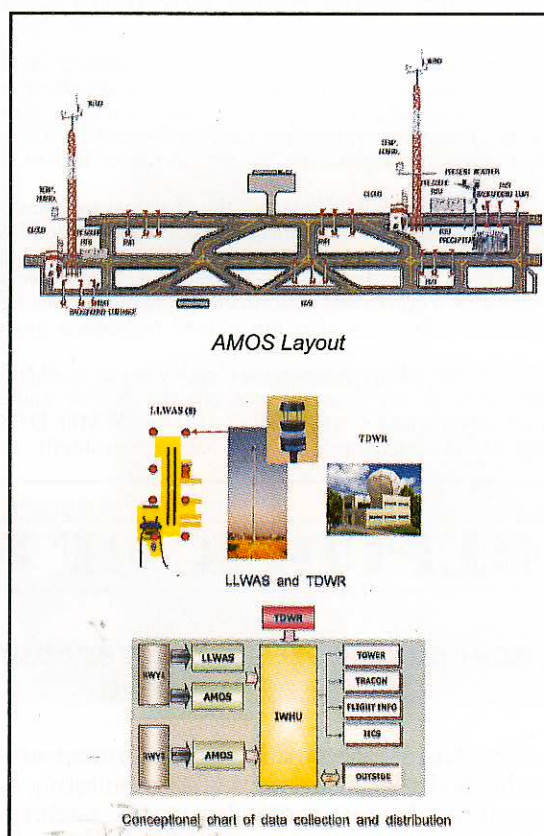
The AMOS, equipped with two sets of anemometers, ceilometers and RVR equipment in the middle and at both ends of the runways, will provide users such as air traffic units, airline operators and flight crews with weather conditions along the runways and in the neighboring areas in real-time. The collected data will be displayed in graphics and text form and will also be archived automatically for compilation of climatological statistics.

The TDWR and LLWAS will be used to detect and alert low-level wind shear, microbursts, and turbulences associated with convective thunderstorm over the airport in real-time. The radar can scan meteorological phenomena occurring at a radial distance of up to 200km from the airport. Graphical depictions of and alpha-numeric data for warnings of wind shear will be automatically generated by the TDWR and LLWAS and transmitted via wide-area network and microwave links in the airport.

The IWHU is a computer system for collecting, processing, analyzing and distributing aviation meteorological information produced from the above systems. Designed to support the operation of the Aeronautical Meteorological Center in the airport, the IWHU is connected to other airport meteorological systems, ingesting a variety of data and information such as weather reports from overseas and radar images and data from airport weather stations in Korea.



Aerial shot of the Incheon international Airport under construction.



KMA marine meteorological buoy network

## KMA to expand marine observation network

The observation system in Korea has 75 manned observatories and 385 unmanned observatories with automatic weather system (AWS). KMA's marine observation network is less dense than the 15-18 km density of the ground observing network. Accordingly, there is a need to expand the marine observing network.

KMA is planning to set up 18 unmanned observatories in the Yellow Sea and the South Sea in 2000. In the Yellow Sea, western region of Korea, local severe weather requires strengthening of the marine network. Expansion of the marine network is expected to result in better collection of real-time observational data thus improving weather forecasting ability in the Korean Peninsula.



## Kisang 2000 launched

Since 1996, the KMA has deployed four sets of discus-type buoy with diameters of 3 meters for its automatic marine meteorological observations. Two sets of buoy are located in the Yellow Sea and two in the South Sea around the Korean Peninsula. This year, a 6m nomad-type buoy will be put up in the central part of East Sea. The observed data of four sets of discus-type buoy is being transmitted via Inmarsat or VHF communications every hour.

On April 19, 2000, KMA launched the ship *Kisang 2000* which will carry out observations for studies in upper-air meteorology, greenhouse gases and aerosol, as well as marine meteorological observations. The ship is equipped with various facilities which include AWS for vessel, CTD (Conductivity, Temperature and Depth Profiler), waverider, and a shipboard radiosonde system. In addition, *Kisang* will also be used for managing the buoy and the marine AWS.

This year, *Kisang 2000* will be used for making intercomparison between buoy and on-board ship observations to improve the quality of buoy data and investigation of the environment of the buoy site. *Kisang 2000* is expected to play an important role in monitoring and forecasting marine environment by providing meteorological and oceanographical data, and in furthering the understanding of the ocean's role in climate change.



*Kisang 2000*

Gross tonnage	150 tons
Length over all	39.11 m
Registered length	35.85 m
Breadth	7.0 m
Cruising speed	10 kts
Main engine	800 PS (900 RPM)
Main generators	180 PS×2 sets
Complement (maximum)	60 persons (including 13 crew)

Specification of *KISANG 2000*

## KMA setting up multi-functional video conferencing system

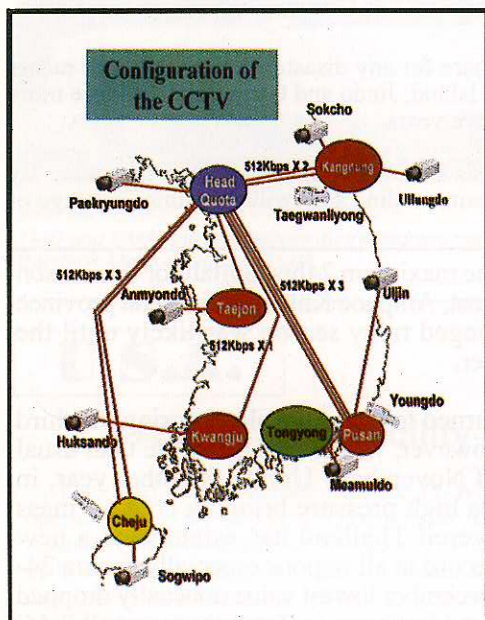
The KMA is setting up a multi-functional video conferencing system which aims to improve conventional forecasting, sea surface monitoring and aviation forecasting. The project, set to be completed in November 2000, consists of three phases.

In the first phase, KMA will install closed circuit televisions (CCTV) at weather stations and lighthouses along the Korean coastline. In the second phase, a video conferencing system between the KMA headquarters and the weather office at Incheon Airport will be installed. The existing video conferencing system installed in 1997 connects six regional centers of KMA. The third phase will consist the integrating of the sea surface condition monitoring function and the existing video conferencing function by installing a multi-cube system at the forecasting room of the headquarters.

The area observed from the CCTVs is displayed on the multi-cube system so that forecasters can easily understand the surface condition of the three seas surrounding the Korean Peninsula.

With the new video conferencing system connected to the existing system, forecasters at the airport weather office can take part in forecasters' meetings and weather briefings on a routine basis to be able to exchange opinions with forecasters at KMA. This will greatly enhance meteorological service for aviation forecasting.

Through the integration of the sea surface monitoring function, the aviation video conferencing function, and the existing video conferencing function through the multi-cube system, forecasters in all KMA weather offices will be able to participate in KMA meetings, receive long-distance education and know sea surface condition in real-time basis.



Location of CCTV's in Korea

## 2nd Int'l Symposium on Asian Monsoon System held

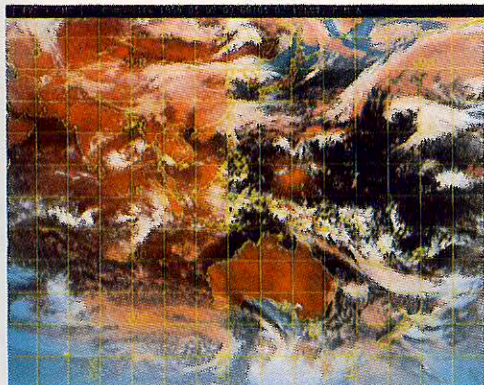


ISAM2 participants

The Second International Symposium on Asian Monsoon System was held in Cheju, Korea, from 27 to 31 March 2000. The symposium, hosted by KMA and the Meteorological Research Institute (METRI) and sponsored by the Group for Natural Hazard Prevention Research (GNHPR) and the Ministry of Science and Technology, was attended by about 100 monsoon experts from East Asia. Major presentation topics included the Asian monsoon system, ENSO and monsoon extreme climate, climate modelling and forecast, and the meso-scale meteorological system.

The symposium provided a good opportunity for up-to-date information exchange, to share experiences on the Asian monsoon system and promote cooperative activities among monsoon scientists from East Asia. For better understanding of the East Asian monsoon, important topics were discussed such as the variability and predictability of the Asian monsoon system, physical processes of the Asian monsoon variabilities, application of the Asian monsoon experimental data, and the impact of global warming on the Asian monsoon.





A composite cloud image from the use of data from GMS-5 and FY-2a

## Data from FY-2a satellite - beginning of an era

KMA receives data from a FY-2a satellite and generates a composite image with GMS-5 on real time basis. A composite image makes possible the expansion of the monitoring area by satellite, from 100E to 50E. It is very useful for detecting an approaching cloud system from the west.

Receiving the data from FY-2a is very symbolic to KMA because it represents the beginning of an era for multisatellite acquisition and utilization. KMA also has a plan to use the METEOSAT data to improve weather monitoring facilities using satellite observation data.

## KMA reinforces radar system

The KMA, as part of its modernization project for weather observing systems, established a nationwide C-band doppler weather radar system consisting of 5 sites in Kwanaksan, Cheju, Pusan, Donghae, and Kunsan, from 1988-1992. The effective range of detecting weather phenomena reaches the distance of 200km to 240km from a site. Moreover, the system may produce the volume data by three dimensional observation, as the software of all the radars had been enhanced to EDGE (Enterprise Doppler Graphic Environment) and WARN (Weather Analysis Radar System) introduced in February 1998.

In order to detect early occurrence of unexpected severe weather phenomena and to prepare for any disaster, KMA has three radars sites under construction and is expanding the observational scope of the radars in Backryeong Island, Jindo and Cheongsong. Three more radar sites in Cheolwon, Sockcho and Seongsanpo are being planned to be completed within five years.

Meanwhile, the five existing radars in operation will be replaced with new ones on the basis of the durable life-cycle of the radar. By year 2006, when the radar reinforcement project is completed, all the Korean peninsular and surrounding seas will be within coverage of radar detection.

## THAILAND

### Significant Weather Events in 1999

Thai weather in 1999 started not too cold with the influence of the cold air mass from Mainland China which mainly moved eastward to the East China Sea and South China Sea. In January, particularly, mean air temperature was 1-2C above normal. Extreme minimum air temperature of 7.8C occurred in the north in Amphoe Umphang, Tak province on 9 January.

Summer began in late February as heat low cell covered upper Thailand. Mean air temperatures were rising and above normal in March. After which, unseasonably April rainfall was above normal nationwide due to the confluence of south and southeast winds, and the low pressure trough which laid across southern and central Thailand in late April. Well-below-normal temperatures were also observed. Extreme maximum air temperature of 41.7C occurred in the northeast, Amphoe Muang in Mukdahan province on March 14 and in north Amphoe Muang, Tak province on April 3.

The rainy season began two weeks earlier than normal, abundant rainfall continuing from late April were generally in May. While less amount of rainfall were experienced over the country, especially during the second half of June, rainfall averaged mainly below normal from June to September.

In October, substantial rainfall occurred almost the whole month and amounts were in general above normal due to the low pressure trough and tropical depression that passed through southern Thailand. Many places were severely

damaged by flood. The maximum 24hrs rainfall for this season was 362.7mm in the east, Amphoe Khlong Yai in Trat province on July 30. A prolonged rainy season was likely until the first half of November.

Cool weather returned to upper Thailand during the third week of October. However, winter was quite late than usual in the second half of November. Unlike the other year, in December, the active high pressure bringing cold air mass from China that covered Thailand has established a new lowest temperature record in all regions especially during 24-28 December. The December lowest value unusually dropped to 0.8C on the 27th at Umphang in Tak province and 3.5C over mountainous area on the 26th with frost over mountain top. In addition, a tropical depression in early December brought excessive rainfall and flash floods in the south causing damage to fishing boats.

### TMD int'l cooperation activities

The Thailand Meteorological Department (TMD) completed a number of international cooperation activities in early 2000 as follows:

A TMD working group was formed to collaborate with Japanese scientists on the 5-year GAME-T Project (first phase in March);

Training-course on Disaster Preparedness and Mitigation conducted by TMD for 25 participants from the China Meteorological Administration (CMA), held at TMD Head Office and at Northern and Southern Regional Meteorological



Centers (20 March - 2 April);

Five TMD officials, under the Project of Lightning Prediction, visited the China Research Institute of Radiowave Propagation in Xinxiang City, for the signing of Agreement on Joint Research and Development on the Lightning Location Network in Thailand (11-18 March); and

Five TMD officials visited CMA under the Meteorological Satellite Project and signed the MOU for the Beijing-Bangkok Meteorological Circuit (17-22 April).



TMD and CMA representatives during signing ceremony of MOU of Beijing-Bangkok Meteorological Circuit.



Opening ceremony of the Training on Disaster Preparedness and Mitigation.



At farewell party hosted by TMD for the Chinese delegation

## U.S.A.

### A new NWS facility in Guam

The National Weather Service (NWS) inaugurated its new operations facility in Tiyan, Guam on 28 April. John Jones, Deputy Assistant Administrator of NWS and Richard Hagemeyer, Director of NWS Pacific Region, came to Guam for the ceremony. Local dignitaries in attendance included Lieutenant Governor of Guam, Madeleine Z. Bordallo, and Robert Underwood, Guam's Congressional Delegate. John Miller, Meteorologist in Charge of the Guam office, gave the inaugural speech and proudly opened the new facility.

In order to withstand the ravages of typhoon alley, and Guam's precarious location in an active seismic zone, the building was constructed to survive 195 mph winds and Richter Magnitude 8.5 earthquakes. Two generators, providing a redundant source of emergency power, for the facility, are safely located inside the building, and telemetry antennas are covered by domes. Life support implements provided to sustain the staff for extended periods include a 7000 gallon potable water supply, kitchen/ready room, shower facilities, and laundry room.

The NWS, as part of the National Oceanographic and Atmospheric Administration (NOAA) which is dedicated to improving understanding and stewardship of the environment, was careful to incorporate environmentally sensitive and energy efficient features into the building design. Carpets, flooring material, and insulation are made from recycled materials. Building materials such as glues, paints, vinyls, foams and caulks meet zero or low toxic emission standards. Energy efficiency is enhanced through use of solar energy for water heating and outside yard lighting. The ventilating and air conditioning system design is variable air volume, with high efficiency fan motors. The units are under direct digital

control and night/weekend setback helps reduce power consumption. T-8 fluorescent lights, compact fluorescent lights, electronic ballasts and clerestory natural day-lighting produce low energy consumption benefits and also help enhance employee productivity and morale.

The Guam weather forecast office provides daily weather forecasts for the U.S. Territory of Guam, the Commonwealth of the Northern Mariana Islands, Republic of Palau, Federated States of Micronesia, and Republic of the Marshall Islands. During periods of inclement weather, the office issues weather warnings, including Tropical Cyclone watches and warnings for the islands.

### Meteorologist training program for Pacific Region Weather Service Offices

Several years ago, the National Weather Services (NWS) Pacific Region began a program to educate and train meteorologists for the Weather Service Offices (WSO) located in the Republic of Palau, Federated States of Micronesia (FSM), and Republic of the Marshall Islands. Candidates from the island nations were enrolled at the University of Hawaii for their formal education, leading to a degree in meteorology. Subsequent to this schooling, they enter a period of internship at the NWS forecast office in Guam, during which they learn the day to day rigors of the Weather Service's observations and forecast program.

David Aranug and Ceasar Hadley from the Federated States of Micronesia, have successfully completed this program. Aranug is currently the Meteorologist in Charge of WSO Yap, while Hadley will eventually become the FSM Weather Service Coordinator. Maria Ngemaes, from the Republic of Palau, is currently working to complete the internship phase of the program.

The skills of these people and the future meteorologists developed under this program will be called upon to provide local



expertise in issuing weather warnings and adapting the forecasts produced by NWS Guam to their regions of concern. They will also play an active role in improving current disaster preparedness programs and developing new public outreach programs to enhance knowledge and use of weather warning and forecast information.

## EMWIN in Micronesia

The National Weather Service's efforts to provide EMWIN (Emergency Manager's Weather Information Network) service to the Pacific Ocean region received a big boost when an agreement was drawn up with the University of Hawaii's PEACESAT office to use a part of the communication capability of their newly acquired GOES 7 satellite to broadcast the EMWIN data stream. Equipment has been purchased to uplink the data to the satellite through the Honolulu PEACESAT facility. The GOES 7 satellite will be parked in geo-stationary orbit near 175 degrees east longitude, effectively providing EMWIN broadcast coverage reaching westward to the Philippine Islands.

WSO Pohnpei, Federated States of Micronesia (FSM) currently operates an EMWIN ground station, receiving the Pacific data broadcast from GOES 10 satellite. National Weather Service Pacific Region Headquarters has purchased EMWIN ground stations for installation at the WSOs located in Majuro, Republic of the Marshall Islands, Chuuk FSM, Yap FSM, Koror, Republic of Palau, and Guam, providing redundant weather message and data reception. These sites may eventually be able to rebroadcast the data locally via radio signal.

EMWIN applications software is able to scan the data stream, extracting weather forecast and warning messages of interest and readily display the information. The system may be configured to provide alarm tones for warnings, and connected to various peripheral devices to notify users at remote locations. The data stream also includes satellite imagery and graphics presentations of various model data fields. The EMWIN data stream may also be accessed through the internet. Further information, access the NWS EMWIN homepage at URL: <http://iwin.nws.noaa.gov/emwin/index.htm>



Honored Speakers at the opening of the new National Weather Service office. From left, Mr. Richard Hagemeyer, Director of the National Weather Service Pacific Region, Vice President of the Republic of Belau Tommy E. Remengesau, Jr.: Lt. Governor of Guam Madeleine Z. Bordallo; Mr. John E. Jones, Jr., Deputy Director of the National Weather Service; Guam Congressman Robert A. Underwood and Mr. John F. Miller, Meteorologist in charge of NWS in Guam.



National Weather Service personnel pose in front of the new NWS building. The new facility houses the WFO Guam operations and the NWS Sub-regional Maintenance Depot. (photo courtesy of John F. Miller)

## PHILIPPINES

### PAGASA marks 135th anniversary on WMD 2000

The Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) marked its 135th anniversary on 23 March in joint celebration of World Meteorological Day 2000. The worldwide observance of WMD 2000 carried the theme- The World Meteorological Organization - 50 Years of Service.

Officials and employees of PAGASA marched in the streets early morning kicking off the twin celebration which included an exhibit, a program, video showing and lecture. A press conference was also held for the media aimed at building strong awareness on the importance of the occasion.

The exhibit was opened by Rep. Heherson Alvarez and Undersecretary Rufino Lirag of Science and Technology. During the program, awards were given out to the winners of the Name a Bagyo (typhoon) contest, Poster-making and PAGASA Logo contests. Dr. Leoncio Amadore, Director of PAGASA, spoke on the significant achievements of WMO and PAGASA over the years. Finally, fun games were held in the afternoon capping the day-long program of activities.

### Seminar on Development of Non-Structural and Emergency Counter Measures for Sediment and Flood Disaster

About 50 hydrological and engineering experts took part in the Seminar on Development of Non-Structural and Emergency Counter Measures for Sediment and Flood Disaster held in Quezon City, Philippines, from 8 to 12 May 2000. The seminar was jointly sponsored by TCS and the Japan International Cooperation Agency (JICA), in cooperation with PAGASA and the Philippine Department of Public Works and Highways.

The officials on the opening of the five-day seminar which was attended by eight members of TC included: Hideo Ono, JICA Resident Representative; Teodoro Encarnacion, DPWH Undersecretary; Roman Kintanar, TCS coordinator; Cipriano Ferraris, deputy-director of PAGASA; and Han-Se Lee, hydrologist of TCS.

The seminar provided specialized instructions on the causes of sediment disasters, emergency rehabilitation and maintenance, flood fighting activity, and promoting public awareness on the threat of sediment and flood disasters in countries in Asia and Pacific. Topics focused on the forecasting and warning of sediment and flood disasters and provided a full understanding of the foundations of the warning information.

The participants also visited Mt. Pinatubo and conducted a field inspection of the flood forecasting and warning systems at Sacobia-Banban and Pasig-Potrero rivers, a flood control project at Pampanga river, as well as the hydrological observatories in Sasmuan and Sulipan towns.

### WMO consultant visits TCS

Kuniyuki Shida, WMO consultant, discussed future technical cooperation activities and other new initiatives between TCS and WMO during his meeting with TCS coordinator Roman Kintanar on May 17. Shida also met with other officials of PAGASA.

Shida's mission to the Philippines and other Asian countries was in line with WMO's efforts to enhance collaboration with bilateral and multilateral funding agencies, development banks, donor Member countries, relevant inter-governmental and non-governmental organizations and the private sector to assist developing countries in the region.



WMO consultant Kuniyuki Shida (center) poses with Dr. Kintanar and new TCS Meteorologist Efigenia C. Galang.