

Report on the Fifth Asia-Pacific Satellite Data Exchange and Utilization (APSDEU) Meeting

**Beijing, China, China Meteorological Administration
27-30 April 2004**

Tuesday 27 April 2004

Introduction and Welcome

The Fifth Meeting of the Asia-Pacific Satellite Data Exchange and Utilization (APSDEU-5) group was hosted by the China Meteorological Administration at its Headquarters in Beijing, China. Professor Dong Chaohua welcomed participants on behalf of the Deputy Administrator of CMA Dr Zheng Guoguang. She introduced the Deputy Director-General of NSMC, Dr Yang Jun who provided the Opening speech.

Dr Jun said it was a great honour and pleasure to welcome the participants to this fifth meeting of APSDEU. He expressed a warm welcome to the country representatives during the springtime. He described the long history of satellite observations and noted that the spaced based observing network is complementary to the surface network. The improvement of utilisation in NWP models has highlighted further needs to maximise use of satellite data to get the greatest benefit to users. The APSDEU forum has provided a special opportunity for meteorological agencies in this region to hold face to face discussions and discussions with satellite operators and users.

Dr Jun announced the new schedule for forthcoming launches. In October FY-2C is planned to be launched as the first fully operational geostationary meteorological satellite of China, in the wake of the experimental FY-2A and FY-2B satellites. FY-3A the first of the next generation polar orbiters and is now being manufactured with launch in 2006 or 2007. The Direct Broadcast of data from all these satellites will be available to all Members of WMO as part of China's free and open data policy.

Dr Jun encouraged participants to make use of the APSDEU meeting to improve joint efforts in data use and applications. He hoped that the meeting would be a complete success and that all participants would have a pleasant stay in Beijing.

Mr Luo Dongfeng from CMA, who represented the local Secretariat, announced its support for the administration and coordination of arrangements for APSDEU-5. He acknowledged the assistance of representatives from Australia and USA who had agreed to assist with the record of the meeting.

At the end of the opening proceedings, Professor Dong Chaohua formally declared the APSDEU-5 open.

Participants (see Attachment A for detailed list of representatives)

Dr Zheng Guoguang, Deputy Administrator of CMA (official welcome)
Dr Yang Jun, Deputy Director-General of NSMC, CMA.
Mr Luo Dongfeng, International Affairs, CMA/NSMC
Mr Zhao Licheng, CMA/NSMC, China
Mr Shi Peiliang, CMA/NMC, China
Mr Zhang Hongtao, CMA/NSMC, China
Mr Xue Jishan, CMA/MSRA, China
Professor Dong Chaohua, CMA/NSMC, China
Professor Xu Jianmin, NSMC, CMA
Mr Lu Naimeng, CMA/NSMC, China
Mr Liu Jian, CMA/NSMC
Ms Gu Songyan CMA/NSMC
Mr Ran Maonong and Mr Yang Zhongdong, CMA/NSMC
Dr David Griersmith, Australian Bureau of Meteorology
Mr Kit Chi Tsui, HKO, Hong Kong, China
Ms Josee Morneau, CMC, Canada
Mr Jun-Tae Choi, KMA, Korea
Messrs S-W Joo, E-J Lee, S-D Yoon and W-J Lee, KMA, Korea
Mr Yoshiaki Takeuchi, JMA, Japan
Mr Toshiyuki Amano, JAXA, Japan
Ms Tomomi Nio, JAXA, Japan
Mr Miyano Yoshikazu, JAXA, Japan
Mr Fred Branski, NOAA/NWS, USA
Ms Emily Harrod, NOAA/NESDIS, USA
Ms Katy Vincent, NOAA/NESDIS, USA

Agenda and Meeting Record/Secretariat

The detailed Agenda is provided at Attachment B. Secretariat services were provided by Mr Luo Dongfeng and colleagues from CMA, while rapporteur services to provide the record of the Meeting proceedings were provided by Dr David Griersmith from the Australian Bureau of Meteorology, and Mr Luo Dongfeng.

Country Reports on Satellite Data Exchange and Utilization

All reports and scientific papers as well as Abstracts, may be found on the CD-ROM accompanying the report and at the APSDEU web site (<http://apsdeu.noaa.gov/>). For convenience the Abstract for each presenter (in most cases) is given below. A summary of questions and discussions is also provided. The details of each presentation are on CD, so that only summaries and key points are presented here.

Chair of morning proceedings: Professor Dong Chaohua, CMA

0930-0950 hrs Overview of Current and Future NOAA Satellite Systems (Emily Harrod, NOAA/NESDIS, USA)

Abstract: The National Oceanic and Atmospheric Administration (NOAA) presentation is in three parts. The first includes updated information on the current status of the operational NOAA Polar satellites with emphasis on the current anomalies affecting the instrument data. The presentation provided information on the plans for operational support of the NOAA mission under the Initial Joint Polar Operational Satellite System (IJPS) and described the agreement between NOAA and the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT) binding both parties' Polar-orbiting satellites in a manner beneficial to the world's meteorological community. The second part of the presentation provides an overview of the National Polar-orbiting Operational Environmental Satellite System (NPOESS) program, a tri-agency effort to leverage and combine environmental satellite activities following the IJPS series. Emphasis is placed on the impact of changes to NOAA and the user community. Then finally an update is presented on the non-NOAA mission, where it stands and where it's going. Additional user information, not provided in the presentation, can be found in the following:

Current Operations:

Products from the internet - www.saa.noaa.gov (New users must register)

IJPS:

MHS direct readout information in section 4 of KLM Users' Guide -

<http://www2.ncdc.noaa.gov/docs/klm/index.htm>

HIRS calibration algorithm in paper found in [HIRS-alg4.pdf](#) along with presentation materials is available on the web site that contains the NOAA-N test data

(<ftp://metroweb.nesdis.noaa.gov/pub/noaa-n>) within the HIRS folder (Contact

Changyong.Cao@noaa.gov with questions)

NOAA-N test data, new formats, and differences in instrumentation -

<ftp://metroweb.nesdis.noaa.gov/pub/noaa-n>

NPOESS:

Integrated Program Office site - <http://www.ipo.noaa.gov>

Meeting Report: Ms Harrod greeted participants from the NOAA Office of Satellite Data Processing and Distribution. She indicated that the Office is undergoing some re-alignment organisationally. Reginald Lawrence is the new Chief of Information Processing Division. Dave Benner heads the Satellite Services Division and Barbara Banks heads the Program Management Division.

Ms Harrod highlighted IJPS (Integrated Joint Polar System) launches including NOAA-N (pm) planned for December 2004 around the time of GOES-N, although NOAA-N might slip to January 2005. NOAA-N' might be 2007 launch. Ms Harrod gave an overview of the IJPS system including linkages with Eumetsat.

Ms Harrod described the details of operational NOAA polar orbiters. The current constellation includes N-17 (am), 16 (pm), 15 (backup am), 14 and 12. AMSU-A1 has failed on N-17 and there are some problems with AVHRR on N-16 which involve barcoding into the image, making

the data largely unusable. N-16 was launched in September 2000, and very recently work has been in progress including a rephase four times per day, in an endeavour to rectify the problems. Rephasing involves loss of a few scan lines which is better than data containing unusable barcodes.

NOAA-N involves a number of significant changes. MHS replaces AMSU-B so the field of view for HIRS changes as well. AMSU-A and AVHRR will have format changes, and AMSU-A will have a calibration change. The NOAA web site details the changes (see presentation). This is a major issue for the user community. MHS and AMSU-B are different, for example, they use some different channels. MHS also operates in different modes. HIRS/4 has 10km FOV compared to HIRS/3 20km. AMSU-A will have a lunar intrusion detection correction, using a new algorithm.

Ms Harrod foreshadowed major system upgrades in the era of Metop. CCSDS and GAC raw data will be processed and after L1a the data will be processed in the form of granules. From day 1, products from Metop will include core instruments such as AVHRR, AMSU-A, MHS, HIRS, SBUV etc. Metop is scheduled for a late 2005 launch.

Dr Jun asked about the data transmission methodology during the IJPS era. Ms Harrod suggested that delays would be reduced. Mr Takeuchi expressed interest in the ASCAT data distribution from NOAA. Ms Harrod indicated that she would provide that information to participants later. **Action Item 2004-5-1. NOAA will provide Meeting participants with information about plans for ASCAT data availability and dissemination.** Professor Dong Chaohua asked about calibration changes. The HIRS calibration algorithm changes will be on the NOAA web site soon.

0950-1010 Status of GOES-9 Operation and MTSAT Program (Yoshiaki Takeuchi, Numerical Prediction Division, Japan, with contributions from Nozumu Ohkawara and Ryoji Kumabe from MSC

Mr Takeuchi described the Multifunctional Transport Satellite (MTSAT) program, and the recent history. Unfortunately the MTSAT launch failed in November 1999. GMS-5 was backed up by GOES-9 on 22 May 2003. GMS-5 continues with WEFAX and DCP functions, while GOES-9 at 155E provides operational imagery (GVAR) data.

MTSAT-1R is now at the Tanegashima launch center, awaiting launch. JAXA has not yet announced the new launch schedule for the H-IIA rocket. MTSAT-1R has a number of improved functions including 10 bit quantisation and an additional 3.7 micron channel. Also the resolution in the visible improves from 1.25 to 1km and in the infrared from 5km to 4km.

Mr Takeuchi described the format changes concerning HiRID and transition to LRIT and HRIT. Initially HiRID will be transmitted for compatibility with S-VISSR ground systems. In the HiRID signal the additional two bits will be stored in the downlinked signal for those users wishing to make use of the 10 bit data. HRIT conforms to international format standards and is close to the original resolution and at 3.5 Mbps.

Major improvements are expected for a number of applications including sea surface temperatures (SSTs), Atmospheric Motion Vectors (AMVs) and Aerosol Optical Thickness (AOT). For SSTs estimates are that the RMS error will be halved. With 10 bit visible data the MTSAT-1R will allow AOT resolution of 0.01 compared to 0.1 with GMS-5 data. AMVs will improve using 15 minute imagery.

Parallel distribution of HiRID and HRIT forces an irregular observation time for full disk images, since the data formats use the same single transponder. Therefore JMA requires migration plans from HiRID to HRIT for the Bureau of Meteorology, CMA and KMA, who will be producing AMVs by themselves. **Action Item 2004-5-2. JMA outlined important issues related to the desirability of termination of HiRID transmissions in favour of HRIT from MTSAT-1R. In particular JMA noted that the time shared distribution of HiRID and HRIT induces irregular observation times for hourly full-disk images and half-hourly northern hemisphere images. APSDEU Member countries (Australia, China, Korea) through their representatives (Australian Bureau of Meteorology, CMA and KMA) agreed to provide JMA with their migration plans from HiRID to HRIT, including ongoing generation of Atmospheric Motion Vectors as appropriate, to enable JMA to expedite implementation of regular observation times.**

Mr Tsui from HKO asked about GOES-9 operations after MTSAT-1R is operational. Mr Takeuchi expected that GOES-9 would stop operations. Dr Jun asked about the Internet data dissemination from JMA in which only the IR data was made available on the server, whereas GOES-9 gives many other channels. Mr Takeuchi said that the data volumes are huge especially for the visible data, and for some countries the Internet environment is limited so at present the further availability of data channels would be problematic for many countries.

Dr Jun asked about HiRID and HRIT and Mr Takeuchi clarified they would be time sharing. HRIT takes about 3 mins for distribution due to compression whereas HiRID takes about 22 minutes. Therefore JMA is encouraging migration to HRIT as soon as possible.

The issue of lifetimes of the geostationary satellites in the region was raised in discussion and Mr Takeuchi and Mr Fred Branski (NOAA/NWS) confirmed that GMS-5 and GOES-9 are both beyond their expected lifetimes (launch 1995). Avoiding launch delays was therefore very important for the Region. **Action Item 2004-5-3. JAXA will provide information on launch schedules to the APSDEU Members when available.**

1010-1030 Overview of CMA/NSMC Satellite Operational System and Data Broadcast (Zhao Licheng, CMA/NSMC, China)

Mr Zhao Licheng from CMA/NSMC gave an overview of CMA satellite plans and organisational arrangements. There is a Director-General, Deputy Directors and Engineer General, and other organisational units (see presentation for details).

NSMC is committed to polar orbiting and geostationary operational systems. Mr Zhao provided

an overview of each including the CMA satellites, plus reception from a number of other satellites. He noted that for FY-2 TARS trilateration was performed at the CDAS, Guangzhou, Urumqi and Melbourne. A new ground processing system is being implemented for operations in 2004. China is also receiving data from Meteosat-5 at 63E.

In 2002 NSMC decided to develop a new archive and retrieval system. NSMC is planning for ingest, archive and cataloguing FY-2C in January 2005. Archival policy includes many satellites with a nearline tape library from 2 to 8 years duration depending on the satellite. For FY-3, NPOESS and Metop nearline data is planned for 2 years. Data retrieval targets are also in place. In June 2004 a new access system is being implemented with up to 8000 user terminals.

FY-2B has a three-channel imager the same as FY-2A (now at 86E as backup). FY-1D was launched on 15 May 2002 and FY-1C ceased transmissions in February 2004. Remaining FY-2 series satellites are scheduled for launch in 2004, 2007 and 2010. For the advanced FY-3 series the first satellite will be launched around 2006.

1030-1050 Tea/Coffee Break and Group Photo

1050-1110 Overview of Australian Bureau of Meteorology Satellite Activities (David Griersmith)

Abstract: The Bureau of Meteorology (BoM) is a National Meteorological and Hydrological Service which provides services such as weather forecasts and warnings, climate, oceanographic and hydrological information, in support of aviation, shipping, defence, industry and the general public, to enhance economic and social well-being. The capacity to provide these services depends critically on space-based observations, and complementary ground-based observations coupled with computing and communications technology.

This paper summarises the types of satellite data used by the Bureau, including assimilation into Numerical Weather Prediction (NWP) models, and Internet services. In recent years data from Bureau local reception networks (e.g. antennae for GOES-9, FY-2B, NOAA, FY-1D, MODIS reception) has been increasingly complemented by data from Internet, GTS or dedicated communications links. Another major trend has been greater use of products from X-band and R&D satellites, although timeliness, resolution and operational reliability remain important. AATSR and altimeter data from ENVISAT are being used experimentally. Other key issues include: education and training in satellite data use; dissemination of satellite data via a SATAID server; re-engineering systems to receive new format data (e.g. LRIT, AHRPT); exchange arrangements; coordinated Australian approaches to data processing for AVHRR and MODIS; and ongoing clarification of user needs and priorities to assist in planning and applications development. This paper also provides an update on Bureau satellite data reception, processing and archive systems, and reports on plans for further X-band reception and the Geostationary Imaging Transform Spectrometer (GIFTS) project.

Meeting Report: Dr Griersmith provided a summary of the Bureau's role as Australia's national weather service, with activities including forecasting, warning, climate, oceanography and hydrology. He emphasised the critical role of satellites in the Bureau's activities. The Bureau

has 18 satellite ground stations and derives many products. The Bureau also accesses large amounts of satellite data from non-direct means such as GTS, Internet, ftp and dedicated communications links. Dr Griersmith provided examples of applications from geostationary and polar orbiting satellites. He emphasised how important the geostationary satellite data were to the Bureau (e.g. GOES-9, FY-2 series) and stressed the relevance of the forthcoming FY-2C, MTSAT-1R and COMS, as underpinning Bureau observing capabilities and services and research.

Dr Griersmith highlighted 4 major issues before the international satellite community including the incorporation of experimental and R&D satellites into the Global Observing System (GOS) of WMO; the integration of imagers with sounders in hyperspectral instruments; the move from L-band to X-band to accommodate higher data rates; and major format changes which necessitated comprehensive mandatory changes to ground reception stations around the world. He indicated a vision for the Asia-Pacific region including improved coordination on issues such as data dissemination, regional servers, coordination of ground stations, coordination of archive facilities, and closer cooperation on education and training issues.

Discussion and questions were on the issue of ATOVS data and Dr Griersmith indicated that use was made of AMSU-A for the Bureau's global model but for the local area model NESDIS and locally received AMSU-A and AMSU-B were going into operations this year. Another issue raised was Indian Ocean coverage and Dr Griersmith indicated that the best likelihood was FY-2C although another Meteosat, an Indian or USA satellite all remained possibilities to improve coverage. If GIFTS (Geostationary Imaging Fourier Transform Spectrometer) goes ahead and is stationed over the Indian Ocean it would provide excellent coverage with its advanced imager/sounder capabilities. The Bureau plan is to provide a ground station for GIFTS, in Perth, Western Australia.

Dr Griersmith raised a number of R&D operational issues for discussion as detailed in his written paper provided to the Secretariat. These included the Bureau's desire for MODIS polar winds, and support for the transition of further products to BUFR. He asked when AVHRR SST data might become available in BUFR. **Action Item 2004-5-4. NOAA will provide an update to Meeting participants concerning the future availability of AVHRR SST data in BUFR. This was requested by the Australian Bureau of Meteorology.**

**11:10-1130 Recent Remote Sensing Activities and Applications at the Hong Kong Observatory
(K C Tsui, Hong Kong)**

Abstract: This paper describes remote sensing activities and applications at the Hong Kong Observatory with emphasis on recent developments. Major activities of interest in 2002 and 2003 included the transition from GMS-5 to GOES-9, the installation of a LIDAR system for use in airport weather alerts, the studies and use of satellite data on numerical models, as well as the efforts made in public information and education. Brief discussion will also be made on the implementation of the AMDAR programme and wind profilers in Hong Kong.

Meeting Report: Mr Tsui gave a brief introduction to HKO: the 4 main branches are Development, Research and Administration; Forecasting and Warning Services; Radiation Monitoring and Assessment; and Aviation Weather Services. He also gave an overview of satellite activities in which HKO now receives GOES-9 GVAR and IR1 data from the JMA Internet server. He thanked JMA and NOAA for the backup arrangements. The polar-orbiting satellite reception system was enhanced in 2002 for receiving the FY-1 series of satellites.

Aviation weather service is one of the most important services provided by HKO. A Lidar was implemented in 2002 and has demonstrated well its capability in detecting windshear and turbulence. It was the first of its kind of use in airport weather alerts.

The use of satellite data in NWP is another very important area. A 4D-VAR mesoscale model is under implementation. Studies and work have also been done in making use of the vertically integrated precipitable water vapour extracted from GPS satellites.

Public information and education have been enhanced (see www.weather.gov.hk). Training courses on interpretation of radar and satellite images were conducted for government officers and the public for enriching their knowledge in the weather information available on the web.

Since late 2003 AMDAR data has been regularly received. These AMDAR data are distributed over the GTS starting from April 2004. Wind profilers have been used since 1996. HKO has started to distribute the hourly wind profiler data in BUFR format via GTS since April 2003.

Looking ahead, HKO will be implementing MODIS and MTSAT reception, and automate the alerting of windshear and turbulence based on LIDAR data.

Professor Dong Chaohua asked about training courses and Mr Tsui said that the courses would be conducted from time to time for allowing more members of the public to attend.

1130-1150 Recent Progress at CMC/Meteorological Service Canada (Josee Morneau, CMC, Canada)

Abstract: The MSC progress report provides an overview of the Canadian forecast system. Changes made over the last two years to the CMC data assimilation and numerical weather prediction system are discussed.

The status of the Canadian AMDAR program is presented. CMC's monitoring has demonstrated the good quality of the Canadair Regional Jet (CRJ) data (soon available on GTS in BUFR format ; IUAA01 CWA0 and IUAB01 CWA0).

In June of 2003, CMC added four AMSU-B channels from NOAA15/16/17 and one channel from GOES-10 to its operational data assimilation cycle as a replacement to the HUMSAT data. Positive impact was measured in particular for humidity forecast over southern hemisphere and a significant threat score improvement of North American 24h precipitation accumulation was noted. It is showed that the two sets of data complement each other in terms of coverage and

timeliness.

During the summer of 2004, CMC is planning to include AMSU-A from AQUA, radiances from GOES-12, US profiler data and MODIS winds data to the operational data assimilation suites. It is showed that the assimilation of MODIS AMV alone significantly reduce the 24h wind forecast errors over the Polar Regions.

The future plans include the implementation of a global 4D-Var data assimilation cycle which showed significant forecast error reduction at all forecast time.

APSDEU's participants are encouraged to visit the new Canadian data monitoring web site (http://www.cmc.ec.gc.ca/~cmcdev/data_monitoring username: monitoring password: CMC)

Meeting Report: Ms Morneau gave a presentation based on her work with Gilles Verner about the Canadian Meteorological Centre, Environment Canada. She began with an overview of the organisational arrangements for MSC, which has 5 Directors-General.

CMC has three GOES GVAR stations and MSC operates 3 HRPT systems. The NEC SX-6 supercomputer has been replaced with an IBM SP-928 in January 2004. The GTS link to NWS was upgraded to a T1 link in 2003 mainly for upgrade of NWP exchange. There is also a link for Eumetsat and CMC for EARS. A T1+ link with NESDIS has been approved.

The Global system uses 3D-VAR T108 to produce 6-hour forecasts. The main aspects of modelling are:

- the GEM model which works at a global 100km 10-15 days 28 levels with a 3 hour cutoff,
- regional model at 15km resolution out to 48 hours with 58 eta levels (this model is actually global but with higher resolution over Canada), and
- HIMAP mesoscale model with resolution at 10km out to 24 hours, and 35 levels.

Further observations such as profiler, Aqua AMSU-A, GOES-E and Aqua and Terra MODIS winds are being added to the 3D-Var assimilation this summer.

CMC does a continuous ice cover analysis.

Some of the Canadian observational network characteristics are being diminished, for example greater use of AMDAR will replace the need for some soundings. The Canadian AMDAR program involves about 31 aircraft and there are plans for expansion, particularly on regional jets. CMC does the processing. In the early days of the AMDAR program, monitoring revealed that there was a bias associated with the aircraft-mounted probes, which are being progressively replaced.

In late 2002 AMSU-A from NOAA-17 was added to NWP but unfortunately the instrument failed in October 2003. Ms Morneau then gave an overview of work on AMSU-B from her colleagues in CMC (e.g. Mr Chouinard). The data is being assimilated from NOAA-15,16 and

17, and the coverage is excellent for a global model. Both AMSU-B and GOES have similar large, average corrections for $T-T_d$ at 250 hPa of up to many degrees. Verification studies for the model predictions after AMSU-B assimilation show that they are much better, especially for parameters like precipitation. RMS errors have been reduced substantially for many other geophysical parameters.

In coming years there are plans to implement new data in the assimilation systems at CMC. Global 4-D VAR is planned for fall 2004. Polar winds from MODIS show a positive impact especially over the poles. Contrary to a 3D assimilation scheme, the 4D-Var analysis takes into account the time of observations to compute the innovations at the appropriate time.. The 4D-Var algorithm seeks for a forecast that best fits the observations over the 6 hour assimilation window. Spatial data thinning is done for every time bin, currently 45 minutes. Trials of the new 4D-Var system show good positive impacts for example on 500 hPa geopotential height. Other plans include improvements to the GEM global model in 2005.

Satellite data priorities include ATOVS, SSMI/SSMIS, QuikScat and ENVISAT, MODIS products, Meteosat and GOES-9 imagery, high density AMVs for GOES-9 and MTSAT, AIRS and Metop (e.g. IASI).

The data monitoring website is http://www.cmc.ec.gc.ca/~cmcdev/data_monitoring and for access participants can use:

user name: monitoring
password: CMC

Discussion surrounded Ensemble Kalman filter (EnKF) and 4D-Var. Intercomparisons have not been done yet. Global ATOVS data is obtained from NESDIS via dedicated ftp at high data rate. The link is being upgraded. Only ice cover is used but not ice thickness so far.

1230-1400 Lunch Break

Chair for afternoon proceedings: Mr Fred Branski (NOAA/NWS, USA)

**1400-1410 Introduction to Satellite Activities and COMS Program in KMA
(Jun-Tae Choi, Remote Sensing Division, Korea Meteorological Administration)**

Abstract: Korea Meteorological Administration has been operating satellite data receiving and processing systems which include the receiving facilities for geo-stationary meteorological satellite (GOES-9, FY-2B, Meteosat-5), polar orbiting meteorological satellites (NOAA, FY-1) and EOS satellite (Terra, Aqua, QuikSCAT). According to JMA's plan for the transition from GMS-5 to GOES-9, KMA upgraded one of GMS-5 receiving equipment in early 2003 to prepare for the GOES-9 data acquisition and all of the GMS-5 satellite imagery service of KMA has been replaced with GOES-9 data. KMA also has been receiving Fengyun-2B with technical support of NSMC for the installation and operation based on the bilateral cooperation project with NSMC. KMA upgraded X-band receiving system for acquisition of direct broadcast Aqua data in 2002

and has established the Level 1.5 product generation system for Aqua/AMSR-E, AIRS, AMSU in 2003, in collaboration with NASDA. Now KMA is working on Level-2 geophysical parameter retrieval using Level 1.5 data.

The National Space Program was established to accommodate the requirement of public and civilian use with respect to the domestic satellite demand and continuity for satellite service. In communications, oceanography and meteorology field in the program for the public and R&D purposes, two of COMS (Communication, Ocean and Meteorological Satellite) developments are scheduled to launch in 2008 and in 2014, respectively. The first COMS development program spans from 2003 to 2008. The meteorological mission is the acquisition of real-time meteorological observation data, which provides higher temporal, spatial and spectral resolution data than currently available, especially in case of severe weather in Korean Peninsular. Meteorological observation data from COMS will be distributed to worldwide user station, according to HRIT/LRIT global specification defined by CGMS of WMO.

Meeting Report: Mr Choi spoke about the status of the satellite service in KMA, recent activities and the COMS program. Satellite data is locally received at Munsan, Seoasan and the Seoul HQ. MESDAS-II the Meteorological Satellite Data Reception/Analysis System is used. The main satellite systems used include GOES, Meteosat-5, FY-2, NOAA, Aqua, Terra, QuikScat.

Mr Choi described the transition from GMS-5 to GOES-9. He noted the 10 bit data and the extra 3-9 micron channel compared to GMS-5. Applications include fog detection and Asian dust detection for example using IR1-IR2, although some problems have been encountered in the transition from GMS-5 to GOES-9 for the latter application. KARI the Korean Aerospace Research Institution has developed an improved imagery navigation system for GOES-9, which until then had been a problem for accurately locating various events by satellite.

Since 2002 KMA has received local Terra and Aqua data. ACAP is the Aqua Catalog and Products generation system and was developed by CMA and others. Munsan weather station has a MODIS reception system. Various derived products are provided such as height, temperature and moisture at 700 hPa, total ozone, water vapour, cloud properties, SSTs, fires and low cloud. Microwave data is used to monitor typhoon intensity.

COMS, Korea's multi-purpose geostationary satellite is scheduled for launch in 2008 with a meteorological sensor. This will be a major addition to the satellite monitoring capabilities in the Asia-Pacific region. *[More information needs to go here - editor].*

1420-1440 JAXA's Satellite Mission (Toshiyuki Amano, Earth Observation Research and Application Center, (EORC) Japan Aerospace Exploration Agency (JAXA), Japan)

Abstract: Satellite offers a wide variety of valuable services including weather observation. Japanese satellites in orbit have been performing missions in a wide range of areas. For example, they have been playing an important role in assessing and analyzing abnormal weather patterns.

Since 1997, the Tropical Rainfall Measuring Mission (TRMM) has been measuring precipitation data in tropical and sub-tropical area. We have got fruitful scientific achievements from TRMM data. And we already started to provide for Global Precipitation Measurement (GPM) mission, the successor of TRMM. I'm going to explain about results of TRMM and also about current status of GPM project.

Moreover the presentation also mentions about some another satellites, for example, Aqua, GoSat, GCOM and ALOS.

Meeting Report: Mr Amano explained that in 2003 ISAS Institute of Space Aeronautical Science), NAL (National Aerospace Laboratory) and NAADA merged to form JAXA. JAXA has a president , a Board of Directors and a number of Offices including the Office of Space Applications.

Currently all projects are suspended and an announcement is yet to be made re the H-IIA launch schedule. At end of May 2004 some conclusions and inspections will be made. In June or July and official announcement re the new launch schedule will be made. The target is probably around early next year. JAXA has a responsibility to launch MTSAT-1R successfully. The timing awaits the results and outcomes of the inspection of the H-IIA rocket systems – something which has not been completed.

Mr Amano described TRMM, the Tropical Rainfall Measuring Mission, and provided a number of applications examples.

The Global Precipitation Mission (GPM) involves one core satellite with a constellation of 8 others. GPM will orbit at lower inclination to allow mapping over the tropical region. 3-hourly data globally is being contemplated. The first GPM has a 65 deg orbit with 480km altitude. It will carry a dual frequency precipitation radar. NASA and possibly NOAA and ESA are partners.

GCOM-C involves global change and monitoring and is another advanced satellite system, as a successor to the Global Imager carried on ADEOS-II.. ADEOS-II which carried AMSR, failed unfortunately. The Advanced Land Observing Satellite is scheduled for a launch soon.

Papers on satellite systems, utilisation, applications and exchange or communications issues

1440-1500 Overview of JAXA GPM Ground System And Introduction of GPM Data Working Group (GdaWG) (Ms. Tomomi NIO, Earth Observation Research and Application Center (EORC), JAXA, Japan)

Abstract: Global Precipitation Measurement (GPM) is a global space endeavor conceived by Japan and US. JAXA has been implementing conceptual design of the Global Precipitation Measurement (GPM) program jointly with the NASA.

Building upon the success of the Tropical Rainfall Measuring Mission (TRMM), GPM is one of a future earth observation satellite program and seeks to observe precipitation more frequently

and globally than TRMM. The GPM program consists of a TRMM-type primary satellite that carries a dual-frequency precipitation radar (DPR) by JAXA and a microwave radiometer (GMI), and some constellation satellites that carry microwave radiometers.

GPM will provide a global distribution map of precipitation every three hours by processing data from the constellation satellites, which is calibrated by using data from the primary satellite. Then a global rain-map will be distributed in near-real time. It is important and interesting challenge to collect multiple microwave radiometer data and calibrate them quickly by using high reliable and secure network. And these high frequent and high accurate data are expected to be used widely throughout the world not only for scientific research but also for operational applications such as numerical weather forecasts, flood early warning system and water resources management.

We recognize the importance of partner data contributions to the global products to be produced by GPM. The data exchange is Success Key of GPM. GPM Data Working Group (GDaWG) is organized by GPM core/constellation satellite data providers for valuable data exchange. The 2nd GDaWG workshop was held in February 2004 in Tokyo. I will introduce study status of our GPM data system and the GDaWG activities.

Meeting Report: Ms Nio gave an overview of the GPM ground system. The Global Precipitation Mission begins with the core satellite then a constellation of 8 others. GPM Core is a TRMM-like spacecraft for H-IIA launch. The main instruments are dual frequency precipitation radar, and microwave radiometers. The constellation approach enables good observational sampling. Ground system requirements include data acquisition, data processing, data distribution and exchange amongst the partners. Near real time distribution is very important, especially to NWP centres. L1,2 and 3 products will be made including a L3 global rain map.

GPM core data goes via TDRS to White Sands then to processing centres. JAXA hopes to reduce time delays from the satellite via use of TDRS and fast processing. GDaWG, the GPM Data Working Group, has been formed to assist re ground system developments and specifications.

1450-1510 JAXA's Ground Operation System And Data Transfer Network in Japan (Miyano Yoshikazu, Earth Observation Centre, Earth Observation Research Application Centre, JAXA, Japan)

Abstract: JAXA founded EOC, Earth Observation Center, in 1978, for the establishment and development of satellite remote-sensing technology particularly to study the environment and its effects globally. EOC currently holds 4 antennas, acquisition and recording system, data processing system, storage system and data distribution system. EOC focus on satisfying data services, for public users and researchers, by the extreme development of information technology.

This presentation consists of 3 overviews: EOC ground system, user service and network interfaces with other agencies like MSC/JMA as data service. User service characterizes 2 search and order user interfaces; EOIS, Earth observation information and data system, and AUIG, ALOS user interface gateway. In network interfaces, data distribution to MSC/EOC, for

example, and EOC future plan are explained.

Meeting Report: Mr Yoshikazu described in detail the ground segment and data transfer arrangements for managing satellite data in EOC. A tape library with 170 Tb is available. EOC has had involvement in many satellite systems including MOS, JERS, ADEOS, TRMM and so on. Also data are obtained from a number of foreign satellite systems.

Data systems include a cutting edge technology system called AUIG, the ALOS User Interface Gateway. EOC has network interfaces with a number of agencies including JMA/MSC, via which is sends Aqua, TRMM and QuikScat data products in near real time. The link is 1 Mbps. The transPacific link between JAXA/EOC and JPL is ATM 3 Mbps.

1510-1530 NOAA GTS System (Mr Fred Branski, NOAA/NWS, USA)

Abstract:

1. *Fred Branski of NOAA/NWS provided an overview of the NWS Telecommunication Gateway (NWSTG) which includes the WMO Regional Telecommunication Hub (RTH) Washington as well as the communications gateway for many types of meteorologically related data into and out of the U.S. and WMO Region IV including both domestic U.S. and international data. Included was a summary of the major hardware and software systems and how they supported the many communications networks including the WMO Global Telecommunication System (GTS). The current state of the GTS was highlighted with an emphasis on the connectivity between RTH Washington and the Asia Pacific region.*

2. *As summary of the types and volume of data exchanged by the NWSTG was provided. Also provided was information and World Wide Web addresses on where to find additional detail about the data available on NWSTG file servers and the directory and file naming convention used.*

3. *Lastly, contacts were provided for NWS Data Management and for 24x7 help desk support for operational communication of data.*

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Meeting Report: Mr Branski described the current NWSTG (National Weather Service Telecommunications Gateway) arrangements and system characteristics. About 850,000 messages processed daily. Around 9.5-10 Tb per day is processed. The WMO GTS network is being improved via two frame relay “clouds”. Hiroyuko Ichijo provided a usage slide indicating the cyclic nature of communications transfers for example for Tokyo-Melbourne and Washington to Tokyo. About 450,000 observations and 96,000 model products (and other products) provided on a daily basis. Data input methods are multiple, while dissemination includes NOAAPORT (20 Gbytes per day and 2M products including AWIPS), NWSS, EMWIN (Emergency Managers Weather Information Network), and ISCS (International Satellite Communications) etc.

EMWIN reception systems are inexpensive and data is available from GOES-E and GOES-W. Peacesat-4 from University of Hawaii extends the footprint over Asia.

Many products are available via push. FTPmail is email based ftp for clients without the capability to establish interactive sessions. Http access is via [weather/noaa.gov/pub](http://weather.noaa.gov/pub) and has been available since 1994. Countries are invited to note that a complete list of a large number of URLs and servers is available in Mr Branski’s presentation on CD-ROM.

Mr Branski is the Team Leader of the NWS Data Management area and is contactable on fred.branski@noaa.gov.

Professor Dong Chaohua asked about data delays and Mr Branski said that messages statistics were continuously measured to check on throughputs. Most users in the public domain do not actually get their data from the NWS directly so it is important to the NWS to get information to the dissemination communities such as radio and TV (e.g. via NOAA Weather Wire service).

1530-1550 Tea/coffee break

1550-1610 Telecommunications for Satellite Data Exchange (Mr Yoshiaki Takeuchi, NWP Division, JMA, Japan, with contributions from Hiroyuki Ichijo, Planning Division)

Mr Takeuchi outlined the WMO frame relay cloud model for telecommunications improvements. For example the frame relay component to Melbourne from Regional Telecommunications Hub (RTH) Tokyo is 256 kbps. The links vary generally from 64 to 256 kbps but are 1.5Mbps to Washington. Data flows are asymmetric with large flows from Washington, and from Tokyo. Almost all data from Washington to Tokyo is via file transfer. In early April 2004 38% capacity is used and is around 974 Mbytes/day. The NWS ftp server has made available SSM/I and AMSU L1b data and soon SSMIS, ATOVS HIRS and AVHRR GAC will become available.

There is a possibility for Tokyo to relay such data on to neighbouring centres such as Seoul,

Beijing and Hong Kong, but a major limiting factor is sometimes the low bandwidth for the latter communications. However bandwidth from Tokyo to Beijing is acceptable so it could be agreed that the SSMI data from NWS could be relayed.

JMA's Message Switching System and Fax Exchange systems are at their limit and in 2005, they will be augmented via ftp server technology.

In December 2002 JMA implemented high-resolution satellite image data on an ftp server in real time to enable NMHSs with easy access.

Mr Takeuchi showed a graph of ftp usage by month for about 10 countries in the region who are accessing JMA's ftp server. Australia is the biggest user followed by Hong Kong and Malaysia.

In summary the GTS links for Tokyo have been greatly improved in the last 3 years. In the context of discussion items, JMA desires more satellite data such as SSMIS, AVHRR GAC and ATOVS HIRS from the NWS server. Distribution of SSMI (and SSMIS in the future) should be examined by countries. Current GTS systems for bulletins in Tokyo are nearing their limits and will be upgraded in October 2005. Internet is invaluable for data exchange however it is subject to variable fluctuations. **Action Item 2004-5-5. The requirements for additional data sets for candidate exchange on the GTS are needed by NOAA/NESDIS and for improved coordination in the region. Members of the APSDEU and RTH communities are encouraged to circulate their requirements for data sets such as SSM/IS, AVHRR GAC, ATOVS HIRS and other data, including volumes and timeliness.**

Action Item 2004-5-6. JMA expressed an urgent requirement to obtain SSM/IS, AVHRR GAC and ATOVS HIRS Level 1b data via GTS link from the NWS ftp server or possibly from the NOAA/NESDIS ftp server and NOAA therefore agreed to examine this issue.

Action Item 2004-5-7. Distribution of SSMI (and SSM/IS in the near future) on the GTS in the local region should be reviewed from the practical perspective of possible collaboration between data users and telecommunications staff. JMA, CMA, KMA and HKO will coordinate to complete this action.

1610-1630 Overview of CMA Meteorological Data Transfer Network (Mr Shi Peiliang, CMA/NMIC, China)

Mr Shi summarised the RTH Beijing linkages. The rates are mostly around 9 to 48 kbps. Beijing-Offenbach is 48 kbps ftp while Beijing-Tokyo is frame relay 32 kbps. X.25 is being phased out since it is becoming increasingly expensive to maintain. An Internet web server is being established in second half of 2004.

Offenbach to Beijing is a major route with about 123 Mbytes per day in that direction. 36 Mbytes per day from Tokyo to Beijing. Links like these are asymmetric. There is some spare capacity on RTH Beijing links which might be used for satellite data exchange. Capacity upgrade is technically easy, is required.

The CMA has a national comms network which uses VSAT extensively. PCVSAT is China's VSAT-based data distribution system. There are 31 provincial centres and 311 city level centres. The speed is 512 kbps and 8*128kbps shared by various stations. LotusNotes is one component of the comms traffic. 2300 PCVSAT reception stations. Some are two-way. The communications use AsiaSat which is a commercial telecommunications satellite. The footprint of Asiasat-II covers mainly China.

PCVSAT data volume has showed a steady growth in the last few years, with about 45 Gbytes each day broadcast from the centre. There is an annual fluctuation in which traffic is far greater in the summer, flood season.

Challenges include radar and satellite data, especially die to volumes. Automatic Weather Station (AWS) data is also a challenge. Centralised data management and the Olympic Games pose further challenges. A broadband 2-4 Mbps network between Beijing and provincial capitals is planned in 2004., and a new generation of satellite broadcast system is planned.

Contact email for enquiries is shipl@cma.gov.cn).

Professor Dong Chaohua asked about procedures for accessing data and Mr Branski added that the first point of contact was normally the local RTH. Mr Branski noted Japan's desire for additional data across the GTS – he encouraged the Asian nations to form a combined set of requirements.

1630-1650 Overview of CMA Meteorological Satellite Applications and Services (Mr Zhang Hongtao, CMA/NSMC, China)

Mr Zhang gave an overview of NSMC/CMA satellite applications. Operational products were described first. Satellite data is especially important for typhoon monitoring. In 1922 about 1M people died as a result of a typhoon. In 2002 about 600,000 people were evacuated thereby saving large numbers of lives. Satellite data is used not only for such typhoon monitoring but also for related flood monitoring. Forest fire monitoring is also undertaken. Other applications include:

- precipitation monitoring
- SSTs e.g. global FY-1D SST maps compare well with NOAA AVHRR
- dust storm monitoring – also ground truthed via about 20 sun photometers
- snow disaster and snow monitoring
- fog monitoring
- vegetation and drought
- sea ice
- algae in lakes
- city heat island monitoring

NSMCs website has data including raw data.

For R&D products, the following work is underway:

- precipitable water, aerosol optical depth from FY-1D
- cloud optical thickness
- effective radius of cloud particles
- seasonal cloud parameter variations
- cloud properties
- MODIS image maps over China
- QuikScat storm detection

**1650-1710 Introductory Briefing to Invite Discussion on Transition to BUFR Format
(Fred Branski, NOAA/NWS, USA)**

Abstract:

1. Fred Branski of NOAA/NWS provided an overview of the NWS Telecommunication Gateway (NWSTG) which includes the WMO Regional Telecommunication Hub (RTH) Washington as well as the communications gateway for many types of meteorologically related data into and out of the U.S. and WMO Region IV including both domestic U.S. and international data. Included was a summary of the major hardware and software systems and how they supported the many communications networks including the WMO Global Telecommunication System (GTS). The current state of the GTS was highlighted with an emphasis on the connectivity between RTH Washington and the Asia Pacific region.

2. As summary of the types and volume of data exchanged by the NWSTG was provided. Also provided was information and World Wide Web addresses on where to find additional detail about the data available on NWSTG file servers and the directory and file naming convention used.

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day) Phone: (301) 713-0902 Fax: (301) 587-1773

Meeting Report: Mr Branski opened the subject of data migration. WMO Congress 14 endorsed a new approach, to counter the very large number of data formats in use each of which requires decoders and is inflexible to varying degrees. See the WMO website (URL given in presentation on CD-ROM) which gives the relevant documentation including the WMO migration plan.

BUFR has good flexibility and is becoming universally accepted as the main code form for satellite based data. The goal is to have migration for satellite data exchange to BUFR complete by 2006. Other systems such as maritime and aviation may take longer for the transition. Mr Branski noted Dr Griersmith's support of the importance of BUFR format.

During discussion Mr Shi from CMA asked about how the BUFR issue was managed in NWS/NOAA. Mr Branski indicated that NOAA/NESDIS is the main provider and producer of satellite data. Winds are in BUFR and AVHRR is moving in that direction. The USA profiler and AMDAR type data is already in BUFR. Radiosonde data will be made available in BUFR at high frequency. Argos already produces buoy data in BUFR. Mr Branski said his office was in charge of the coordination issues re BUFR.

Dr Griersmith added that Bureau customers were now very precise in their requirement for satellite data in BUFR, for example from use of AAPP for ATOVS data. So in recent years BUFR had become far more important in the Bureau and is the standard for archive and retrieval systems for much data in the Bureau.

1710- 1800 General Discussion

Mr Branski opened the discussion around 4 possible action items which were agreed to and which were subsequently confirmed and integrated into the relevant parts of the Record during the first day of proceedings. The action items relate to ASCAT data; the need for Australia, China and Korea to indicate their plans for the transition to HRIT plus continuation of AMV production; availability of BUFR AVHRR SSTs from NOAA/NESDIS; and the need for countries to clarify their data requirements for newer datasets such as SSM/IS, AVHRR GAC, ATOVS HIRS and other data (plus volumes, formats and timeliness).

1800-2000 Dinner Reception by CMA. During the reception there was a formal welcome speech for APSDEU-5 by the Deputy Administrator of CMA, Dr Zheng Guoguang.

Wednesday April 28, 2004

Chair for morning proceedings: Mr Zhang Hongtao, Vice Director-General, NSMC, CMA

0910-0940 NPOESS (National Polar-orbiting Operational Environmental Satellite System)

**by Gene Legg, Integrated Program Office, presented by Ms Emily Harrod,
NOAA/NESDIS, USA**

Ms Harrod gave an overview of the NPOESS program. There is a tri-agency management structure with an Integrated Program Office involving Department of Defense, NOAA and NASA. The NPOESS contract was awarded on 23 August 2002 and Northrop Grumman is providing the six satellites. NPOESS Preparatory Project (NPP) is scheduled for 2006 launch and NPOESS C1 for 2009 launch.

There are integrated operational requirements documents for various geophysical products. A large number of sensor Environmental Data Records (EDRs) have been identified. Various products or parameters depend on one or more sensors.

There is a direct readout Users Forum meeting in California on 19-20 May and follow-on meetings for users including a MAXI conference at Los Angeles 19-21 October 2004.

NOAA and other agencies are using earlier instruments to develop expertise in management and use of advanced satellite data so that when NPP and NPOESS are flying, full use can be made of the data. The preparatory work involves systems like Terra and Aqua, Windsat/Coriolis, Metop and similar spacecraft. NPP is central in the preparation strategy. Ball Aerospace was awarded the NPP contract in May 2002. NPP includes instrument risk reduction via testing of key instruments such as VIIRS, ATMS, CrIS and OMPS prior to NPOESS launch.

For reception use is made of TDRS and TDRSS and there are field terminals and SafetyNet Receptors with a global fiber network of the 15 receptors to central processing sites. The mission data flows were described by Ms Harrod. The NPOESS ground stations include Melbourne and Auckland, Korea and Nimitz-Hill Guam. The average data latency which is defined from ground stations to Centrals is less than 10 minutes but this does not include delivery time to the user community. The Interface Data Processing Segment generates SDRs and EDRs including data quality monitoring and archive and dissemination. The earliest delivery of EDRs from ground stations is 3 minutes time from observation, and the average is 10 minutes. The requirement is for 95% of data (EDR products) delivered within 28 minutes.

A large number of sensors will be flown and include the Visible Infrared Imager/Radiometer Suite (VIIRS) and the Cross-Track Infrared Sounder. For details on the sensors and entire NPOESS program see <http://www.npoess.noaa.gov>.

Discussions included the issue of the real time status of data delivery. The IPO web page has the details. The direct readout stations can also obtain recorded data from the satellites. Raytheon is managing the ground segment. After the Central receives the data in real time there is additional time to process before data is sent to users. NPP is not only a risk reduction satellite but also a bridge between the end of Terra and the beginning of NPOESS. Although Metop is in a morning orbit NPOESS C1 may also be in a morning orbit especially for the advanced microwave sounding capability in support of NWP, which is not available on Metop. There was some discussion and uncertainty about orbit times. **Action Item 2004-5-8 NOAA will provide**

information to participants about the NPP and NPOESS programs including equatorial crossing times for NPOESS and their coordination with Metop. Ms Vincent highlighted a forthcoming USA conference on NPOESS which would provide an opportunity for information provision to users. **Action Item 2004-5-9. NOAA will provide APSDEU-5 participants with information about a forthcoming NPOESS Maxi Conference for users to be held in Los Angeles 19-21 October 2004.**

0900- FY-2C Geo-stationary Satellite: Launch and Ground System Preparation
(Mr Yang Jun, CMA/NSMC, China)

This paper was integrated in to the earlier CMA presentations to allow time for the preceding NPOESS overview.

Papers on satellite data assimilation in NWP models

0940-1000 Status of Operational NWP System and the Satellite Data Utilisation at JMA (Yoshiaki Takeuchi, NWP Division/JMA, Japan)

Mr Takeuchi outlined current NWP models in the Numerical Prediction Division at JMA. There are 4 main models, global called GSM – 60 km, regional (RSM, 20km), typhoon (TYM, 24km) and mesoscale (MSM, 10km).

The performance of the global model is steadily improving. ATOVS radiances were assimilated direct in 2003 as well as foreign wind profiler data, and QuikScat data.

Regional 4D-VAR was implemented in mid 2003. 6 hour forecasts of precipitation have improved significantly. Also typhoon forecast positioning errors have been reduced noticeably.

Currently satellite microwave radiometer data is being assimilated into the mesoscale model e.g. SSM/I, TMI water vapour and rain rate data. Rain forecasts have been improved.

Plans for JFY2004 include MODIS polar winds, SSMI/TMI total precipitable water in GSM, and Quikscat winds in MSM which are valuable for convergence/divergence at the surface and frontal zone positioning. Also Doppler radar radial winds data for the MSM is being tested. A MODIS band 27 animation over the poles was shown, emphasising the value of such data to the global model.

In September 2004 a 10km non-hydrostatic mesoscale model will be implemented. In 2006 the resolution will be upgraded to 5km.

Mr Branski asked about the typhoon model after 2007. Mr Takeuchi answered the typhoon model would be unified to a next generation global model with 20km resolution. Mr.Zhang asked about the specification of the JMA future models. Mr Takeuchi explained the next generation global model would remain spectral model, whereas the non-hydrostatic mesoscale model would be grid model.

1000-1030 Recent Development of Satellite Assimilation in KMA (presented by Mr Sang-Won Joo, co-author Seung-Deuk Yoon, KMA, Korea)

Abstract: The Korea Meteorological Administration (KMA) starts to operate the 3dVar analysis for global numerical weather prediction system at December 29, 2003. The 3dVar has benefit on the satellite data assimilation compared to the 3dOI and it gives a good opportunity for KMA to assimilate satellite data in NWP analysis. First, the direct assimilation of ATOVS radiance data is developed in order to use the satellite observation information fully. The direct assimilation of the radiance data shows better performance in NWP forecast score compared to the retrieval method (i.e. 1dVar) and it is more significant as the forecast time is getting longer. Second, the infrared imager of GOES-9 satellite is used to retrieve humidity profile. It is developed to replace the humidity profile retrieved from GMS-5 because the GMS-5 satellite is out of service. The impact of GOES-9 is similar to the GMS-5 and without the GOES-9 bogus profile, the developing system over the ocean is not predicted properly in a selected case. Third, the total precipitable water is retrieved from SSM/I data by using 1dVar technique and its impact on the NWP analysis is compared with that of regression method. The 1dVar shows better sensitivity for large and small amount of TPW compared to the regression method.

In order to maximize the benefit of the 3dVar analysis, we plan to assimilate more satellite data such as QuikSCAT sea surface wind data using a PBL operator and directly received ATOVS data in both local and global analysis. Furthermore, in order to reduce the error caused by the time difference between satellite observation and background, the First Guess at Appropriate Time (FGAT) is being developed.

Meeting Report: Mr Joo outlined recent developments which included:

- GOES-9 TBB bogus data has replaced GMS-5.
- 1DVAR is used for ATOVS
- SATOB, SATEM and QuikScat are assimilated globally and regionally
- 1DVAR for SSMI globally is under test;
- global 3DVAR was implemented in late 2003.

For TBB from GMS-5 and GOES-9 the differences are very small. Bogussing changes rain forecast accuracy.

1DVAR with ATOVS uses 25 channels. Considerable attention is paid to errors and bias corrections.

Direct assimilation of ATOVS is undertaken. Scan angle and air mass bias correction is done before 3DVAR for the global model. .

Plans include:

- direct assimilation of ATOVS over land in 2004;
- using observed ozone data in assimilation;
- improvements for QuikScat global 3DVAR;

- direct assimilation of SSMI radiances;
- ingest of locally received ATOVS with similar data from GTS into the regional data assimilation system.

Discussion revealed that global ATOVS data in the global system came from the GTS. ATOVS data was received locally with an HRPT system.

1035-1050 tea break

1055-1115 Application of Satellite Data in NWP (Professor Xue Jishan, CMA/Chinese Academy of Meteorological Sciences, China)

Professor Xue gave an overview of the development of a variational assimilation system. The use of satellite data is an effective way of solving data sparseness problems. Since 2002 in CMA ATOVS radiances and QuikScat data have been used. GRAPES is the next generation Global/Regional Assimilation and Prediction System, and 3DVAR is one component which includes a unified grid system for global and regional configurations.

N-16 and N-17 AMSU-A are used. Typhoon forecast tracks are improved significantly. A new method of height assignment for AMVs from FY-2 satellites is being used. Other data types being assimilated include QuikScat data. Professor Xue gave examples of the impact on model accuracy for experiments with and without the satellite data types being assimilated. 1DVAR quality control is also done.

Professor Xue said that the contribution of satellite data to NWP was extremely important for China and he encouraged further international cooperation and data exchange.

Mr Joo from KMA asked about 3DVAR which required careful attention to control variables. Professor Xue said that this issue was handled in a different way for the global and regional models.

1115-1135 ATOVS Processing at NSMC (Ms Wu Xuebao CMA/NSMC, China)

Abstract: The report briefs on processing at CMA/NSMC the ATOVS onboard the NOAA-15/16/17 polar-orbiting meteorological satellites. The AAPP (ATOVS and AVHRR Preprocessing Package) has been installed to process the relay HRPT data from the 3 receiving stations (Beijing, Guangzhou and Urumqi). The radiances from ATOVS instruments are interpolated to the HIRS sounder's field of view. With high-resolution AVHRR data as well as AMSU data, the cloud detection technique for current ATOVS is improved significantly. The physical retrieval scheme is implemented in our experiment. Retrieval results validated against radiosondes indicate good agreement between ATOVS retrievals and conventional observations. Applications of the atmospheric retrieval parameters from the satellite-borne ATOVS are studied for two weather systems: the tropical typhoon over the western Pacific Ocean and rainfall over the China's terrain. In order to facilitate the operational service of the weather forecasters, a PC based image/graphic visualization system to display the brightness temperature and the isopleths

is developed. It is of great help to quickly know the three dimension structure of the weather system.

Meeting Report: Ms Wu described the ATOVS on N-15, 16 and 17 and the use of the Eumetsat preprocessing software AAPP. Three HRPT stations are used from Urumqi, Guangzhou and Beijing. After preprocessing TBB L1C data is available. AVHRR is used for cloud masking. 1DVAR retrieval scheme developed by Meteo France is used. RTTOV is used as the forward model. Comparisons of retrievals with RAOB data were shown.

Positioning and intensity forecasts for typhoons are improved after assimilation of the ATOVS data. Retrieved temperature and forecast geopotential height are useful in imagery overlay maps for forecasters to use operationally. Future plans involve use of NESDIS or GTS or ftp global ATOVS data – another possibility is to access such data from Eumetsat via EARS.

1135-1150 Sandstorm Weather Monitoring with Satellite (Professor Dong Chaohua, CMA/NSMC, China)

Professor Dong described the dust storm monitoring system and NWP prediction of dust storms. From spring to early summer dust storms are common in the NE Asian and northern China regions. An operational monitoring system was implemented in 2001 in NSMC. FY-1D channels used are 0.65, 3.7 and the split window 10.5 and 11.5 microns.

Usually around every April there will be some serious dust storms. One of the consequences is very poor visibility. NDVI and DDI (Dust storm detection index) are used. Also GMS-5 data has been used to assist with animations of dust storms.

Physical processes for NWP prediction include entrainment, erosion and deposition. Land surface parameters are very important. Erosion modelling is included. A high resolution nested limited area model is used. Spatial resolution is 50km. Results of NWP models with and without satellite data were shown. Also ground truth observations of magnitude of dust concentration were used as comparison with the NWP model predictions. An detailed example for a severe dust storm on 6 April 2002 was shown. It is also common that Japan and Korea are severely affected.

In discussion, Mr Takeuchi said JMA started a dust storm forecast in February 2004. He was interested in CMA's modelling efforts. He said he would like to exchange information on the dust storm modelling in both agencies. **Action Item 2004-5-10. CMA NSMC and JMA will nominate contact persons for exchange of information on dust storm monitoring and prediction including NWP modelling.**

1150-1210 Satellite Precipitation Estimates at NSMC (Lu Naimeng, NSMC/CMA, China)

Mr Lu explained that China encountered huge variations in precipitation both geographically and seasonally. Variations geographically are from 100mm to over 2000mm per annum. More than 2000 weather stations record rainfall but in the west the distance between such stations is very

large. Therefore satellite observations are very important.

Operational prediction techniques began in 1996, and from 1997 microwave work has been in progress. A precipitation estimation technique has been developed using both rainguage data and satellite results. Good results have been obtained and were illustrated. Validation confirmed the usefulness of the system. Hydrological users and especially the application to flooding were major beneficiaries.

1210-1230 Remote Sensing of Cloud Microphysical Properties with Satellite Data (Liu Jian, CMA/NSMC)

Abstract: The report describes the methods for retrieving cloud microphysical properties such as thermodynamic phase and cloud overlap using multi-spectral image such as visible, near-infrared and infrared channel reflectance and brightness temperature. The channels chosen for this study correspond to wavelengths 0.65, 1.38, 1.64, 3.75, 8.52, 11, and 12 μm . Firstly, analysis of cloud microphysical and optical properties at different wavelength is done. Then Radiative Transfer (RT) calculations are performed to simulate FY-1D, NOAA and EOS channels for all kinds of input parameters, such as scenario parameters (sun-sensor geometry, atmospheric sounding, surface type, cloud optical thickness, effective radius and so on). The RT calculations are performed for single-layer cirrus- and water-phase clouds as well as for the thin cirrus overlying a lower-level water droplet cloud. The simulation results show, 0.65, 1.64 and 11 μm have different properties of radiative and reflection to clouds. The reflectance of 0.65 μm is larger for both ice cloud and water cloud with similar particle size and distribution. However the reflectance of 1.6 μm for ice cloud is smaller compared with 0.65 μm . 11 μm is sensitive to clouds for its 11 μm window and it is used for cloud detection. So the reflectance at visible band is mainly a function as cloud optical thickness, the thicker the cloud optical path is, the larger reflectance at visible wavelength will be. The reflectance at 1.6 μm is affected greatly by effective radius of particles and cloud's phase, the larger effective radius the smaller the reflectance at 1.6 μm . Ice cloud has smaller 1.6 μm reflectance than water cloud. 1.38 μm is sensitive to thin cirrus because this band lies in the strong water vapor absorption region. Radiance at 3.75 μm also can be used to analysis cloud phase and effective radius. Brightness temperature and brightness temperature difference between three infrared channels (8.55-11.0 μm , 3.75-11.0 μm and 11.0-12.0 μm) can be used to detect cloud phase. The methods are developed for multi-spectral channels to detect cloud thermal phase and multiple cloud layers.

The cloud phase/multiplayer analysis methods are used to study the cloud properties in middle scale rainstorm. Cloud analysis show that the methods are applicable and have scientific meanings. From cloud phase and multiplayer analysis angle, we understand more about cloud structure of middle scale rainstorm.

Meeting Report: Dr Liu described cloud property characteristics via solar reflectance techniques e.g. water nonabsorbing clouds using 0.65 micron satellite data; water absorbing clouds using 1.6 and 3.7micron satellite radiances; and the TBB (brightness) temperature difference technique which involves 8-11 microns and 10-12 microns.

A radiative transfer model was used to illustrate some key relationships concerning the satellite radiances and cloud microphysics. For example Dr Liu showed the relation between 0.65 micron reflectance and cloud optical thickness, which was largely independent of effective cloud droplet radius. By contrast at 1.6 microns, the reflectance varies dramatically with optical thickness depending on the radius of cloud particle. For TBB there is an inverted asymmetric U or arch relationship between 3.75-11 micron difference versus T11 – this relationship depends on radius of cloud droplet.

Dr Liu gave many examples showing the use of satellite data to derive cloud microphysical properties. Multichannel data has been used to detect cirrus for example. Colour coding on an intercomparison between FY-1D, MODIS and AVHRR refers to clear, water cloud, multilayer cloud, cirrus cloud and ice cloud.

Cloud system analysis of a typhoon showed the comparison between multilayer cloud and eye detection with FY-1D versus a standard 11 micron enhancement.

In conclusion use of the 0.65, 1.6 and 11 micron channels is very effective for cloud property determination.

1230 Lunch Break

Chair for afternoon proceedings: Mr Fred Branski (NOAA/NWS, USA)

1410-1425 Direct Broadcast of China's Meteorological Satellite Data (Xu Jianping, CMA/NSMC, China)

Abstract: This paper describes the present and future direct broadcasting data of China polar orbiting meteorological satellites FY-1 and FY-3, and China geo-stationary meteorological satellites FY-2B and FY-2C. The transmission characteristics of CHRPT of FY-1D and AHRPT and MPT of FY-3 are described in detail, as well as those of S-VISSR of FY-2B and FY-2C. FY-2C will broadcast LRIT to replace WEFAX of FY-2B.

Meeting Report: Professor Xu described the details of current and future FY satellite broadcast characteristics. For FY-3 AHRPT will be transmitted at 4.2 Mbps a large increase over FY-1D at 1.38 Mbps. FY-3A carries imagers (e.g. Medium Resolution Spectral Imager with 20 channels, similar to MODIS), and has instruments for passive microwave observations, plus IR and microwave sounders. Medium Resolution Picture Transmission (MPT) will be used at X-band at 7.775 MHz at 18.7 Mbps. DPT is transmitted to NSMC/CMA only at around 90 Mbps.

For FY-2A and FY-2B transmission characteristics were very similar to S-VISSR for GMS-5. FY-2C transmission will be similar at 660kbps with 5 channels, so not all data can be put in the data stream. FY-2C will broadcast LRIT to replace WEFAX. Products will include SSTs, winds and precipitation.

For international satellite contingency planning compatibility concerning formats is desirable for

example LRIT on FY-2C and LRIT on MTSAT-1R. Both transmit LRIT at 1691 MHz. EIRP for FY-2C is 57.5 dbm compared to MTSAT 55 dbm – all other characteristic are similar.

Dr Griersmith asked about transmission of the 5 channels of data for FY-2C and Professor Xu responded that similar arrangements would be done as with the HiRID data format for MTSAT-1R, with the additional two bits stored in a spare part of the format. **Action Item 2004-5-11. NSMC/CMA will provide participants with confirmation of the format of FY-2C data transmissions, noting that it has an extra two channels compared to its predecessors.**

1430-1445 Calibration Method for FY Satellites (Gu Songyan CMA/NSMC)

Abstract: CMA/NSMC operates two series meteorological satellite: FY-1, the sun-synchronous polar-orbiting satellite series, and FY-2, the geo-stationary satellites. The payload instrument on board the FY satellites is the visible and infrared radiometer. Calibration for the instrument is implemented before and after satellite launching.

Pre-launch calibration for visible channel is conducted outdoor in carefully- selected areas in Kunming and Dali of Yunnan Province, China. Pre-launch calibration for the infrared channels is conducted in a vacuum container used to simulate the space environment.

At CMA/NSMC, two approaches of post launch calibration are mainly relied on: field radiation calibration and the inter-calibration.

Meeting Report: Ms Gu described pre-launch calibration over the Kunmin and Yunnan Provinces in China, but noted they are subject to angle effects. IR pre-flight calibration is done in the laboratory.

Visible in-orbit calibration relies on reference to a key ground site in China. FY-2 has a triple prism to get a solar image at night as a reference for the degradation of the visible channels. For FY-1 polar orbiters Dunhuang satellite observations are used for in-orbit visible channel calibration information. Reflectivity degradation of all visible channels on FY-1C is normal except for channel 1, which showed a sever decline in reflectivity. .

The Dunhuang site (at which ground measurements are made) is used for absolute visible in-orbit calibration but if the viewing angle is bigger than 30 degrees then BRDF corrections are needed.

Relative calibration of visible channels has been undertaken but has not been good enough for operational use. Absolute calibration in orbit can be done for the FY-1 IR channels. FY-2 absolute calibration is problematic since there are optical path differences between the black body and observed targets.

CGMS has been encouraging intercalibration studies for operational satellites. FY-2B and N-17 intercalibration is very good. GAC data is delayed by one or two days which limits the operational utility of the intercalibration. **Action Item 2004-5-12. NOAA will provide**

information to participants on the potential availability of AVHRR GAC data in a more timely manner.

1450-1510 EOS/MODIS Data Receiving and Processing System (Ran Maonong and Yang Zhongdong, CMA/NSMC)

Mr Ran gave an overview of a 3m X&Y axis ground reception and processing system for Terra and Aqua. The system is called Shinetek EOS/MODIS. There are 3 or 4 Linux PCs used for various functions, namely for acquisition and ingest; pre-processing, cloud masking; imagery and product preparation; and optional database and dissemination. The pre-processing uses IMAPP for cloud properties and cloud masking. MODIS LIB data is archived. .

RGB combined channel 143 examples were provided for MODIS imagery over China. Applications include NDVI, water body and flood monitoring, sand storm and fire monitoring, snow index, and so on. Mr Ran showed a large number of impressive colour examples of products.

1530-1730 Tour to CMA/ NMC and Information Service Center followed by
Tour to CMA/MSRA

1930- Informal group dinner

Thursday April 29, 2004

Chair for morning proceedings: Mr Fred Branski (NOAA/NWS, USA)

0830 – 0840 Status Report on AMDAR program in Japan – Mr Yoshiaki Takeuchi, NWP Division, JMA

Mr Takeuchi provided a status report on the AMDAR program in JMA.

In April 2003 JMA started receiving ACARS weather data from All Nippon Airways (ANA) and JAL whose data have been available since April 2002. About 10,000 wind and temperature data reports are received each day. The agreements with the airlines are on an experimental basis and JMA is seeking a budgetary foundation to upgrade the system to an operational basis.

JMA is preparing to make the data available on the GTS, during 2004. Ms Morneau asked about high temperature bias errors in some data and Mr Takeuchi agreed to follow up on that issue later and inform participants. **Action Item 2004-5-13. JMA will inform participants about the details of availability of aircraft data including time of availability and temperature bias information.**

0840 – 1050 Discussion

Discussion issue: Exchange of Meteosat-8 data

Mr Takeuchi (JMA) introduced this item. Meteosat-8 has been in operation since January 2004. Products such as AMVs have been available since October 2003. HKO has requested AMV data in the D region via RTH Tokyo. JMA NWP has requested 6 hourly AMV data. One issue is that the Tokyo GTS communications are insufficient to cope with expanded data volumes until an upgrade in October 2005.

Since April 2004 Melbourne and Exeter are transmitting 6 hourly AMV data. In the trial stage regions A,D,E,H are being transmitted (the full disk is divided into six regions).

JMA/NWP is planning to assimilate TBB and albedo data direct. JMA/MSM will produce gridded MTSAT-1R data at 0.1 deg resolution as a product. A similar product for Meteosat-8 is under consideration.

Currently the Bureau of Meteorology is transmitting Meteosat-7 data. JMA would appreciate if the Bureau could investigate transmission of Meteosat-8 data in 4 hourly channels 1(vis),5(WV),9(IR1),10(IR2) and at resolution at least 2000x2000. In the trial stage 6 hourly data is acceptable.

CMA is also interested in obtaining the Meteosat-8 data. Dr Griensmith expressed a great willingness on the part of the Bureau of Meteorology to assist in exchange of such data however he noted that this was subject to communications issues and multilateral agreements, especially those involving Eumetsat. He indicated the Bureau would try its best to assist with the implementation.

Action Item 2004-5-14. The Australian Bureau of Meteorology will liaise with appropriate agencies such as JMA, CMA, Eumetsat and UKMO concerning the issue of exchange of Meteosat-8 imagery data.

Discussion issue: Exchange of ATOVS Direct Broadcast Data in Eastern Asia

This item was introduced by Mr Takeuchi (JMA). JMA uses vertical temperature profiles in regional and mesoscale models from NOAA DB data. JMA started direct assimilation of ATOVS radiance data in its global model in 2003. JMA has implemented AAPP to produce ATOVS L1B and L1C data. Exchange of locally received ATOVS data would improve coverage in operational assimilation for mesoscale modelling. Therefore JMA would appreciate it if CMA, KMA and JMA could explore the possibility of real time data exchange.

Professor Dong indicated that there is capacity for greater information exchange of data and that CMA was favourably disposed toward the idea. For Korea Mr Choi indicated that KMA was very interested but that the type of communications method needed to be studied since bandwidth was an issue.

Ms Morneau described the Canadian experience with such data dissemination. Eumetsat uses the EARS system and that can be implemented so that many countries can participate in real

time data exchange. This approach would open up free access to the European data as well. This is most likely fibre optic channel and not GTS. Mr Branski said it was likely that the GTS would have to be upgraded to enable the exchange in the Asia-Pacific region, if the GTS was to be used. Mr Joo said Korea is using locally received data. Mr Tsui from HKO said that they had little experienced some difficulties within using AAPP to produce ATOVS L1B and L1C data implementation and would first like to learn from CMA or JMA for example.

Action Item 2004-5-15. The meeting noted the importance of real time data exchange of locally received ATOVS L1B or L1C data processed by AAPP. KMA, CMA and JMA agreed to investigate the possibility of real time ATOVS data exchange. The Australian Bureau of Meteorology also agreed to investigate the possibility of distributing real time ATOVS data. These countries agreed to explore the Eumetsat EARS approach as one possible strategy to achieve implementation.

Ms Morneau (CMC) agreed to assist with contact information concerning Eumetsat EARS.

Discussion issue: IR1 JMA server

Mr Tsui (HKO) asked about possible continuation of the IR1 JMA server. Mr Takeuchi said that GOES-9 operations would cease after MSTAT-1R is operational and in any case JMA could not undertake parallel operation of both satellite data processing systems. He said that there would be a period of overlap when users could access HiRID and HRIT data. Dr Griersmith indicated that the Bureau had been collaborating with JMA and now provided a SATAID server which gave access to real time imagery in SATAID format for GOES-9 and would be continued after MSTAT-1R is operational.

Discussion issue: APSDEU administrative and coordination arrangements

Mr Branski (NWS/NOAA) suggested it might be useful to undertake a review of progress on Action Items and Recommendations. Coordinators of the relevant and subsequent meeting might facilitate this process. Dr Griersmith agreed with this suggestion and also suggested for discussion two additional models such as election of Co-Chairs as in the ITSC model, or a small group of coordinators from key APSDEU Member countries. The Meeting participants, after some discussion, agreed to a mid-term review of Actions and Recommendations by coordinators for APSDEU-5 and APSDEU-6. Each country would nominate a focal point for APSDEU.

There was some discussion over the issue of broadening the APSDEU community to include other countries although it was recognised that the current relatively small grouping afforded distinct advantages by way of efficient decision-making without the requirement for complex and more time-consuming formal arrangements of the type encountered in some large WMO fora.

Action Item 2004-5-16. The meeting noted the achievements of the APSDEU meeting in increasing the exchange of satellite and in situ data. Member countries will determine their views on inviting other nations in the Asia-Pacific region to participate in future

meetings, and will communicate those views to the current APSDEU participants.

Discussion issue: GOES-9 backup

Dr Griersmith asked JMA and NOAA if they had any contingency plans in the event of a premature failure of GOES-9 before MTSAT-1R is in operation. No firm plan exists, and in fact it is likely that GOES-9 will be retired from operations after MTSAT-1R operates. Also GOES-8 is de-orbited.

Discussion issue: Review of Actions and Recommendations from APSDEU-4 and new Actions and Recommendations for APSDEU-5.

Notes for this issue are provided below under separate, appropriate headings. Action items are:

Action Item 2004-5-17. In accordance with the change in the WMO Manual on Codes, the meeting noted the importance and value for some countries in RA II to put in situ snow depth data on the GTS. CMA agreed to explore the possibility of distributing in situ snow depth data over the GTS. NWS will explore the possibility of distributing snow depth data.

Action Item 2004-5-18. NOAA agreed to investigate the issue of RT or near RT SSM/T data being made available for use by operational agencies such as NMHSs that expressed interest.

Action Item 2004-5-19. NOAA agreed to examine its plans to utilise MTSAT-1R and –2 data and provide that information as appropriate to APSDEU countries.

Action Item 2004-5-20. JMA will investigate provision of hourly rain gauge reports for international use.

1050-1100 Host country for next meeting

Mr Branski as Chair invited expressions of interest for the host country for the next meeting. On behalf of KMA, Mr Choi expressed KMA's desire to hold the next Meeting in Seoul at KMA. September or October are the best times of year. Therefore KMA recommended October 2005 for APSDEU-6. Mr Choi would be coordinator for the next meeting and would exchange information via email. The Meeting unanimously accepted KMA's kind offer to host APSDEU-6 and provide a coordinator.

Ms Vincent (NOAA) said NOAA had previously indicated an interest in hosting a meeting. NOAA will investigate the possibility of hosting the subsequent APSDEU-7 and will get back to the participants as this issue develops.

Professor Dong noted that CMA will provide a CD of the APSDEU-5 meeting including:

- Record of the meeting
- Presentations

- Abstracts
- Papers in Word format

1100-1115 Closure of the Meeting

On behalf of NOAA Mr Branski thanked Dr Griersmith for acting as Rapporteur and preparing the Record of the Meeting. He thanked the host country for a wonderful experience and tremendous hospitality.

Dr Griersmith (Bureau of Meteorology, Australia) thanked CMA on behalf of countries present. The meeting was most successful, with many papers that contributed to valuable exchange of information and enhanced cooperation. CMA hospitality was outstanding and had contributed greatly to a warm, friendly atmosphere in which Member countries were working together for common good, in the interests of international cooperation. He also thanked CMA for the hard work in coordination and administrative arrangements for the meeting which once again were excellent.

Professor Dong said that the past two and half days passed quickly and that it was an efficient meeting. She thanked Fred Branski for his excellent work in chairing, Ms Vincent, Dr Takeuchi and Dr Griersmith for good advice and comments in drafting the meeting agenda. She gave special thanks to Dr Griersmith for his wonderful work in preparing the Meeting report. She said it had been a very successful meeting so on behalf of NSMC and the Local Secretariat she especially thanked Drs Branski, Vincent, Takeuchi and Griersmith for their contributions. In addition Professor Dong thanked all country representatives for their contributions and presentations. A CD-ROM was provided containing copies of all presentations.

Professor Dong wished everyone an enjoyable stay in Beijing and a safe journey home. She noted the value of Focal Points for the APSDEU community.

Mr Branski once again thanked CMA for their work and invited the Secretariat to make closing comments. Mr Zhang (CMA) thanked all participants and friends who supported the work of the local organising group.

Mr Branski as Chair for the last day's proceedings formally declared the meeting closed at 1115hrs.

Recommendations for APSDEU-5

Considerable discussion occurred on key issues arising from the meeting and the APSDEU countries agreed on the following recommendations.

- 1. Participants in the meeting thanked CMA for hosting a successful APSDEU-5 meeting.**
- 2. The meeting noted the usefulness of maintaining the APSDEU website and thanked NOAA for its offer to create and maintain a new static web site. APSDEU participants are**

requested to provide corrections and updates to the information as appropriate.

3. The Meeting noted the achievements during APSDEU-5 in increasing the exchange of satellite and in situ data. Member countries will examine the issue of possible invitations to other nations in the Asia-Pacific region to participate in future meetings.

4. APSDEU Member countries thanked JMA and NOAA for their excellent arrangements involving the backup of GMS-5 with GOES-9. This had been extremely important to the Region in the period before the replacement of GMS-5 with MTSAT-1R.

5. APSDEU Member countries noted the importance of the earliest possible MTSAT-1R launch and operations, to secure continuity of essential meteorological services, and appreciated relevant authorities such as JAXA taking note of this critical requirement in support of National Meteorological and Hydrological Services and other users in the Asia-Pacific region.

6. The Meeting appreciated that Hong Kong, China started sending domestic AMDAR data on the GTS from April 2004. JMA is preparing to distribute its ACARS data on the GTS during 2004. Appreciation is expressed to CMC for placing Canadair regional jet (aircraft) data on the GTS.

7. Members agreed to nominate one designated focal point from each country by end of May 2004.

8. APSDEU Members agreed to undertake a mid-term review of actions and recommendations from APSDEU-5 to be coordinated by APSDEU coordinators from CMA and KMA.

9. The Meeting participants agreed to make much greater use of email for undertaking ongoing cooperation during intersessional periods.

10. The APSDEU Member countries accepted KMA's offer to host the next meeting (APSDEU-6), most probably in October 2005 at KMA in Seoul. KMA nominated Mr Jun-Tae Choi as coordinator for APSDEU-6. NOAA will investigate the possibility of hosting the 2007 APSDEU meeting subject to administrative considerations.

List of Action Items for APSDEU-5 (extracted from the meeting record including review of Actions from APSDEU-4)

Action Item 2004-5-1. NOAA will provide Meeting participants with information about plans for ASCAT data availability and dissemination.

Action Item 2004-5-2. JMA outlined important issues related to the desirability of termination of HiRID transmissions in favour of HRIT from MTSAT-1R. In particular JMA noted that the time shared distribution of HiRID and HRIT induces irregular observation times for hourly full-disk images and half-hourly northern hemisphere images. APSDEU Member countries (Australia, China, Korea) through their representatives (Australian Bureau of Meteorology, CMA and KMA) agreed to provide JMA with their migration plans from HiRID to HRIT, including ongoing generation of Atmospheric Motion Vectors as appropriate, to enable JMA to expedite implementation of regular observation times.

Action Item 2004-5-3. JAXA will provide information on launch schedules to the APSDEU Members when available.

Action Item 2004-5-4. NOAA will provide an update to Meeting participants concerning the future availability of AVHRR SST data in BUFR. This was requested by the Australian Bureau of Meteorology.

Action Item 2004-5-5. The requirements for additional data sets for candidate exchange on the GTS are needed by NOAA/NESDIS and for improved coordination in the region. Members of the APSDEU and RTH communities are encouraged to circulate their requirements for data sets such as SSM/IS, AVHRR GAC, ATOVS HIRS and other data, including volumes and timeliness.

Action Item 2004-5-6. JMA expressed an urgent requirement to obtain SSM/IS, AVHRR GAC and ATOVS HIRS Level 1b data via GTS link from the NWS ftp server or possibly from the NOAA/NESDIS ftp server and NOAA therefore agreed to examine this issue.

Action Item 2004-5-7. Distribution of SSMI (and SSM/IS in the near future) on the GTS in the local region should be reviewed from the practical perspective of possible collaboration between data users and telecommunications staff. JMA, CMA, KMA and HKO will coordinate to complete this action.

Action Item 2004-5-8. NOAA will provide information to participants about the NPP and NPOESS programs including equatorial crossing times for NPOESS and their coordination with Metop.

Action Item 2004-5-9. NOAA will provide APSDEU-5 participants with information about a forthcoming NPOESS Maxi Conference for users to be held in Los Angeles 19-21 October 2004.

Action Item 2004-5-10. CMA NSMC and JMA will nominate contact persons for exchange of information on dust storm monitoring and prediction including NWP modelling.

Action Item 2004-5-11. NSMC/CMA will provide participants with confirmation of the format of FY-2C data transmissions, noting that it has an extra two channels compared to its predecessors.

Action Item 2004-5-12. NOAA will provide information to participants on the potential availability of AVHRR GAC data in a more timely manner.

Action Item 2004-5-13. JMA will inform participants about the details of availability of aircraft data including time of availability and temperature bias information.

Action Item 2004-5-14. The Australian Bureau of Meteorology will liaise with appropriate agencies such as JMA, CMA, Eumetsat and UKMO concerning the issue of exchange of Meteosat-8 imagery data.

Action Item 2004-5-15. The meeting noted the importance of real time data exchange of locally received ATOVS L1B or L1C data processed by AAPP. KMA, CMA and JMA agreed to investigate the possibility of real time ATOVS data exchange. The Australian Bureau of Meteorology also agreed to investigate the possibility of distributing real time ATOVS data. These countries agreed to explore the Eumetsat EARS approach as one possible strategy to achieve implementation.

Action Item 2004-5-16. The meeting noted the achievements of the APSDEU meeting in increasing the exchange of satellite and in situ data. Member countries will determine their views on inviting other nations in the Asia-Pacific region to participate in future meetings, and will communicate those views to the current APSDEU participants.

Action Item 2004-5-17. In accordance with the change in the WMO Manual on Codes, the meeting noted the importance and value for some countries in RA II to put in situ snow depth data on the GTS. CMA agreed to explore the possibility of distributing in situ snow depth data over the GTS. NWS will explore the possibility of distributing snow depth data.

Action Item 2004-5-18. NOAA agreed to investigate the issue of RT or near RT SSM/T data being made available for use by operational agencies such as NMHSs that expressed interest.

Action Item 2004-5-19. NOAA agreed to examine its plans to utilise MTSAT-1R and -2 data and provide that information as appropriate to APSDEU countries.

Action Item 2004-5-20. JMA will investigate provision of hourly rain gauge reports for international use.

Review of Recommendations from APSDEU-4

1. Participants in the meeting thanked JMA for hosting a successful APSDEU meeting.

APSDEU-5 response: noted and closed.

2. The participants noted the value of QuikSCAT data currently available. They expressed the view that scatterometer data from QuikSCAT and ADEOS-II were important for NMHSs operations, research and especially NWP data assimilation and encouraged satellite operators and related agencies to ensure supply of such data in real time or near real time. *APSDEU-5 response: noted and closed.*

3. NOAA, NASA, NASDA and relevant agencies are invited to explore the possibility of ADEOS-II data dissemination to NMHSs in real time. *APSDEU-5 response: noted and closed.*

4. JMA expressed an urgent requirement to obtain ATOVS Level 1b data from the ftp server. *APSDEU-5 response: noted and closed except for ATOVS HIRS data and replaced with a new Action item for APSDEU-5 – Ms Harrod said the data is available – NOAA/NESDIS will follow up. JMA requires such data plus SSMI and AVHRR GAC via GTS link/ftp server.*

5. In accordance with the change in the WMO Manual on Codes, the meeting noted some countries in RA II put in situ snow depth data on the GTS. CMA has agreed to explore the possibility of distributing in situ snow depth data over the GTS. NWS will explore the possibility of distributing snow depth data. *APSDEU-5 response: noted and closed. NWS is providing some snow data. CMA will continue to explore the possibility – leave open.*

6. The meeting noted that JMA would begin distributing wind profiler data on the GTS in April 2002. Some other countries offered to explore the possibility of disseminating wind profiler data from operational and research programs in BUFR code over the GTS in the near future. *APSDEU-5 response: noted and closed – already on GTS.*

7. The meeting noted that SSM/I data is received by JMA and transmitted to HKO. JMA agreed to explore the possibility of disseminating the data to additional countries.

APSDEU-5 response: noted and closed. JMA, Seoul and Beijing have completed testing. Bilateral agreements needed for operational mode.

8. The meeting noted the importance of real time data exchange of locally received ATOVS data. KMA and CMA agreed to explore the possibility of real time ATOVS data exchange. BoM will investigate the possibility of distributing locally received ATOVS data.

APSDEU-5 response: noted and closed and replaced by new Action item.

9. The meeting noted the usefulness of the APSDEU website and requested that members provide corrections and updates to the information as well as use the page to submit data exchange requests. *APSDEU-5 response: noted and replaced with new Recommendations. Mr Branski said that the previous site was interactive but not easy to maintain. A static site could be*

maintained. The Meeting agreed to this kind offer from NOAA. Information will be provided to participants by NOAA/NESDIS. Ms Vincent suggested greater use of email for intersessional periods.[further new Recommendation]

10. The meeting noted the achievements of the APSDEU meeting in increasing the exchange of satellite and in situ data. Member countries will explore inviting other nations in the Asia-Pacific region to participate in future meetings. APSDEU-5 response: noted and replaced with new Action item for members to liaise in next few weeks on the issue of how broad the Meeting participation becomes (e.g. which additional countries might be invited), with a view to enabling next host country to send appropriate invitations.

11. The meeting noted the possibility of transmitting information specific to the Asia-Pacific region on the RMTN portion of the ISCS broadcast in the POR . The ISCS operator requested nominations for the data transmission program. APSDEU-5 response: noted and closed. Mr Branski explained that the new ISCS has a dedicated Asia-Pacific data stream. Many portions are determined by ICAO however contact can be made with NOAA regarding the possibility of additional requirements being met.

12. NOAA agreed to provide prior notice of AIRS operational product distribution. NOAA also agreed to continue distribution of simulated AIRS data until operations begin. APSDEU-5 response: noted and closed.

13. CMC agreed to explore the possibility to distribute its operational Sea Ice Cover Analysis in GRIB format by appropriate means. APSDEU-5 response: noted, closed and replaced by bilateral action between NOAA and CMC. Ms Morneau (CMC) said this is possible and a request would be needed to facilitate possible implementation. GTS is not possible and ftp server is more likely. NOAA expressed interest. Closed and replace by bilateral action between NOAA and CMC.

14. The member countries noted the importance of continuing GMS-5 operations and requested JMA to provide updates on the MTSAT data dissemination formats. APSDEU-5 response: noted, closed and replaced by more recent developments/recommendations.

15. The member countries recommended the next meeting be hosted in 2003 by CMA subject to agreement by CMA. Mr Wu Xiaojing was nominated to be coordinator for APSDEU-5 subject to the approval of CMA. KMA volunteered to host the 2004 APSDEU meeting and USA expressed an interest in hosting a subsequent meeting. APSDEU-5 response: closed.

Review of APSDEU-4 Action Items

Action 2002.4.1: Mr Gene Legg (NOAA/NESDIS) to provide information to APSDEU-4 participants (e.g. via web site) on details of the Direct Broadcast from NPP and NPOESS. *APSDEU-5 response: closed and overtaken by more recent action items and presentations.*

Action 2002.4.2: Dr Griersmith (BoM) to examine the possibility of BoM providing its locally received ATOVS data at Level 1a or 1b, on servers for Internet or ftp access. *APSDEU-5 response: closed and replaced by new action item.*

Action 2002.4.3: Mr Gene Legg (NOAA/NESDIS) will clarify details of GOES BUFR data available on the GTS and inform APSDEU participants. *APSDEU-5 response: closed.*

Action 2002.4.4: Mr Gene Legg (NOAA/NESDIS) to investigate the size, format and related details for SSM/IS and make that information available. *APSDEU-5 response: closed.*

Action 2002.4.5: Mr Brockman (NWS/NOAA) to arrange for snow depth data to be sent to JMA.) *APSDEU-5 response: closed*

Action 2002.4.6: Mr Gene Legg (NOAA/NESDIS) to provide information on how and where countries can access real time SSM/I data including file and directory structures. *APSDEU-5 response: closed*

Action 2002.4.7 Mr Brockman (NWS/NOAA) and Mr Legg (NOAA/NESDIS) to investigate the possibility of SSM/I Sensor Data Records (SDRs) being made available to countries in real time. *APSDEU-5 response: closed – SDRs on ftp server*

Action: 2002.4.8: JMA and BoM to place a request via the APSDEU home page for AVHRR GAC data to be available via Internet. *APSDEU-5 response: closed*

Action 2002.4.9: Mr Gene Legg (NOAA/NESDIS) to investigate the issue of RT or near RT SSM/T data being made available for use by operational agencies such as NMHSs that expressed interest. *APSDEU-5 response: open and follow up by NOAA (Ms Harrod)*

Action 2002.4.10: Mr Gene Legg (NOAA/NESDIS) will investigate NOAA/NESDIS plans to utilise MTSAT-1R and -2 data and provide that information as appropriate to APSDEU countries. *APSDEU-5 response: open and follow up by NOAA (Ms Vincent)*

Action 2002.4.11: JMA to investigate provision of hourly rain gauge reports for international use. *APSDEU-5 response: open. AMeDAS data is being sent to Seoul which includes these reports. JMA to follow up on further dissemination to other countries.*

Action 2002.4.12: APSDEU countries to provide for the next APSDEU meeting, an update on wind profiler data networks and data availability in their respective countries, plus the status of their plans to make these data available for international users e.g. NMHSs.

APSDEU-5 response: closed.

Action 2002.4.13: Mr Brockman (NWS/NOAA) to follow up on issue of missing aircraft data to west of about 85W longitude. *APSDEU-5 response: closed - Mr Branski indicated that exchange of such data beyond requirements of ICAO is being undertaken.*

Action 2002.4.14: APSDEU countries to report back to APSDEU-5 on their local aircraft data and plans or status of data provision for the international community. *APSDEU-5 response: closed – JMA status report appreciated.*

word: APSDEU5_Report_DCG_V12_Changes_Accepted_29Jun2004

Attachment A - List of Main Participants at APSDEU-5

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Attachment B: APSDEU-5 Agenda

Tuesday, April 27, 2004

08:30- Registration

Opening

09:00- Welcome address by Yang Jun, Deputy Director-General, NSMC

Presentations

Chair: Dong Chaohua Rapporteur: David Griersmith

09:20- Overview of Current And Future NOAA Satellite Systems (Emily Harrod, USA)

09:40- Status of GOES-9 Operation And MTSAT Program (Yoshiaki Takeuchi, JMA, Japan)

10:00- Overview of CMA/NSMC Satellite Operational System And Data Distribution
(ZhaoLicheng, CMA/NSMC, China)

10:20- Tea break and group photo

10:50- Overview Australian Bureau of Meteorological Satellite Activities
(David Griersmith, BoM, Australia)

11:10- Recent Remote Sensing Activities And Applications at The Hong Kong Observatory
(K C Tsui, HKO, Hong Kong)

11:30- Recent Progress at CMC/MSC (Josée Morneau, CMC, Canada)

12:00- Lunch Break

Chair: Fredrick Branski Rapporteur: David Griersmith

14:00- Introduction of Satellite Activities And COMS Program in KMA
(Jun-Tae Choi, KMA, Korea)

14:20- JAXA's Satellite Mission (Toshiyuki Amano, JAXA, Japan)

14:40- Overview of JAXA GPM Ground System And Introduction of GPM Data Working
Group (Gag) (Ms. Tomomi NIO, JAXA, Japan)

14:50- JAXA's Ground Operation System And Data Transfer Network in Japan
(Miyano Yoshikazu, JAXA, Japan)

15:10- NOAA GTS System (Fredrick Branski, NOAA/NWS, USA)

15:30- Tea/coffee break

15:50- Telecommunications for Satellite Data Exchange (Yoshiaki Takeuchi, JMA, Japan)

16:10- Overview of CMA Meteorological Data Transfer Network
(Shi Peiliang, CMA/NMIC, China)

16:30- Introductory Briefing to Invite Discussion on Transition to BURF Format
(Fredrick Branski, NOAA/NWS, USA)

17:10- Overview of CMA Meteorological Satellite Application And Service
(Zhang Hongtao, CMA/NSMC, China)

17:30- Discussion

18:00- Dinner Reception by CMA

20:00- End of today's activities

Wednesday April 28, 2004

Chair: Zhang Hangtag Rapporteur: David Griersmith

09:00- Direct Broadcast of China Meteorological Satellite Data

(Xu Jianping CMA/NSMC, China)

09:20- Status of Operational NWP System And the Satellite Data Utilization at JMA

(Yoshiaki Takeuchi, JMA, Japan)

09:40- Recent Development of Satellite Assimilation in KMA

(S-W Joo, E-J Lee, S-D Yoon and W-J Lee, KMA, Korea)

10:00- Application of Satellite Data in NWP (Xue Jishan, CMA/CAMS, China)

10:20- ATOVS Processing at NSMC (Wu Xuebao, CMA/NSMC, China)

10:35- Tea/coffee breaks

10:55- Dust Storm Monitoring and Quantitative Prediction Experiment with NWP
in Northeast Asia (Dong Chaohua, CMA/NSMC, China)

11:15- Satellite Precipitation Estimate at NSMC (Lu Naimeng, CMA/NSMC, China)

11:35- Remote Sensing of Cloud Microphysical Properties with Satellite Data

(Liu Jian, CMA/NSMC, China)

12:00- Lunch Break

Chair: Fredrick Branski Rapporteur: David Griersmith

14:00- Calibration Method for FY Satellites (Gu Songyan CMA/NSMC, China)

14:20- EOS/MODIS Data Receiving And Application

(Ran Maonong and Yang Zhongdong, CMA/NSMC, China)

14:40- METEOSAT-8 Data Exchange

(Discussion issue suggested by Japan)

ATOVS Data Exchange

(Discussion issue suggested by Japan)

15:00- Tour to CMA/ NMC and National Meteorological Information Center

15:20- Tour to CMA/AMSR

19:00- Informal group dinner

Thursday April 29, 2004

Chair: Fredrick Branski Co Chair: Dong Chaohua Rapporteur: David Griersmith

08:30- Invitation for other issues for discussion

09:00- Decide host country of next meeting

09:10- Review of Discussions

Recommendations

11:50- Closure of the Meeting

12:00- Lunch

13:30- City tour

Friday April 30, 2004

08:00- Tour to the Great Wall