Name:	Likun Wang
Email:	Likun.Wang@noaa.gov
Association / Organisation:	ESSIC/University of Maryland
Role / Position:	Research Scientist
Type of presentation:	Presentation (talk)

Suomi NPP CrIS Sensor Data Record Quality Assessment toward the Validated Product Maturity Level

The Cross-track Infrared Sounder (CrIS) is a Fourier Transform Spectrometer (FTS) flying onboard the Suomi National Polar-orbiting Partnership (Suomi NPP) UOMI-NPP satellite that was launched on October 28th 2011. Since the beginning of the mission, calibration and validation activities have has led to the achievements of the beta and provisional maturity levels of the CrIS Sensor Data Record (SDR) product. The validated level is expected to be reached in January 2014. This presentation summarizes provides results from the SDR quality assessment work for achieving Validatedvalidated product status. The instrument noise level is evaluated by analyzing the Noise Equivalent Differential Radiance (NEdN) and its stability over the past 18 months. The spectral accuracy is estimated by comparing channel frequencies between observed and simulated spectra through analyzing their maximum correlation. The radiometric accuracy is evaluated by comparing CrIS radiance measurements with IASI, AIRS and VIIRS. The geolocation accuracy is determined by comparing CrIS observations with measurements from VIIRS IR image band I5 band (11.4 μm) over highly inhomogeneous scenes. All the CrIS performance and SDR requirements have been met. The radiance noise levels of the three bands are well below the specifications, by 30% to 90%. The spectral uncertainty is in the range of 2-3 ppm. The agreements between CrIS and IASI/AIR/VIIRS are better than 0.3 K. The consistencies of the radiometric and spectral performances among the 9 field-of-views (FOVs) that form a field-of-regard (FOR) are better than 0.1 K and 1 ppm, respectively. The geolocation uncertainty for near nadir pixels is less than 0.4 km.

Name:	Quanhua (Mark) Liu
Email:	quanhua.liu@noaa.gov
Association / Organisation:	University of Maryland, @NOAA/NESDIS/STAR
Role / Position:	senior research scientist, CRTM co-chair
Type of presentation:	Presentation (talk)

SUOMI NPP VIIRS SENSOR DATA RECORD (SDR) CALIBRATION AND VALIDATION

Authors: Changyong Cao, Quanhua (Mark) Liu, Slawomir Blonski, Xi Shao, Sirish Uprety, and Fuzhong Weng The successful launch of the Suomi National Partnership Program (SNPP) spacecraft on Oct. 28, 2011 with the Visible Infrared Imaging Radiometer Suite (VIIRS) starts a new generation of capabilities for operational environmental remote sensing for weather, climate, ocean, and other environmental applications. The VIIRS instrument was turned on 8th November, 2011 for the reflective solar bands. The VIIRS cryo-cooler door was opened on 18th January 2012, starting the observations with the thermal emissive bands. VIIRS succeeds the NOAA AVHRR, NASA EOS MODIS, and DMSP OLS with 22 spectral bands covering wavelengths from 0.41 to 12.5 μm, providing data for the production of more than 20 Environmental Data Records (EDRs) with its calibrated and geolocated Sensor Data Record (SDRs). The VIIRS imagery EDR is the key performance parameter (KPP), while ocean color, sea surface temperature, green vegetation fraction, and polar winds are the next priority. Thanks to the wide swath (~3000 km), accurate geolocation of the VIIRS sensor data record, and frequent polar coverage, the VIIRS polar wind provides a unique product for weather forecasting. Using a pixel aggregation strategy and manages data compression with several strategies including the so-called “bow-tie” removal, the VIIRS achieves a resolution of 0.8 km for imagery bands, and 1.6 km for moderate resolution radiometry bands at the edge of scan. VIIRS Day Night Band (DNB) has a unique capability for night time environmental applications with 0.75 km spatial resolution. After subtracting background noise, the VIIRS DNB shows a beautiful image of cities’ light and moon light reflected by clouds. This presentation will provide a progress update on the VIIRS postlaunch cal/val, and discuss issues resolved during the VIIRS calibration and verification process, in particular the degradation in the VIIRS rotating telescope assembly (RTA) mirrors. The RTA degradation is gradually leveling-off after reaching ~30%, and thus far has limited impact on instrument performance and products. Environmental data record users are generally satisfied with the data quality which meets the product requirements. In the near future, major upgrade of the VIIRS SDR processing will include the automated radiometric calibration of the VIIRS reflective solar bands, and the operationalization of the DNB straylight correction. Other remaining issues include the calibration of the dual gain thermal emissive band M13 because there is no onboard calibration at low gain for this band. Bias between the VIIRS M15 and CrIS measurements over cold scenes also needs to be addressed. The VIIRS radiometric, spectral and geospatial performance as well as calibration parameters and event databases are actively maintained at http://ncc.nesdis.noaa.gov. REFERENCES Cao, C., J. Xiong, F. DeLuccia, Q. Liu, S. Blonski, and D. Pogorzala, Visible/Infrared Imager Radiometer Suite (VIIRS) Sensor Data Record (SDR), User’s Guide, version 1, 2011. Cao, C., F. Deluccia, X. Xiong, R. Wolfe, and F. Weng, 2013a, Early On-orbit Performance of the Visible Infrared Imaging Radiometer Suite (VIIRS) onboard the Suomi National Polar-orbiting Partnership (Suomi-NPP) Satellite, IEEE Transaction on Geoscience and Remote Sensing, DOI:10.1109/TGRS.2013.2247768. Cao, C., X. Shao, S. Uprety, 2013b, Detecting Light Outages After Severe Storems Using the Suomi-NPP/VIIRS Day/Night Band Radiances, IEEE Geoscience and Remote Sensing Letters, DOI: 10.1109/LGRS.2013.2262258. DeLuccia, F. et al., 2013, Automated Calibration of the NPP VIIRS Reflective Solar Bands (JGR special issue). Liao, L., S. Weiss, S. Mills, and Bruce Hauss, 2013, Suomi NPP VIIRS Day-Night-Band (DNB) On-Orbit Performance (JGR special issue). Liu, Q., C. Cao, and F. Weng, 2013: Assessment of Suomi National Polar-Orbiting Partnership VIIRS Emissive Band Calibration and Inter-Sensor Comparisons, IEEE JSTAR, 6, 1737-1748, 10.1109/JSTARS.2013.2263197. Sun, N., M. Grotenhuis , T. Chang , X. Jin , Q. Liu , Y. Chen , 2013, Instrument Performance and Sensor Data Accuracy Long-Term Monitoring for Suomi-NPP and JPSS (JGR special issue). Wolfe, R. et al., 2013, VIIRS Geospatial

Performance (JGR special issue). Xiong, X. et al., 2013, VIIRS Onboard Calibration and Instrument Performance (JGR special issue).

Name:	Jin Lee
Email:	j.lee@bom.gov.au
Association / Organisation:	Australian Bureau of Meteorology
Role / Position:	Research scientist
Type of presentation:	Presentation (talk)

Assessing the ACCESS-G Global 4DVAR Data Assimilation System Using Adjoint-Based Forecast Sensitivity to Observations

Adjoint-based Forecast Sensitivity to Observations (FSO) is increasingly used in operational NWP centres in assessing the effectiveness of their data assimilation systems (DAS). The FSO methodology in conjunction with other diagnostic tools can provide information about relative importance of different observations types and can reveal whether a particular observation type is optimally utilised by the DAS. With some caution it can also be used to investigate observation impact in case studies – for example, observation impacts for tropical cyclones. In this study we will describe our FSO methodology and discuss what it reveals about the Australian Bureau of Meteorology's operational global 4DVAR data assimilation, with particular attention to how the DAS utilises satellite observations.

Name:	Na-Ri Kim
Email:	narikim@korea.kr
Association / Organisation:	NMSC/KMA
Role / Position:	Researcher
Type of presentation:	Poster

Volcanic ash detection through COMS satellite

This study analyzes volcanic ash products derived from Communication, Ocean, and Meteorological Satellite (COMS) meteorological data based on algorithms of EUMETSAT as well as KMA/NMSC. Hybrid method was developed based on brightness temperature difference (BTD) which uses split window channels (10.8 and 12.0 ㎛) combined with three band volcanic ash product (TVAP) method which adds shortwave infrared channel (3.9 ㎛). EUMETSAT method of volcanic ash detection is based on BTD with water vapor correction. In addition to detection area, these methods can produce aerosol optical depth, effective radius, mass loading and height of volcanic ash. The study cases were Shinmoedake and Sakurajima Mt. Eruptions which were occurred on 26 January 2011 and 18 August 2013, respectively. The results were validated with COMS/GOCI, MODIS and CALIPSO data.

Name:	Kefei Zhang
Email:	kefei.zhang@rmit.edu.au
Association / Organisation:	SPACE Research Centre, RMIT University
Role / Position:	Professor and Director
Type of presentation:	Presentation (talk)

Soil moisture measurements using reflected GNSS signals – a recent Australian quest

Soil moisture is one of the fundamental parameters for hydrology, agricultural science and numerical weather prediction models. A new approach that uses GPS multi-path signals reflected from the earth's surface has recently emerged as a potential alternative technology for the determination of soil moisture through passive sensing of GPS satellite signals. The recent UK disaster monitoring constellation (DMC) satellites are a typical dedicated LEO satellite program using the reflected GPS signals from the surface of the earth's oceans to determine wave motion and windspeed.

There are many advantages using this new GPS reflectometry (GPS-R) technology since GPS signals can penetrate clouds in the sky and are very sensitive to soil moisture. The GPS-R system is of low-cost and its self-positioning and self-timing characteristics make the technology ideal for meteorological and environmental applications.

This paper will first introduce the GPS-R concept along with its basic principles, methodologies / algorithms and data processing requirements. The history, current status and future trend will be presented, in particular in the Australian context. Key GPS-R data processing procedures are compared and the effects of soil water contents and surface roughness are investigated using both real and simulated data. Recent Australian effort using both ground-based and air-borne experiments in Victoria and New South Wales will be outlined and major outcomes will be presented. Results suggest that the GPS-R is an effective new technology for remotely sensing soil moisture in Australia.

KEYWORDS: GPS, reflectometry, soil moisture, remote sensing, interference.

Name:	Kefei Zhang
Email:	kefei.zhang@rmit.edu.au
Association / Organisation:	SPACE Research Centre, RMIT University
Role / Position:	Professor and Director
Type of presentation:	Presentation (talk)

GNSS for Severe Weather – A New Horizon of Satellite Positioning Technology

Rapid developments in satellite positioning, navigation and timing have revolutionised surveying and mapping practice and significantly influenced the way people live and society operates. The advent of new generation Global Navigation Satellite Systems (GNSS) has heralded an exciting future for not only the GNSS community, but also many other areas that are critical to our society at large. The ability to remotely sense the atmosphere (i.e. the troposphere and ionosphere) using space geodetic techniques has dramatically improved over the past decade, as a result of the advances of space-based technologies, large scale and dense contemporary geodetic networks, new dedicated space missions and developments of new algorithms/methodologies. Water vapour, as the most abundant element of greenhouse gas and accounting for ~70% of global warming, is under sampled in current meteorological and climate observing systems. For extreme weather and climate studies, GNSS derived atmospheric variables are required to be available in real-time/near real-time, with refined spatial and temporal resolutions and robust quality measure in place. This contribution investigated the emerging area of GNSS technology for near real-time monitoring and forecasting of severe weather and climate change research. The March 2010 Melbourne storm was used as a case study and GPS observations from the most advanced Victorian state-wide CORS network in Australia were used. Different GPS data processing strategies were also investigated for the most robust precipitable water vapour (PWV) estimation. Results show strong spatial and temporal correlation between the variations in the ground-based GPS-PWV estimates and the thunderstorm passage. This indicates that the ground-based GPS technique can complement conventional meteorological observations for the studying, monitoring, and potentially predicting of severe weather events. The advantage of using the ground-based GPS technique is that it can provide continuous observations of the storm passage with a high temporal and spatial resolution while the space-based GPS (i.e. Radio Occultation) can capture the dynamics of the atmosphere with a high vertical resolution. The ongoing research effort made in the SPACE Research Centre in the area of GNSS meteorology and its involvement in the 4-year collaborative European Union project under the scheme of EU Cooperation of Science and Technology (COST) Action ES1206 recently awarded with the title of "Advanced Global Navigation Satellite Systems tropospheric products for monitoring severe weather events and climate (GNSS4SWEC)" will also be introduced to highlight the frontier international development in this area of research.

Name:	Kum-Lan KIM
Email:	kimkumlan@korea.kr
Association / Organisation:	National Meteorological Satellite Center, Korea Meteorological Administrator
Role / Position:	Director
Type of presentation:	Presentation (talk)

Current and Future Plan of KMA Satellite Program

COMS (Communication, Ocean, and Meteorological Satellite), the first Korean geoostationary meteorological satellite has been operating at a longitude of 128.2°E since April 1st, 2011. COMS meteorological mission is performed by MI (Meteorological Imager) with one visible channel and four infrared channels.

The COMS MI observation data are disseminated to M/SDUS (Medium/Small Scale Data Utilization Stations) users in H/LRIT (High/Low Rate Information Transmission) formats within 15 minutes after the end of image scanning. Also, we provide high quality COMS MI level 1B data through land-based network via NMSC (National Meteorological Satellite Center) website (http://nmsc.kma.go.kr/jsp/homepage/eng/main.do) and FTP.

Currently, H/LRIT include the FD and ENH images and level 2 meteorological products images such as cloud detection (CT), cloud top height (CTH), cloud top temperature (CTT) and GOCI images are broadcast in only LRIT. KMA has a plan to add more contents such as sea surface temperature, fog, numerical weather prediction and typhoon information to LRIT service. The dissemination has started since April 1st, 2011

KMA is planning for the follow-on geostationary meteorological satellite (GEO-KOMPSAT-2) to continue the COMS's meteorological and oceanographic mission. From 2009, KMA has prepared a feasibility study for GEO-KOMPSAT-2 program under the cooperation with Ministry of Science, ICT and Future Planning (MSIP), Ministry of Oceans and Fisheries (MOF), and Ministry of Environment (ME) of Korean government. The GEO-KOMPSAT-2 program had been approved in September 2010, and kicked off in the middle of 2012.

The GEO-KOMPSAT-2 consists of a pair of satellites for multi-purpose. One (GEO-KOMPSAT-2A) is for meteorological mission-only. The other (GEO-KOMPSAT-2B) is for ocean and environmental missions. Ocean mission is to monitor the ocean colour using an advanced GOCI (Geostationary Ocean Colour Imager) continuously. The environmental mission is to monitor atmospheric environments globally with the first payload carried on the geostationary satellite. The GEO-KOMPSAT-2A and -2B satellites will be launched in 2017 and 2018, respectively.

The Advanced Meteorological Imager (AMI), the payload for meteorological mission of GEO-KOMPSAT-2A, is comparable to those of the AHI and ABI imager on board Himawari-8/9 and GOES-R. The development of AMI was kicked off in April 2013. In addition to meteorological mission, Geo-KOMPSAT-2A will carry on payload for space weather observation and the selection of developer will be decided by the end of 2013.

Name:	Ardhasena Sopaheluwakan
Email:	ardhasena@bmkg.go.id
Association / Organisation:	Agency for Meteorology, Climatology and Geophysics
Role / Position:	Head, Climate Analysis and Information Subdivision
Type of presentation:	Poster

Reconstruction and data filling of clouded images of sea surface temperature in the Indonesian Seas

Sea surface temperature observation using satellite provides a synoptic view of the ocean's state. However data retrieved from satellite observation is often covered by clouds, resulting in incomplete dataset with missing observation. In this study we perform reconstruction of incomplete sea surface temperature dataset derived from the MODIS sensor on board the Terra satellite using a method based on empirical orthogonal functions decompositions. The historical SST dataset with the missing observation is decomposed to its empirical orthogonal function modes, and a linear superposition of a number of leading order modes of the decomposition is used as an estimate for the region with the missing observation. This procedure is iterated until convergence of the SST value is reached for the area with missing observation. The method was applied to the Indonesian seas region, where cloud coverage is known to be high. The reconstruction provides the modes that governed the variability of SST in the region, where the dominant modes found from the reconstruction describes the seasonal cycle in the sea surface temperature, and the large scale oceanic sea surface temperature gradient in the region.

Name:	Dr Dieter Klaes
Email:	dieter.klaes@eumetsat.int
Association / Organisation:	EUMETSAT
Role / Position:	Atmospheric Profiling Manager
Type of presentation:	Presentation (talk)

EUMETSAT's Meteosat Third Generation Programme and relevant Applications from MSG

Meteosat Third Generation (MTG) will consist of six satellites. Four of them are imaging satellites, which will carry the advanced Flexible Combined Imager (FCI) with 16 channels and the lightning imager (LI). The two sounding satellites will be equipped with an infrared hyper-spectral sounder (IRS) and a spectrometer measuring trace gases and aerosol in the UV, visible and near-infrared part of the solar spectrum (UVN). While the FCI provides continuity and improvements over and above MSG, the other three instruments on MTG, though they have heritage from polar satellites, will enable innovation and advanced services, which in turn implies that utilization and services need to be established. An interesting recent development towards MTG are the super-rapid scans conducted with Meteosat-8 at intervals of 2.5 minutes which provide new insight into convective cloud development.

Name:	Dr. Dieter Klaes
Email:	dieter.klaes@eumetsat.int
Association / Organisation:	EUMETSAT
Role / Position:	Atmospheric Profiling Manager
Type of presentation:	Presentation (talk)

The EUMETSAT Polar System - Towards the next generation

The EUMETSAT Polar System (EPS) will provide data for operational meteorology and climate monitoring until 2021. Preparations for the EPS Second Generation have progressed with the generation of user and mission requirements. Based on user consultations, concept and feasibility studies as well as affordability considerations, new observation missions have been proposed for the continuation of EPS/Metop measurements and aiming to provide novel measurements to reach a breakthrough of various user applications in numerical weather forecast, nowcasting, atmospheric composition, operational oceanography, hydrology, and climate monitoring. High priority is put on the continuation of EPS/Metop measurements for the infra-red and micro-wave sounding of temperature and water-vapour profiles, optical radiometry for cloud and surface imaging, radio occultation for the sounding of atmospheric refractive indices, short-wave sounding of trace gases, as well as scatterometry for the measurement of sea surface wind vectors and land surface soil moisture. New mission are planned to include micro-wave imaging for the measurement of precipitation, clouds, and sea ice and optical polarisation imaging for the observation of atmospheric aerosols.

Name:	Andrew Tupper
Email:	a.tupper@bom.gov.au
Association / Organisation:	Bureau of Meteorology
Role / Position:	Regional Director, NT
Type of presentation:	Presentation (talk)

Remote

During the 2010-2012 period, several major events demonstrated the urgent need to improve volcanic ash warning services for aviation. The International Civil Aviation Organization convened a Task Force during this period, which after four meetings and many teleconference and working group discussions, made many recommendations for moving forwards. At the same time, the World Meteorological Organization, together with the International Union of Geodesy and Geophysics, created a Volcanic Ash Science Advisory Group to provide ongoing science advice for improving the warning service. Remote sensing improvements are an essential part of this work. Examples from the two major Iceland eruptions, the 2010 Merapi eruption, and the 2011 Cordon Caulle eruption demonstrate the potential for operational improvement, increased industry confidence, and the consequent saving of millions of dollars (or more) of costs as well as increased safety in flight.

Name:	Kum-lan Kim
Email:	kimkumlan@korea.kr
Association / Organisation:	NMSC/KMA
Role / Position:	Satellite Analysis Division Director
Type of presentation:	Presentation (talk)

Improved status of COMS meteorological products

COMS meteorological products are in operation from April 1, 2010 for supporting short-range forecasting, aviation, NWP data assimilation, and disaster monitoring. The COMS satellite with the temporal resolution (8 times an hour over Korean Peninsula) has a capability to observe locally-developing convective clouds, trajectory and landing site of Typhoons. In addition, AMV (Atmospheric Motion Vector), one of 16 COMS products, showed the positive effect over East Asia in KMA Global NWP model. NMSC (National Meteorological Satellite Center of KMA has improved the quality of COMS data through periodical validation using various polar-orbit satellites and in-situ ground measurements. NMSC also provides monthly reports for COMS products including uncertainties and error analysis. For the weather forecasting, NMSC make an effort to combine the satellite imagery with dynamical field derived from NWP model. In particular, COMS meteorological products are applied to the analysis of turbulence, flight icing, and volcanic ash detection. NMSC is also preparing the era of a next-generation geostationary meteorological satellite (GEOKOMPSAT-2A) after 2017 with approximately 50 meteorological products for various user-friendly services.

Name:	Jin Woo, Byung-Il Lee, Jeong-Sik Kim, Seung-Hee Sohn
Email:	superjwoo@korea.kr
Association / Organisation:	National Meteorological Satellite Center
Role / Position:	Research Scientist
Type of presentation:	Poster

Diurnal Variation of COMS MI Image Navigation and Registration Performance

Communication, Ocean and Meteorological Satellite (COMS) Meteorological Imager (MI) , the first Korean geostationary meteorological satellite, has providing high quality data since the official MI data release on April 1st 2011. COMS MI Image Navigation and Registration (INR) based on landmarks matching method has also maintained within user specification(65.3 μrad for IR and 87.5 μrad for VIS). COMS INR performance investigated by using image geometric quality information and the 3-sigma landmarks residuals has diurnal variations with channels; one visible and four infra-red. We are going to present the characteristics of COMS MI INR performance and this result will be support useful information to COMS follow-on satellite image processing.

Name:	Leon Majewski
Email:	Leon.Majewski@bom.gov.au
Association / Organisation:	Australian Bureau of Meteorology
Role / Position:	Satellite Specialist
Type of presentation:	Presentation (talk)

Reducing Temporal Biases in Sea Surface Temperature Observations from MTSAT-1R

The MTSAT-1R satellite is in geostationary orbit above 140°E and carries the Japanese Advanced Meteorological Imager (JAMI) on board. JAMI captured full-disc imagery on an hourly basis during the period 2005-2010 in five spectral channels (0.6-12.0 µm). The observations from spectral channels centred at 3.7, 10.8 and 12.0 µm were used to calculate SST. Initial comparison to a network of drifting buoys indicated that the difference between MTSAT-1R and buoy SST observations varied spatially and temporally, with biases on the order of ±0.2 K and standard deviations on the order of 0.8-1.2 K. Additionally, the use of different algorithms for day (2-channel) and night (3-channel) scenes introduced hour-to-hour differences in the bias of > 0.2 K. This order of uncertainty reduces the utility of the data for temporal studies of diurnal variability. Correction factors were developed from a number of geometric and temporal properties, including pixel/line position, observation hour, solar declination and Earth-Sun distance. The application of these correction factors reduced the spatial and temporal differences between buoy and MTSAT-1R SST observations. The resulting bias is < 0.1 K with a standard deviation of ~0.7 K and hour-to-hour differences < 0.1 K. This improved data set has been made available for use in the Group for High Resolution SST Tropical Warm Pool Diurnal Variability Project.

Name:	Emile Jansons
Email:	e.jansons@bom.gov.au
Association / Organisation:	Darwin Volcanic Ash Advisory Centre
Role / Position:	Manager VAAC Darwin
Type of presentation:	Presentation (talk)

Operational Perspectives on Volcanic Ash Remote Sensing

Significant volcanic eruptions cause high workloads in Volcanic Ash Advisory Centres (VAACs). In this environment, the correct interpretation and fast assimilation of data of all kinds, much of which may be contradictory, is essential for prompt analysis and preparation of evidence-based advice to the aviation industry. The use of remote sensing data in VAAC analysis is affected by the trust that the operational team has in those data, easy access and straightforward interpretation of the data, and embedding of the data in operational procedures. The Darwin Volcanic Ash Advisory Centre has, since 1993, relied heavily on a combination of pattern analysis and reverse-absorption remote sensing for most of its operations, and preferably using geostationary data to ensure timeliness. Increasingly, higher resolution MODIS infrared data and SO2 data such as from AIRS or GOME-2 is used to supplement and assist in reinterpreting geostationary imagery, particularly when these images are easy to access or automatic alerting systems are in place. For example, an automated SACS alert during the Soputan eruption of 27 August 2012 was extremely useful. However, the experiences of recent eruptions such as from Soputan and Merapi in Indonesia demonstrate that, on many days, remote sensing must be supplemented by timely and accurate ground and air-based reports for effective VAAC operations. Image frequency, cloud, sub-resolution eruptions, and water entrainment into the eruption plume all remain major issues. Many eruptions are identified first on satellite imagery, particularly from more remote volcanoes such as Papua New Guinea's Manam. The introduction of the Himawari-8 satellite in the Asia-Pacific Region will increase the chances of eruption detection. In order to fully take advantage of these new data, a greater reliance will need to be placed on automatic monitoring algorithms, whilst recognising that many eruptions are not easily distinguishable from non-volcanic convection in their early stages, particularly in the moist tropics but also elsewhere. Long term observations of Kagoshima's Mt Sakurajima, for example, show that volcanic eruption clouds will change character according to the season. The role of the human analyst will remain important in VAAC operations for the foreseeable future.

Name:	Kim, Jae-Gwan
Email:	kimjgwan@korea.kr
Association / Organisation:	National Meteorological Satellte Center / KMA
Role / Position:	Research Scientist
Type of presentation:	Poster

COMS MI Radiometric Performances over Two Years

National Meteorological Satellite Center (NMSC) of Korea Meteorological Administration has been operating the Meteorological Imager (MI) of the Communication, Ocean, and Meteorological Satellite (COMS) since April 1st, 2011. We have investigated radiometric indices and analyzed trend of radiometric parameters to estimate radiometric performance of COMS MI over two years. The Signal to Noise Ratio (SNR) for visible channel is about 25 which value is better than the specification, i.e. 10 at 5% Albedo. Noise Equivalent Differential Radiance (NEDR) for infrared channels is also within the specification up to the present.

In this paper, we will present not only radiometric performances of COMS MI such as SNR, NEDR and Pixel-to-pixel Response Non-Uniformity (PRNU) but also environmental information to monitoring health of the sensor.

Name:	Christopher Griffin
Email:	cgriffin@bom.gov.au
Association / Organisation:	Australian Bureau of Meteorology `
Role / Position:	Scientific Programmer
Type of presentation:	Presentation (talk)

A Quick introduction to the methods and features of the IMOS HRPT AVHRR SST dataset produced by the Australian Bureau of Meterology

As part of the Integrated Marine Observing System (IMOS: http://www.imos.org.au), the Australian Bureau of Meteorology produce high-resolution satellite sea surface temperature (SST) products over the Australian and Antarctic regions, designed to suit a range of operational and research applications. All these products follow the latest Group for High Resolution Sea Surface Temperature (GHRSST: http://www.ghrsst.org) file formats, including information on bias and standard deviation for each SST value, along with other useful ancillary data. The highest spatial resolution (1.1 km x 1.1 km) data from Advanced Very High Resolution Radiometer (AVHRR) sensors on NOAA polar-orbiting satellites can only be obtained through receiving direct broadcast “HRPT” data from the satellite. In Australia, HRPT data is received at ground-stations located in Darwin, Townsville, Melbourne, Hobart, Perth and Alice Springs and in Antarctica at Casey and Davis Stations. The Bureau of Meteorology, in collaboration with CSIRO Marine and Atmospheric Research, is combining raw data from the various ground-stations and producing real-time HRPT AVHRR skin (~ 10 micron depth) and foundation (~ 10 m depth) SST data files in the GHRSST formats for both geolocated, single swath data (“L2P”) and various gridded (level 3) files (http://imos.org.au/sstproducts.html). By June 2014, it is expected that we will have completed processing of a consistent dataset back to 1992, being the most complete, long run, 1.1km dataset over the Australian Region. The dataset is freely available at (ftp://aodaac2-cbr.act.csiro.au/imos/GHRSST). The dataset has a number of features and processing methodologies which target a range of user expertise, and attempt to provide a consistent accurate record. These features include a dynamic retuning of SST regression algorithms, dynamic estimates of sensor based error statistics based on drifting buoys, muti-swath, multi-instrument composites over time periods from single day to monthly, and a consistent evaluation of day / night SST. Further estimates of instrumentation and model sensitivities and performance over time are also evaluated and available to supplement the dataset. We provide a brief summary of the dataset, its generation and use.

Name:	Yuha Kim
Email:	yhkim97888@korea.kr
Association / Organisation:	Korea Meteorological Administration
Role / Position:	Reseach Scientist
Type of presentation:	Poster

Convective clouds detection using RGB composite imagery with COMS observation

The typhoon and heavy rainfall are the most important meteorological phenomena in natural disaster over Korean peninsula. Recently, the Communication, Ocean and Meteorological Satellite (COMS) with one visible and four infrared channels was launched in 2010. The 16 meteorological products and algorithms are developed for full use of COMS data. Recently, RGB composite imagery using combination of different channels is effective to analyze and visualize the satellite data for operational and educational purposes. In particular, Japan, China, Europe, U.S.A. and South Korea have plans to launch 16 channel geostationary meteorological satellites. In this presentation, RGB composite method using COMS data to detect the convective clouds will be suggested. The current RGB technique provided by EUMETSAT with SEVIRI satellite provide only daytime RGB image because of visible channel. However, we suggest a RGB method to detect the convective clouds in day and night using a combination of infrared channels. A study was performed to cases of monsoon (Chang-ma (in Korean) (2013.7.27.18:00UTC~2013.7.28.07:00UTC) and Typhoon Bolaven (2012.08.27.00:00UTC~2012.08.28.23:45UTC). Methodologically, the brightness temperature (BT) at 10.8 μm, BT difference (BTD) between 12 μm and 10.8 μm, and BTD between 10.8 μm and 6.7 μm correspond to blue, red, and green colors, respectively. the threshold values (230K to 260K for blue, -20K to 15K for green, -4K to 2K for red) of RGB composite image for convective clouds detection was determined using a look-up table of Convective Rainfall Rate (CRR) of EUMETSAT/NWCSAF products, rainfall datasets observed by the Korea radar network system, and COMS data. As a result, strong convections appear green because green color in this case means a heavy rain rate higher than over 20 mm/hr. This study provides a useful method to monitor the heavy rainfall for the purpose of operational use of the COMS and the next-generation geostationary satellite (GEO-KOMPSAT 2A).

Name:	Sungwook Hong
Email:	sesttiya@gmail.com
Association / Organisation:	Korea Meteorological Administration
Role / Position:	Deputy Director
Type of presentation:	Presentation (talk)

Improved retrieval of sea ice surface properties from satellite passive-microwave observations

Sea ice in Polar Regions is important variable for monitoring the global climate change. The microwave satellite remote sensing has a capability of mapping the expansion and contraction of sea ice surface. Recently, a method to estimate the surface roughness and refractive index of sea ice surface is developed using the Hong approximation which is an approximation between the vertically and horizontally polarized reflectivities of specular surfaces. In addition, recently, the direct relationship (Azzam relationship) and the analytical (Azzam–Sohn–Hong (ASH) approximation) were derived and validated. In this presentation, the characteristics of sea ice surface roughness and refractive index are presented using observations from the Advanced Microwave Scanning Radiometer for the Earth Observing System (AMSR-E) with two approximations. The advantages and disadvantages of each approximation are described for analyzing the melting of sea ice surfaces. Consequently, the ASH approximation is useful to retrieve the ice properties while the Hong approximation is effective to the melting ice because of the imaginary part of the refractive index. The combination of two methods will improve the analysis of sea ice variation and climate changes from the satellite observations.

Name:	Yi Huang
Email:	vivian.huang@monash.edu
Association / Organisation:	Monash University
Role / Position:	Research Fellow
Type of presentation:	Presentation (talk)

A-Train Observations of Maritime Storm Track Cloud Systems: Comparing the Southern Ocean against the North Pacific and Atlantic

Mace (2010) studied the clouds over the Southern Ocean (SO) and the North Atlantic (NA) using observations from A-Train satellites, and concluded that there is 'a high degree of similarity in cloud occurrence statistics, in cloud properties, and in the radiative effects of the clouds.' This finding is remarkable given the inherent differences between NA and the SO with respect to aerosol properties. This study revisits this conclusion by employing both the individual products (CloudSat, CALIPSO and MODIS) and the A-Train merged product DARDAR-MASK to further explore the cloud properties over these regions. The Northwest Pacific (NWP) and Northeast Pacific (NEP) are also examined to extend our understanding of the intrinsic differences of cloud properties between the two hemispheres. Climatologies of cloud fraction (CF), thermodynamic phase, vertical structure, cloud effective radius (CER), and thermodynamic structure are constructed for 2007–2010 winter and summer. The CFs over the four regions are found to be comparable (over 88%), with higher coverage in winter. MODIS observed slightly higher CFs than CALIPSO and the DARDAR-MASK. Cloud top distributions across temperatures over the study regions display a similar bimodality, with minimal occurrence between -15 and -30ºC. While virtually no clouds are found below -65ºC by MODIS, notably more ice are found between -30 and -70ºC by CALIPSO and the DARDAR-MASK (given the lidar's sensitivity to cirrus clouds). The distributions also reveal large seasonality over NA, NEP, and particularly, NWP. Substantially more ice and mixed phase are recorded by the DARDAR-MASK between freezing and -25ºC, compared to the observations by MODIS and CALIPSO. This is likely to be a consequence of the course vertical resolution of the radar and how its signals are resolved in the merged algorithm. Despite this ambiguity, all products reveal that the SO is exclusively covered by supercooled liquid water all year round, particularly during summertime. The climatologies of cloud vertical structure built with the merged product display a large seasonal variation over the NA, NWP and NEP compared with the SO. The bulk of clouds (mostly ice) are thicker over NA and NWP during wintertime, while the SO is largely dominated by BL clouds. Much more rain is found during summer over NA, NWP and NEP, which is a reflection of the temperature based partition between ice and rain class in the merged algorithm. This feature is consistent with the strong seasonality of the thermodynamic structure over the Pacific and Atlantic. The statistics of CER derived from MODIS displays a clear seasonal cycle and a high similarity over the study regions (particularly during summer), although the CERs are found slightly larger in liquid (mixed and ice) phase clouds over the SO (NWP and NEP). Given that the aerosol composition is different between the hemispheres, the differences in cloud microphysics need to be further explored.

Name:	Beth Ebert
Email:	e.ebert@bom.gov.au
Association / Organisation:	CAWCR, Bureau of Meteorology
Role / Position:	Research Program Leader
Type of presentation:	Presentation (talk)

High Impact Weather Applications of Space-Based Precipitation Estimates

Quantitative precipitation estimates from satellite are available over most of the globe in near real time from a number of global providers. The spatial resolution is 25 km or better, the temporal resolution is 3 hourly or better, and the latency is 8 hours or better. Many of the rainfall algorithms blend the more accurate rain sensing properties of microwave retrievals with the excellent spatial and temporal sampling provided by geostationary satellite imagers. The International Precipitation Working Group (IPWG) promotes the use of these rainfall products for a variety of applications in the weather, climate, hydrology, environment, and public health domains. This talk will highlight some applications of satellite precipitation for high impact weather analysis and prediction. In particular, the Ensemble Tropical Rainfall Potential (eTRaP) for estimating heavy rain in landfalling tropical cyclones and the Global Flood Monitoring System (GFMS) for detecting flood and estimating its intensity, will be described and demonstrated for the case of Tropical Cyclone Yasi which made landfall in northeastern Australia in early January 2011.

Name:	Jae-Dong Jang
Email:	jaedongjang@korea.kr
Association / Organisation:	NMSC/KMA
Role / Position:	Deputy Director
Type of presentation:	Presentation (talk)

The current status of COMS MI Data Processing and Service in NMSC

The Communication, Ocean and Meteorological Satellite(COMS) mission has been under the normal operation 24 hours a day 365 days a year since April 1st , 2011 and the Meteorological Imager(MI) observation data are disseminated to M/SDUS (Medium/Small Scale Data Utilization Stations) users in H/LRIT (High/Low Rate Information Transmission) formats within 15 minutes after the end of image scanning. Also, we provide high quality COMS MI level 1B data through land-based network via NMSC (National Meteorological Satellite Center) website (http://nmsc.kma.go.kr/jsp/homepage/eng/main.do) and FTP. And as a part of WMO Information System(WIS) Data Collection or Production(DCPC) project led by WMO, NMSC accomplished the construction of DCPC-NMSC(http://dcpc.nmsc.kma.go.kr) and started normal operation on 29th March 2013 for providing COMS meteorological data. To show the current status of COMS MI mission operation, we estimate the COMS MI operational availability with the success rate of COMS MI data receiving, processing and H/LRIT dissemination and the result of it is up to 99.79% with support of back-up site operation for the first 25 months from April 1st , 2011 to April 30th , 2013. In this paper, we also present the future plans for improving MI data quality and service as well as COMS MI operation.

Name:	YINGJUN CHEN
Email:	y.chen@bom.gov.au
Association / Organisation:	University of Melbourne
Role / Position:	PhD student
Type of presentation:	Presentation (talk)

Evaluation of TRMM 3B42 estimates of tropical cyclone daily rainfall over the Pacific and Australia.

This study evaluates TRMM 3B42 version 7 (V7) estimates of daily rainfall in tropical cyclones (TCs) over the Pacific and Australia region. Over the Pacific, the Comprehensive Pacific Rainfall Database (PACRAIN) of 24h rain gauge observations is utilized as reference data. The evaluation is performed on two different terrain types: low-lying atoll sites (assumed to represent open-ocean conditions) and coastal and island sites (over land). The results show that TRMM 3B42 has good skill at detecting intense TC rainfall, with good correlation and pattern matching with PACRAIN observations. However, it tends to overestimate heavy rain frequency on atoll sites, but tends to underestimate heavy rain frequency on coastal and island sites. Overall, TRMM 3B42 is better able to estimate the intensity of TC heavy rain over ocean than over land. It is least skillful at coastal and island sites with high elevation, where it significantly underestimates TC heavy rainfall, suggesting that TRMM 3B42 is unable to capture orographic enhancement during TC landfall. The evaluation is also performed over Australia region using a high quality gauge-based gridded rainfall product from the Australian Water Availability Project (AWAP). The results show that TC intensity, location, terrain and TC seasons all have impacts on TRMM 3B42's detection skill. For TC heavy rain, TRMM 3B42 shows better agreement with AWAP during more intense TCs (CAT3-5), in eyewall as opposed to the rain bands, in tropics as opposed to sub-tropics, and in late TC seasons as opposed to early and peak TC seasons.

Name:	YINGJUN CHEN
Email:	y.chen@bom.gov.au
Association / Organisation:	University of Melbourne
Role / Position:	PhD student
Type of presentation:	Presentation (talk)

Evaluation of TRMM 3B42 estimates of tropical cyclone daily rainfall over the Pacific and Australia.

This study evaluates TRMM 3B42 version 7 (V7) estimates of daily rainfall in tropical cyclones (TCs) over the Pacific and Australia region. Over the Pacific, the Comprehensive Pacific Rainfall Database (PACRAIN) of 24h rain gauge observations is utilized as reference data. The evaluation is performed on two different terrain types: low-lying atoll sites (assumed to represent open-ocean conditions) and coastal and island sites (over land). The results show that TRMM 3B42 has good skill at detecting intense TC rainfall, with good correlation and pattern matching with PACRAIN observations. However, it tends to overestimate heavy rain frequency on atoll sites, but tends to underestimate heavy rain frequency on coastal and island sites. Overall, TRMM 3B42 is better able to estimate the intensity of TC heavy rain over ocean than over land. It is least skillful at coastal and island sites with high elevation, where it significantly underestimates TC heavy rainfall, suggesting that TRMM 3B42 is unable to capture orographic enhancement during TC landfall. The evaluation is also performed over Australia region using AWAP, a high quality gauge-based gridded rainfall product. The results show that TC intensity, location, terrain and TC seasons all have impacts on TRMM 3B42's detection skill. For TC heavy rain, TRMM 3B42 shows better agreement with AWAP during more intense TCs (CAT3-5), in eyewall as opposed to the rain bands, in tropics as opposed to sub-tropics, and in late TC seasons as opposed to early and peak TC seasons.

Name:	Helen Beggs
Email:	h.beggs@bom.gov.au
Association / Organisation:	CAWCR, Bureau of Meteorology
Role / Position:	Ocean Remote Sensing Scientist
Type of presentation:	Presentation (talk)

The Group for High Resolution Sea Surface Temperature (GHRSST)

Helen Beggs[1], Gary K. Corlett[2] and Peter J. Minnett[3]
[1]CAWCR, Bureau of Meteorology, Docklands, Vic 3008, Australia, h.beggs@bom.gov.au,
[2]University of Leicester, Department of Physics and Astronomy, Leicester, UK, gkc1@le.ac.uk
[3]RSMAS, University of Miami, USA, pminnett@rsmas.miami.edu

The Group for High Resolution Sea Surface Temperature (GHRSST) started in 2002 as one of the pilot projects of the Global Ocean Data Assimilation Experiment (GODAE), and is now the main expert group of users and providers of satellite SST data (Donlon et al., 2007). A new generation of high-resolution (< 10 km) global SST products and services, which have a demonstrated positive impact on ocean and atmospheric forecasting systems, are now provided by GHRSST in near-real-time on a day-to-day basis. Looking forward, GHRSST will continue to improve the quality and provision of high-resolution global SST data. GHRSST provides a forum for the operational and scientific communities to interact and exchange ideas and requirements. Further information on GHRSST can be found at https://www.ghrsst.org .

Operational agencies running various numerical weather and ocean forecast systems are key users of GHRSST data and indeed their objectives underpin many of the GHRSST scientific and technical activities necessary to provide daily high resolution SST products for ingestion into operational forecast and analysis systems. GHRSST has championed the use of common data formats for a specific user domain and all GHRSST products are available in these internationally agreed formats.

GHRSST takes user requirements for operational services from a number of sources including the WMO Rolling Requirements Review (RRR), expert science teams such as the GODAE Ocean View Science Team that focuses on operational ocean forecasting, GCOS for long term climate measurements, and the GHRSST Science Team members, who represent many agencies involved in GHRSST. GHRSST then synthesises these requirements into a common set of Measurement requirements for both space-based and surface-based instrumentation (including gap analyses and lists of priorities) and Scientific and technical requirements for new and continuing R&D elements (which drive the program of the GHRSST Working Groups and Technical Advisory Groups.

This approach allows GHRSST to maintain close interaction with operational and scientific users in order to respond to their requirements and to have a clear focus as to what instrumentation is needed long-term to provide a sustainable high resolution SST measurement system. There are many existing and planned satellite instruments with the capability to provide SST and it is essential that all such instruments are considered in the SST measurement system to maximise the scientific return through complementary measurements and analyses.

This presentation will summarise GHRSST products and services and will demonstrate the many advantages to agencies of participation in GHRSST.

Reference

Donlon, C.J., et al., (2007). The Global Ocean Data Assimilation Experiment High-resolution Sea Surface Temperature Pilot Project. *Bulletin of the American Meteorological Society*, 88, 1197-1213.

Name:	Likun Wang
Email:	Likun.Wang@noaa.gov
Association / Organisation:	NOAA/NESDIS/STAR
Role / Position:	Research Scientist
Type of presentation:	Presentation (talk)

Suomi NPP CrIS Sensor Data Record Quality Assessment toward the Validated Product Maturity Level

Suomi NPP CrIS Sensor Data Record Quality Assessment toward the Validated Product Maturity Level Yong Han1, Likun Wang2*, Denis Tremblay3, Yong Chen2 and Xin Jin4 1. NOAA/NESDIS/Center for Satellite Applications and Research, College Park, MD, USA 2. ESSIC/Univ. of Maryland, College Park, MD, USA 3. Science Data Processing Inc. at NOAA/NESDIS/STAR, College Park, MD, USA 4. Earth Resources Technology Inc. at NOAA/NESDIS/STAR, Laurel, MD, USA * Presentation will be given by Likun Wang. The Cross-track Infrared Sounder (CrIS) is a Fourier Transform Spectrometer (FTS) flying onboard the Suomi National Polar-orbiting Partnership (Suomi NPP) UOMI-NPP satellite that was launched on October 28th 2011. Since the beginning of the mission, calibration and validation activities have has led to the achievements of the beta and provisional maturity levels of the CrIS Sensor Data Record (SDR) product. The validated level is expected to be reached in January 2014. This presentation summarizes provides results from the SDR quality assessment work for achieving Validatedvalidated product status. The instrument noise level is evaluated by analyzing the Noise Equivalent Differential Radiance (NEdN) and its stability over the past 18 months. The spectral accuracy is estimated by comparing channel frequencies between observed and simulated spectra through analyzing their maximum correlation. The radiometric accuracy is evaluated by comparing CrIS radiance measurements with IASI, AIRS and VIIRS. The geolocation accuracy is determined by comparing CrIS observations with measurements from VIIRS IR image band I5 band (11.4 μm) over highly inhomogeneous scenes. All the CrIS performance and SDR requirements have been met. The radiance noise levels of the three bands are well below the specifications, by 30% to 90%. The spectral uncertainty is in the range of 2-3 ppm. The agreements between CrIS and IASI/AIR/VIIRS are better than 0.3 K. The consistencies of the radiometric and spectral performances among the 9 field-of-views (FOVs) that form a field-of-regard (FOR) are better than 0.1 K and 1 ppm, respectively. The geolocation uncertainty for near nadir pixels is less than 0.4 km.

Name:	Ha, Su Jin
Email:	sj.ha@kiaps.org
Association / Organisation:	Korea Institute of Atmospheric Prediction Systems
Role / Position:	Senior Staff
Type of presentation:	Poster

Development of IASI Quality Control and Thinning at KIAPS and Preliminary Results

This study mainly investigates IASI data quality control and thinning for KIAPS (Korea Institute of Atmospheric Prediction Systems) Observation Processing System (KOPS). Radiance data needs quality control for better results of data assimilation. Quality control on the brightness temperature (TB) measurements is performed when the input data, i.e. background TB and observation TB, are outside the normal range, or when an error occurs in the process of bias correction or calculation of the observation operator of RTTOV radiative transfer model. When the difference between observations and forward modeled NWP background values exceeds a threshold, the data are eliminated for quality control even if the data pass the preceding procedures. Thinning consists of initial thinning and final thinning. The role of initial thinning is to improve efficiency of time and data by sorting out redundant data and the data with gross errors or outside the temporal and spatial domain of analysis. Final thinning removes observation error correlations and minimizes cost for data assimilation by selecting observations based on factors such as NWP model grid, cloud screening, and previous quality control results. The preliminary results of KOPS quality control and thinning on IASI data for one month period of November, 2012 will be presented.

Name:	Lawrence Rikus
Email:	l.rikus@bom.gov.au
Association / Organisation:	CAWCR
Role / Position:	Model Evaluation
Type of presentation:	Presentation (talk)

Synthetic Satellite Imagery and Weather Prediction

Synthetic satellite imagery generated from the the real time model fields in combination with a radiative transfer code comparable to the model's radiation scheme is routinely produced for all of the Bureau of Meteorology's operational NWP forecasts (see http://cawcr.gov.au/staff/ljr/projects/forcloops.htm). This imagery is useful because it integrates a significant amount of information about the model atmospheric state in single images and is readily comparable with the real imagery. Thus it provides operational weather forecasters, trained to assess synoptic situations using satellite imagery, with a readily accessible assessment of the current model forecasts. It can also serve as a model evaluation tool; discrepancies between the real and synthetic imagery can point to problems in the model, not just in positions of synoptic features but also cloud properties and its interaction with radiation. The evaluation of model forecasts using synthetic imagery has some limitations. Until fairly recently the effective model resolution has been generally much coarser that the real satellite imagery. Since the synthetic imagery is a convolution of model cloud microphysical properties, spatial distribution and optical properties, quantitative assessment of the model's parameterization schemes requires an unraveling process. Some extra diagnostic information can be gained by using more satellite channels but this can be limited by some of the assumptions in the model parameterization schemes which can preclude the representation of some features, e.g. fixed droplet/crystal sizes will prevent the model imagery from representing effects due to very small or very large sizes. The synthetic satellite imagery has been used to qualitatively assess cloud positions and structures in tropical cyclone and mesoscale NWP forecasts, e.g. the cloud structures in forecast loops of ACCESS-TC simulations for Lua and Yasi show a remarkable correspondence with the real MTSAT imagery. More quantitative methods are also under development.

Name:	Stephan Bojinski
Email:	sbojinski@wmo.int
Association / Organisation:	World Meteorological Organization
Role / Position:	Scientific Officer, Space Programme
Type of presentation:	Presentation (talk)

WMO Strategic Priorities and Space Activities

(will be submitted on 2 Sep)

File not found

Name:	Dongryeol Ryu
Email:	dryu@unimelb.edu.au
Association / Organisation:	The University of Melbourne
Role / Position:	Senior Lecturer
Type of presentation:	Presentation (talk)

Synergistic use of satellite soil moisture and precipitation products for hydrological modeling

Remotely sensed hydrometeorological observations from space can provide important input forcing and land surface variables to large-scale hydrological modeling. The key variables include precipitation, evapotranspiration, soil moisture and vegetation biomass. Among these, utility of satellite precipitation and soil moisture products have been improving fast in recent years due to the introduction of new satellite instruments and the advances in retrieval algorithms. This work demonstrates methods to leverage remotely sensed precipitation and soil moisture for hydrological predictions over sparsely gauged or ungauged basins. Using the close coupling between precipitation and surface soil moisture content, we enhance the quality of the real-time satellite precipitation product, the TRMM Multi-satellite Precipitation Analysis (TMPA) 3B42RT. Multiple microwave soil moisture retrievals from the Advanced Microwave Scanning Radiometer – EOS (AMSR-E), the Advance Scatterometer (ASCAT), and the Soil Moisture and Ocean Salinity (SMOS) are assimilated into a simple land model forced by 3B42RT using the ensemble Kalman filter (EnKF) and the analysis increments are used to correct errors in 3B42RT. The quality-enhanced precipitation product is combined with EnKF-based state updating scheme to maximize the utility of remotely sensed soil moisture and precipitation for improving streamflow prediction. Example cases are presented over study basins in Australia and USA are presented.

Name:	Wim van Dijk
Email:	wim.vandijk@metservice.com
Association / Organisation:	New Zealand Meteorological Service
Role / Position:	Data Manager
Type of presentation:	Presentation (talk)

How the National Meteorological Service of New Zealand uses satellite data

This presentation explains how MetService, the National Meteorological Service of New Zealand, collects, processes and displays data from weather satellites. Since New Zealand is surrounded by ocean, our forecast inputs are heavily dependent on remote sensing technology from radar, lightning detectors and satellites. During the past 20 years a large percentage of the organisation's outputs have incorporated all of these, but especially satellite imagery. The methods for interpreting satellite data at MetService today are generally not much different from 1995, however that is expected to change in the next few years as more and more satellite data becomes available. Recently a new XBand receiver has challenged the MetService forecasters to reconsider how they can use polar orbiter data. In 2015 the change to Himawari 8 with higher geographical, temporal and spectral resolution is likely to affect forecast processes in even more significant ways.

Name:	Lihang Zhou
Email:	Lihang.Zhou@NOAA.GOV
Association / Organisation:	NOAA/NESDIS/STAR
Role / Position:	JPSS Algorithm and Data Products Acting Deputy Project Manager
Type of presentation:	Presentation (talk)

Updates on the Performance of Suomi National Polar-orbiting Partnership Data Products

The Joint Polar Satellite System (JPSS) is the next generation United States polar-orbiting operational environmental satellite system that will provide continuity of critical observations for accurate weather forecasting, reliable severe storm outlooks, and global measurements of atmospheric and oceanic conditions. A pre-cursor mission for JPSS - The Suomi National Polar-orbiting Partnership (SNPP) satellite was successfully launched on October 28, 2011 and carries the following five sensors: Visible/Infrared Imager Radiometer Suite (VIIRS); Cross-track Infrared Sounder (CrIS); Advanced Technology Microwave Sounder (ATMS), Ozone Mapping and Profiler Suite (OMPS), and Clouds and the Earth's Radiant Energy System (CERES). SNPP provides on-orbit testing and validation of sensors, algorithms, ground-based operations, and data processing systems that will be used in the operational JPSS mission. Since launch of SNPP, the JPSS Algorithm and Data Products (ADP) teams have been carrying out detailed evaluation of the SDR and EDR products. To assure the quality of the products and performance of the algorithms meeting the requirements, tools for assessing and monitoring the performance of SDR and EDR products are being develop and implemented. Based on specific algorithm readiness levels, the JPSS algorithms and data product teams established a schedule of anticipated dates for the algorithms to achieve Beta, Provisional and Validated statuses. Declaring SDR/EDR product maturity is the result of a specific review of artifacts that document that the products meet a series of criteria defined for each maturity stage. By far, all the SDR products achieved Provisional maturity; and a number of fundamental EDRs also achieved Provisional status. They are now available to the public through the National Oceanic and Atmospheric Administration's (NOAA) Comprehensive Large Array-data Stewardship System (CLASS), and ready for operational evaluation; In the presentation, we will provide an overview of the latest JPSS data products' quality status and the maturity timeline going forward.

Name:	Oleg Pokrovsky
Email:	pokrov_06@mail.ru
Association / Organisation:	Main Geophysical Observatory/RosHydroMet
Role / Position:	Principal Scientist
Type of presentation:	Presentation (talk)

Detection of the spatial anomalies in the North Pacific SST field to forecast extreme monsoon rain area extension to the Northern Asia

Increasing frequency of floods in North-East China and Russia is an actual problem of prominent concern not only for National HydroMeteorological Services, but, also to these countries economy and security issues. Therefore, a problem of development of seasonal forecasting of expected extreme rains in basins of main rivers in this region is of considerable practical value. To predict above mentioned extreme precipitations it is necessary to take into account not only North Pacific SST field anomalies, but several atmospheric circulation factors: Asian South-East monsoon air dynamic and Arctic cold air intrusion. In this respect we consider the ENSO impact on monsoon movement and the PDO as a regulator of non-zonal air flow in the Northern Asia. Remote sensing data is the main source of the SST, LSP and precipitation data over oceans and ajoint land areas in the Northern Asia. Analysis of evolving of above processes during last ten years is a main subject of this study. We kept in mind that the monsoon phenomenon is related to seasonal changes in atmospheric circulation and precipitation rate associated with the asymmetric heating of land and sea. We preceded an impact of the ENSO on the East Asia monsoon related to reduction in net heat input to the Indian Ocean through the Indonesian through flow. The summer monsoon shifts through a series of dry and rainy phases as the rain belt moves northward, beginning over Indochina and the South China Sea (May), to the Yangtze River Basin. We reveal that the summer monsoon final portions in Augusts have reached South East Siberia domain since 2009 to now. This phenomenon was closely related to negative phase of the PDO in summer months. By fuzzy logic tools we split North Pacific area into eastern and western sub-areas and investigated averaged SST values in each of them. Analysis of corresponding time series permit us to deduce transition rule from positive to negative phase of above mentioned indicators. Cross-correlation and wavelet analysis of these time series with precipitation fields over land in the Northern Asia allow us to find a coherency, which in turn opens a way to development efficient statistical prediction algorithm. Many examples will be presented to validate this approach.

Name:	Yongguang Zheng
Email:	zhengyg@cma.gov.cn
Association / Organisation:	China National Meteorological Center
Role / Position:	Research Scientist
Type of presentation:	Presentation (talk)

Climatological Distribution and Diurnal Variations of Short-Duration Heavy Rain, its Relationship with Diurnal Variations of MCSs over China during the Warm Season

Short-duration heavy rainfall (hereafter SDHR) is one type of severe convective weather, and can directly or indirectly lead to large property and life losses. Based on the qualified hourly rain-gauge data from 876 stations during April-September of 1991–2009 provided by the National Meteorological Information Center of China, the spatiotemporal distribution of SDHR over China during the warm season (April-September) is presented, and the diurnal variations between SDHR and MCSs (denoted by TBB lower than -52 ℃ from geostationary satellites) are compared. The spatial distributions of SDHR frequencies with hourly rainfall ≥ 10 mm, 20 mm, 30 mm and 40 mm are very similar to those of heavy rainfall (daily rainfall ≥ 50 mm) over China (excluding Taiwan). However, since the frequencies of SDHR with hourly rainfall ≥ 50 mm are much lower than those ≥ 20 mm/h, their spatial distributions are also much different. The most active SDHR region is South China, and the second most active regions are southern Yunnan Province, Sichuan Basin, south Guizhou Province, Jiangxi Province, the lower reaches of the Yangtze River, and so on. The heaviest hourly rainfall over China (excluding Taiwan) is more than 180 mm (over Hainan Island), and there are lots of SDHR events with hourly rainfall ≥ 50 mm over the inactive SDHR regions, such as western Xinjiang Uygur Autonomous Region, middle and eastern Inner Mongolia Autonomous Region. The monthly variations of SDHR show that the most active SDHR month is July, and August the second most active. The pentad variations of SDHR reveal that the evolution of SDHR is intermittent, and the most active SDHR pentad is the fourth pentad of July. The SDHR frequencies enhance slowly and weaken rapidly with the advance and withdraw of the summer monsoon in East Asia in the monthly and pentad variations over China. Over the entire China, the most active diurnal peak is 16-17BT, the second and third active peaks 01-02 BT and 07-08 BT, and the most inactive period 10-13BT. The diurnal variations of SDHR show that the active periods and propagation of SDHR and MCSs are different in different regions with different underlying surface, and there are different diurnal variations with a single peak, double peaks, multiple peaks or longer duration, which are associated not only with the larger-scale atmospheric circulations, but also with the terrain and land-sea distributions. Good examples for these observations include the South China, Guizhou Province, and Sichuan Province.

Name:	Osamu Ochiai
Email:	oochiai@geosec.org
Association / Organisation:	GEO Secretariat
Role / Position:	Scientific and Technical Officer
Type of presentation:	Presentation (talk)

The Group on Earth Observations - progress and post 2015

The Global Earth Observation System of Systems will provide decision-support tools to a wide variety of users. As with the Internet, GEOSS will be a global and fl exible network of content providers allowing decision makers to access an extraordinary range of information at their desk. The presentation will give a talk concerning to its progress of GEOSS development and benefit to 9 Societal Benefit Areas as well as situation on the development of the post 2015 Strategy.

Name:	Jeffrey Walker
Email:	jeff.walker@monash.edu
Association / Organisation:	Monash University
Role / Position:	Head, Department of Civil Engineering
Type of presentation:	Presentation (talk)

State-of-the-art in soil moisture remote sensing

NOTE: I am only available to present on Thursday. State-of-the-art in soil moisture remote sensing Jeffrey Walker Department of Civil Engineering Monash University, Clayton, Vic 3800 Soil moisture provides an important boundary condition to numerical weather prediction and seasonal-to-interannual climate forecasting, through its control on moisture and energy fluxes from the land surface to the atmosphere. While there has been much research on developing soil moisture remote sensing capabilities over the past three decades, the first dedicated soil moisture satellite was not launched until late 2009. However, there are now several satellites with soil moisture monitoring capability, and some of these have plans to provide long-term monitoring records, making them ideally suited to operational applications including meteorology. The current and planned capabilities in soil moisture remote sensing will be presented in the context of weather and climate modelling.

Name:	Ian Grant
Email:	i.grant@bom.gov.au
Association / Organisation:	Australian Bureau of Meteorology
Role / Position:	Satellite Specialist
Type of presentation:	Presentation (talk)

Solar resource mapping from geostationary satellite data: Status and needs

The solar energy sector depends on solar resource mapping data. Historical data supports planning the capacity of photovoltaic solar installations, the siting of large scale solar power stations, and the prediction of station performance to support financing. Nowcasting and forecasting of the intrinsically variable solar resource is needed to support generator and grid operation, and the electricity market. Solar datasets derived from geostationary imager data on the basis of statistical or physical models are an important source of spatial solar resource information. The Australian Bureau of Meteorology has recently expanded its suite of publicly available satellite-based solar resource datasets. These include hourly time series of global horizontal irradiance and direct normal irradiance, monthly means and monthly climatologies of these hourly quantities, and time series and climatologies of daily solar exposure, all extending back to 1990. The advanced geostationary imagers offer improved accuracy and timeliness of solar datasets, due to their improved temporal resolution and improved characterisation of the atmosphere and clouds arising from their better spectral sampling. Furthermore, cloud motion vectors derived from geostationary image sequences have been shown to improve the accuracy of solar nowcasts and forecasts based on numerical weather prediction. International coordination and standardisation of processing algorithms, dataset uncertainty characterisation, and data distribution are being achieved through Tasks 36 and 46 of the International Energy Agency's Solar Heating and Cooling Programme. This talk will review the current status and future needs of solar resource mapping from geostationary satellite data, with reference to current Australian activity in the area.

Name:	Kenneth Carey
Email:	ken.carey@ertcorp.com
Association / Organisation:	Earth Resources Technology / NOAA-NESDIS
Role / Position:	Vice Presdient for Science and Engineering
Type of presentation:	Presentation (talk)

Maximizing the Usefulness of Satellite Data, Products, and Services--Pursuing Excellence in Satellite Training, Education and Outreach

Given the significant increase in new satellite information that will become available later in this decade (especially by the next generation of satellites, such as the Joint Polar Satellite System [JPSS] and GOES-R), education and training programs must expand to meet increasing user requirements. This presentation will focus on the need for and benefit of expanding the World Meteorological Organization (WMO) Virtual Laboratory (VLab), a worldwide collaborative network of training and education centres—Centres of Excellence (CoEs)—to provide satellite training, education and outreach to users to more fully and effectively exploit satellite information, resulting in improved decision assistance for weather forecasts and climate projections impacting global aeronautical, transportation, and disaster preparedness. The activities of the WMO VLab and the CoEs will be highlighted in this presentation, to include the training activities in the form of online events (Dust Event Week and Aviation Event Week, etc.), Regional Focus Groups and online resources such as VisitView, Environmental Satellite Resource Center (ESRC), CoE websites, etc. I will discuss formulation, sharing and challenges of user-focused satellite training events, such as online resource of training material and case studies resources, which can be shared and conducted in a structured format that will allow better decision assistance by users of operational satellite information.

Name:	Hae-Yong Shin
Email:	shin@seaspace.com
Association / Organisation:	SeaSpace Corporation
Role / Position:	Senior Scientist
Type of presentation:	Poster

Preparing for the Next Generation of Direct Broadcast

Preparing for the Next Generation of Direct Broadcast Hae-Yong Shin, Karen Friedman Dubey, Eric Baptiste, Kota Prasad, Darrel Lawrence SeaSpace Corporation, 13000 Gregg Street, Suite A, Poway, CA 92064 shin@seaspace.com www.seaspace.com With the recent launch of S-NPP, and in anticipation of JPSS-1 and GOES-R in the next five years, the flow of weather data to users will rise ten times (Berchoff, 2009). This volume of data will put a strain on the government infrastructure tasked for data distribution, which could limit real-time data distribution to government users only, forcing others to retrieve their data days to weeks later. In order to receive real-time data, direct reception will become a necessity. SeaSpace Corporation has created a complete solution in anticipation of the forthcoming needs of data users. This solution is made up of four parts: 1) ground reception stations, 2) software to process the data into products, 3) data storage hardware, and 4) data cataloging software and server. The ground station component consists of two systems, an X/L/S-band tracking system and an L-band geostationary system. The combined X-, L-, and S-band reception capabilities are included to ensure the user can receive the maximum amount of data. The X-band receiver in this system can receive data from Terra, Aqua, S-NPP, JPSS, Oceansat-2, and FY-3. The L-band receiver can currently receive NOAA and MetOp. The follow-on to MetOp will be assigned the mid-morning orbit in the next generation constellation, ensuring L-band reception will continue to be a necessity. The S-band is used for DMSP reception, which may, in the near-future, become more widely available to non-defense clients. The L-band stationary antenna in the proposed solution is used for reception of geostationary satellites, such as GOES, COMS, and MTSAT. Upon launch, GOES-R data can be received with a larger dual polarization L-band system. Once the data is received by the ground stations, the TeraScan Rapid Environmental Xtreme processor (T-REX) automatically processes the data through level 3 products using the official NOAA and NASA algorithms. After processing, the raw data and products are moved to TeraVault™, SeaSpace's data storage solution. TeraVault™ comes standard with 60 TB of storage, can be easily expanded, and allows online and readily accessible storage for data. In order to easily manage data of this volume, SeaSpace recommends the TeraCat™ data catalog and retrieval system, which gives users and their customers a web-based interface to search for and order their data. A full direct-reception solution is the only way to guarantee real-time access to the next generation of environmental satellite data. The currently over-tasked system of data distribution via the internet is ill-equipped to service local and foreign customers on a real-time basis now, and this will only get worse as more data comes online. References D. Berchoff, Leveraging GOES Capabilities to Maximize Response to User Needs, 2009 GOES Users Conference, November 3, 2009, Madison, WI.

Name:	Chun-Hsu Su
Email:	csu@unimelb.edu.au
Association / Organisation:	Department of Infrastructure, The University of Melbourne
Role / Position:	Research Fellow
Type of presentation:	Poster

Maximizing the value of satellite soil moisture

Soil moisture is a key variable in hydrological and meteorological processes, and has been recognised as an Essential Climate Variable in the ESA Climate Change Initiative framework. Antecedent soil moisture influences rainfall-runoff response, groundwater recharge and catchment drainage. As a part of the interface between the land surface and the atmosphere, it regulates energy and water exchanges and constrains plant transpiration and photosynthesis. Routine and real-time observations of surface soil moisture as inputs to environmental modelling has therefore great potential in improving predictability and understanding of short-term weather, extreme events and climate variability, and their impact on ecosystems and agriculture. Satellite radiometry with current AMSR-2 (JAXA/NASA GCOM-W Advanced Microwave Scanning Radiometer) and SMOS (ESA Soil Moisture and Ocean Salinity) and upcoming SMAP (NASA Soil Moisture Active and Passive) missions, and scatterometers on MetOp satellites provide this capability of real-time global mapping of surface soil moisture for many prospective operational applications; while a broader range of satellite soil moisture records dating back to 1978 are valuable inputs for re-analysis studies. This leads to huge interest in deriving a long, complete and consistent data set from these multiple sources, and in assimilating them into diverse models to improve model projections. However this is particularly challenging as these data sets often contain large measurement errors and are considerably different due to different measurement scale and support. Robust estimations of exact relationships between various measurements and/or representation of soil moisture, as well as accurate characterisations of their errors, are therefore pivotal steps to achieve meaningful comparisons of different data sets and optimal data assimilation. Here we report on our investigation into these areas to develop novel characterisation methods (Figure 1(a) as an example). Facing the erroneous satellite-retrieved observations with stochastic errors, we report on a novel de-noising scheme to improve the quality of satellite products (Figure 1(b)). These results will inform the development of better strategies to maximise the utility of satellite-retrieved soil moisture for the broader end-user communities of these products.

Name:	Han-dol KIM
Email:	hkim@kari.re.kr
Association / Organisation:	Korea Aerospace Research Institute (KARI)
Role / Position:	Principal Researcher
Type of presentation:	Presentation (talk)

On the COMS Data Product Timeliness

The data timeliness or the product latency, mainly associated with the delay in the data processing and the data delivery and mainly centered around the INR (Image Navigation and Registration) processing, is a key performance parameter for a meteorological sensing system mainly because of the urgency associated with the management of severe weather events, among other reasons. It is perceived that siginificant emphasis is placed on the product latency in the United States' GOES system and that it delivers its product in the form of GVAR telemetery essentially in real time. It is also understood that in the case of MTSAT, too, this latency is on the order of less than 3 minutes. While COMS (Communication, Ocean and Meteorological Satellite), the 1st South Korean geostationary remote sensing, multi-mission satellite, has been working quite faithfully since its launch on June 26, 2010, meeting all the performance requirements including the INR and timeliness requirements, its data product timeliness has been some issue to the end users. A succinct description of this issue would be such that too naive or relaxed a definition of the timeliness requirement itself at the early program definition phase has led to eventually somewhat noticeable impact to the end users even in the cases of full compliance to the original performance requirements. Since the point of identification of this issue, various efforts have been put together to improve upon this aspect of the data product timeliness by KARI, KMA (Korea Meteorological Administration) and the related associates, and some promising outcome are foreseen to be achieved in the near future. While it has been a valuable and also expensive lesson for us, it is believed that this lesson will provide some insightful information to our neighbor countries in this region, not only in terms of its technical implications and end user perspectives but also in the program definition and organization aspect. This paper presents an overview of the COMS data timeliness, in terms of its technical background and operational phenomena, and descriptions of our various efforts to improve upon this aspect. It then discusses the key technical findings and implications obtained during the process of these efforts, and addresses the prospects of expected improvement as the outcome of these efforts. Finally, it summarizes the lessons learned from this whole process and the resulting insights for the way forward both in technical terms and the programmatic scale.

Name:	Wenjian ZHANG
Email:	wzhang@wmo.int
Association / Organisation:	World Meteorological Organization
Role / Position:	Director, Observing and Information Systems Department
Type of presentation:	Presentation (talk)

The Progress on the development of an architecture for climate monitoring from space

The Progress on the Development of An Architecture for Climate Monitoring from Space Wenjian Zhang1, Tillmann Mohr2, Jim Purdom3, Jérôme Lafeuille1 and Stephan Bojinski1 World Meteorological Organization (WMO) Abstract The Sixteenth of World Meteorological Congress (May 2011, Geneva), adopted a Resolution on the Development of An Architecture for Climate Monitoring from Space (Resolution 19 (Cg-XVI)). Representatives from the Committee on Earth Observation Satellites (CEOS), the Coordination Group for Meteorological Satellites (CGMS) and the WMO Space Programme, have written a report titled, “Strategy towards an Architecture for Monitoring Climate from Space”. This strategy report calls for an international end-to-end framework of activities that ensures delivery of climate data records derived from satellite observations. The architecture shall respond to the requirements of WMO, Global Climate Observing System (GCOS), Global Earth Observing System of Systems (GEOSS), Global Framework for Climate Services (GFCS) and the broader climate application user community, for both the long-term monitoring of the Earth’s climate system, and the characterization of climate extreme events in near-real time. It will build upon a constellation of research and operational satellites, both existing and more important currently developed and future planned by space agencies, supported by open data-sharing policies and agreements, contingency planning, data processing, stewardship and long-term preservation, validation mechanisms involving surface observations, and user engagement mechanisms for monitoring and services provisions. Plans should be made to ensure full coverage of observations for the whole climate system domains (atmosphere both physical and chemical, oceans and costal regions, land including biosphere and cyrosphere), long-term and sustained climate observations as we do today for weather observations. Climate monitoring will continue to rely on integrations of operational and experimental meteorological/environmental satellite missions with WMO and partner’s ground in-situ observing networks. The most relevant and comprehensive set of specific user requirements is provided by GCOS within their supple¬ment “Systematic Observation Requirements for Satellite- Based Products for Climate (GCOS-154) to the GCOS Implementation Plan (GCOS-138), for climate change and long-term variability monitoring. The GCOS requirements are defined for a subset of the Essential Cli¬mate Variables (ECV) where the feasibility of satellite mea¬surements has been demonstrated. The Global Framework for Climate Services (GFCS) Implementation Plan, recently approved by the World Meteorological Congress Extraordinary Session (October 2012, Geneva) adds another dimension to the require¬ments in establishing a direct link to climate applications. It defines climate services as climate information prepared and delivered to meet users’ needs. The GFCS describes a need for climate services in many application

areas ranging from disaster risk reduction, agriculture and food security, water resources, health, to energy management, and highlights the need to support developing countries in particular. The needs of decision makers from this broad range of applications are expected to be very diverse and include requirement for tailored services, including observational but also prediction components. Significant progress has been made over the last few decades in observing the Earth globally, with higher temporal and spatial resolution. Satellite observations of the Earth have enabled to construct global views of many ECVs across the atmospheric, oceanic and terrestrial domains, including ozone, cloud cover, precipitation, aerosol optical depth, sea surface topography, changes in polar ice masses, and changes to the land surface, which before the advent of satellites was all but impossible. Indeed, with some satellite observations now spanning more than 50 years, the value of this information for climate monitoring purposes is becoming increasingly evident. However, a number of issues associated with satellite observation, data, and products for climate monitoring remain to be great challenges. These include, among others, instrument calibration, the absence of documented measurement traceability and uncertainty budgets, as well as e.g. changes in the satellite observation time due to orbital drift during the lifetime of some sun-synchronous satellites. All of these can introduce artefacts into long-term time series and when consecutive series of satellite observations are integrated over time. Careful attention is thus required when using these observations to produce climate data records, bearing in mind the stringent ac¬curacy requirements of climate monitoring and decadal climate change detection. Within the WMO context, the architecture shall be part of the space-based component of WMO Integrated Global Observing System (WIGOS). It would include the Global Space-based Inter- Calibration System (GSICS), additional calibration and validation activities to be conducted in coordination with the Commission for Instruments and Methods of Observation (CIMO), the product generation efforts as done within the SCOPE-CM and should benefit of the training and capacity-building activities of the Virtual Laboratory (VLab). Although this architecture initiative focuses on satellite observations for climate monitoring, the role that surface observations play must not be overlooked. Existing in situ networks provide observations of some parameters that are difficult and/or impossible to measure from space. These can serve validation purposes or, in specific cases, vicarious calibration of space-based observations, and can be used in joint analyses with satellite data. Enhancing synergy between in-situ and space-based observing systems is thus essential, and must be taken into account in the development of the architecture. 1 - WMO Space Programme Office, Observing and Information Systems Department, WMO 2 – Special Adviser for WMO Secretary-General on Satellite Matters 3 – Senior Consultant on WMO Integrated Global Observing System (WIGOS).

Name:	Kotaro BESSHO
Email:	kbessho@met.kishou.go.jp
Association / Organisation:	JMA/MSC
Role / Position:	Head of System Engineering Division
Type of presentation:	Presentation (talk)

Current status of Himawari-8/9 products development

The Japan Meteorological Agency (JMA) plans to launch Himawari-8 and 9 in 2014 and 2016, respectively, and start the operation of Himawari-8 in 2015. Himawari-8 and 9 carry a new imager called the Advance Himawari Imager (AHI), whose observing capability is enhanced from MTSAT-2 Imager; multi-channel capacity (16 channels in visible and infrared bands), high spatial resolutions (0.5 – 1.0 km for visible and 1 – 2 km for infrared), fast imaging (within 10 minutes for full disk), and rapid scanning with flexible area selection and scheduling. As mentioned above, Himawari-8 and -9 will offer high observation potential, which will enable users to improve and develop a wide range of products. Using AHI data, JMA plans to improve current satellite products such as Atmospheric Motion Vector (AMV), cloud grid information (CGI), clear sky radiance and sea surface temperature. New products related to volcanic ash and dust will also be developed. For the AMV product, significant improvement of them is foreseen. Higher image resolutions and more frequent observations are expected to provide better target tracking accuracy, and the increased number of imaging bands will enhance AMV height assignment. CGI will consist of three products such as cloud mask, cloud type and cloud top height. The algorithms of them are based on those of EUMETSAT, and some parts of them will be introduced from those of NOAA/NESDIS. As new products for Himawari-8 and 9, JMA is developing two aerosol outputs relating to volcanic ash and dust. Volcanic ash directly affects airplane flight plans, and is monitored by Tokyo Volcanic Ash Advisory Center (VAAC) of JMA. From Himawari-8/9 observations, quantitative data such as ash density and height are expected. JMA has started a pre-operational generation of volcanic ash product in collaboration with EUMETSAT. The algorithm developed for the MTSAT will be extended towards Himwarai-8/9. JMA is also planning to introduce NOAA/NESDIS volcanic ash algorithm. JMA will operate these two algorithms with the data from Himawari-8/9. Dust product will be developed for the purpose of monitoring Asian dust. Two different approaches will be taken for this product. One will use visible and near-infrared data, and the other will use infrared data. Algorithm for the dust product retrieved from visible and near-infrared data has been developed based on NOAA/NESDIS aerosol algorithm. To support the development for products derived from AHI observation on Himawari-8, simulation-based proxy data have been created. Numerical Weather Prediction (NWP) data used in the simulation provide the “truth” of the atmosphere. Not only can simulation data be used as proxy data of pre-launch satellite, but they can be applicable to the improvements of the products generated from existing satellite observation.

Name:	Robert Pipunic
Email:	robp@unimelb.edu.au
Association / Organisation:	The University of Melbourne
Role / Position:	Research Fellow
Type of presentation:	Poster

Examining the value of satellite precipitation data over Australia

Quantitative information on precipitation over spatial and temporal domains is extremely useful for making decisions on flood risk, agriculture and natural resource management. Spatial rainfall data is particularly important as a forcing input to hydrologic models, from which predictions of key water balance components such as moisture storage and runoff provide for decision making in relation to a range of management issues. Good quality spatial rainfall forcing datasets derived from gauge data are available for Australia, however the quality may vary depending on the relative gauge densities for different regions, which has implications for the quality of hydrologic model prediction. Satellite precipitation products based on both passive microwave and infrared remote sensors can potentially add value to areas where existing model rainfall forcing is less reliable. This requires extensive evaluation of satellite products over Australia to determine their error characteristics, which may vary depending on climatic regimes and seasonality. We evaluate three satellite products – TRMM Multi-satellite Precipitation Analysis (TRMM 3B42RT version 7), Precipitation Estimation from Remote Sensing Information using Artificial Neural Network (PERSIANN) and CPC Morphed precipitation (CMORPH) – against gauge data over Australia and investigate their error characteristics for key climate zones (tropical, arid, temperate with dry summers and temperate with wet summers) based on Koppen Geiger classification. This is a step towards producing routine error estimates for such products for any given location and seasonal period, which is essential for understanding the potential value they can add to existing gauge based rainfall data such as the Australian Water Availability Project (AWAP) dataset. Preliminary analysis indicates TRMM 3B42 RT version 7 has the lowest overall error range of the three satellite products over Australia, and is therefore the focus of further detailed examination, including development of a general error model for the data over different regions.

Name:	Chris Lucas
Email:	c.lucas@bom.gov.au
Association / Organisation:	Centre for Australian Weather and Climate Research/ Bureau of Meteorology
Role / Position:	Research Scientist
Type of presentation:	Presentation (talk)

Improving Satellite Detection of Volcanic Ash Clouds at the Bureau of Meteorology

The Bureau of Meteorology operates one of nine global Volcanic Ash Advisory Centres (VAAC), in support of aircraft operations. Australia's VAAC is located in Darwin, NT with a broad area of responsibility, including the 127 active volcanoes in Indonesia. This region is continuously monitored, using whatever reliable information is available. Satellite-based data are particularly important in this endeavour, providing timely information of the position and extent of volcanic ash clouds. This information is a key to predicting their future movement. Traditionally, volcanic ash has been identified in satellite imagery using either subjective direct visual interpretation or the objective 'split window' technique, which considers the difference between the 11 and 12 □m IR brightness temperatures. While these techniques are reasonably robust and useful, both have shortcomings, particularly in the wet tropics, where deep convective activity can obscure can obscure the volcanic plumes or confound the split window signal. Over the previous decade, new techniques have been developed to improve satellite detection of volcanic ash clouds. A greater number of satellite channels are being incorporated into increasingly sophisticated algorithms. Automation of this detection process is a goal, needed to effectively analyse the increasing resolution and volume of the data expected with the next generations of satellites. Ideally, these algorithms will also be able to retrieve information on the physical properties of the ash clouds, including their height, mass loading and particle size. This will provide data that is useful for short-term predictions of volcanic cloud movement. The Bureau is currently evaluating an automated volcanic ash algorithm developed by Mike Pavolonis of NOAA-NESDIS for a planned operational implementation. We are examining the performance characteristics, strengths and shortcomings of the algorithm using a systematic examination of case studies from the Darwin VAAC's area of responsibility. Indonesia and the wet tropics provide a challenging test bed for the algorithm. A thorough evaluation is required to understand the fully the sensitivities of the algorithm. We will present preliminary results of this evaluation process at the workshop. Full operational of the algorithm will allow the Darwin VAAC to fully exploit data from the next-generation Himawari-8 satellite when it comes on line in 2015.

Name:	(Dr) Chris Tingwell
Email:	c.tingwell@bom.gov.au
Association / Organisation:	Centre for Australian Weather and Climate Research (CAWCR)
Role / Position:	Satellite Data Assimilation Team Leader
Type of presentation:	Presentation (talk)

Satellite data assimilation in the Bureau of Meteorology ACCESS NWP systems: an overview of current status and future plans.

Satellite data assimilation in the Bureau of Meteorology ACCESS NWP systems: an overview of current status and future plans. Chris Tingwell, Jin Lee, Paul Gregory, Vinodkumar, Peter Steinle and John Le Marshall. Centre for Australian Weather & Climate Research c.tingwell@bom.gov.au The Australian Community Climate and Earth System Simulator (ACCESS) provides the Australian Bureau of Meteorology with a suite of Numerical Weather Prediction (NWP) systems that incorporate data assimilation and forecast model components developed by the UK Met Office and adapted for local use by the Centre for Australian Weather and Climate Research (CAWCR). The ACCESS Global, Regional and Tropical Cyclone systems feature 4D-VAR assimilation of conventional and satellite-based remotely sensed data which include infrared and microwave radiances from ATOVS, hyperspectral infrared radiances from AIRS and IASI, GPS Radio Occultation data, and Atmospheric Motion Vectors derived from geostationary and polar orbiter imagery. Crucially for the regional ACCESS system, which employs an early data cut-off assimilation cycle in order to generate timely operational forecasts, the Bureau processes ATOVS and hyperspectral radiances from Australian receivers, and also receives radiance data via the Asia-Pacific Regional ATOVS Retransmission Service (RARS). The assimilation of a wide variety of satellite data by means of a state-of-the-art 4D-VAR system is a significant contributor to the excellent forecast skill provided by the ACCESS systems, which provide the Bureau's forecasters and other stakeholders with NWP guidance comparable in quality to that generated by other leading operational centres. The contribution of satellite data is, of course, especially important in the southern hemisphere. Current work is focussed on extending the use of satellite data in ACCESS in a number of ways: through additional sources of microwave data (SSMIS), through expanding the use of infrared channels from AIRS and IASI and through the use of data from next generation instruments on board Suomi-NPP. A very important component of ACCESS development work focusses on convective scale NWP in conjunction with rapid-update-cycle high resolution data assimilation. The use of full resolution moisture-sensitive microwave sounder data, and the high spatial and temporal resolution radiance and cloud top data that will be available from Himawari-8, will be an important part of this development. We also plan to make full use of the capability to derive adjoint-based estimates of the forecast sensitivity to observations that is afforded by the Met Office VAR system. This is expected to be a very useful guide to efforts to extend and enhance the use of satellite data in ACCESS.

Name:	Serguei Soldatenko
Email:	S.Soldatenko@bom.gov.au
Association / Organisation:	CAWCR
Role / Position:	Senior Scientist
Type of presentation:	Poster

GLONASS and its potential for use in NWP Data Assimilation

GLONASS is a space-based global satellite navigation system developed by the Russian Space Agency and operated by the Russian Aerospace Defence Forces, providing real time position and velocity determination for users. GLONASS is an alternative of the US GPS and operates globally with comparable to GPS precision. GLONASS has 24 satellites which are located in middle circular orbits at 19,100 km altitude with a 64.8 degree inclination and a period of 11 hours and 15 minutes. GLONASS can be effectively used at high latitudes (north or south), where GPS signal reception can be unreliable. GLONASS satellites transmit two types of signal: a standard precision (SP) signal and an obfuscated high precision (HP) signal. The signals generated by GLONASS can be used not only for positioning purposes but also, potentially, for numerical weather prediction (NWP) via data assimilation. Many NWP centres, including the Australian Bureau of Meteorology, currently assimilate GNSS Radio Occultation data derived from the GPS system. Such data are considered important sources of unbiased temperature and humidity information in the mid-upper troposphere. Since GLONASS has began to work operationally only recently, the utilization of GLONASS signals for NWP is in the early stages of its development. The objective of this presentation is to discuss the essential features of GLONASS and its potential for use in NWP data assimilation. Early data assimilation results obtained by Russian research organizations will be reviewed.

Name:	Ninghai Sun
Email:	Ninghai.Sun@noaa.gov
Association / Organisation:	NOAA/NESDIS/STAR
Role / Position:	Research Associate
Type of presentation:	Presentation (talk)

Meteorological Satellite Sensor Performance and Data Quality Long Term Monitoring (LTM)

The international community is becoming more interested in using all different available meteorological satellite datasets for weather prediction and climate applications. Due to the different vendor or objectives of those satellite programs, data users need the sensor performance and data quality information in order to help them determine what the most useful data is for their daily operations. A satellite on-orbit sensor performance and data quality long-term monitoring system has been developed in NOAA/NESDIS/STAR to support S-NPP, POES, MetOp, and GOES onboard instruments for STAR Integrated CalVal System (ICVS). Such system provides sensor operational status and performance assessment by real time. Any anomaly or performance degradation can be caught and recorded for further analysis. Long-term trending of monitoring parameters is visualized using orbital mean values and provided online for users. Annual report of NOAA satellite anomalies is submitted to CGMS based on the record of this system. A global data quality assurance system (DQAS) is also developed for characterizing the sensor biases relative to NWP global forecasts (6-hour guess fields) and the global mean bias trending is built using the calculation results. The WMO Global Space-Based Inter-Calibration System (GSICS) baseline algorithms (e.g. Simultaneous Nadir Overpassing, SNO and Double Difference Technique, DDT) are used to cross-calibrate different sensors to the reference sensor. All individual sensor long-term trending data and the x-cal data will be used for building robust satellite climate data records.

Name:	Paul Gregory
Email:	p.gregory@bom.gov.au
Association / Organisation:	Centre for Australian Weather and Climate Research/Bureau of Meteorology
Role / Position:	Research Scientists
Type of presentation:	Presentation (talk)

Satellite data assimilation for improved Tropical Cyclone Forecasts

The sensitivity of tropical cyclone forecasts to assimilated satellite data was assessed using the Bureau of Meteorology's tropical cyclone regional scale models. The tropical cyclone prediction system is a 12km regional atmospheric model with 6 hourly 4DVAR initialization, and is part of the Australian Community Climate and Earth Simulator System (ACCESS), based on the UK Met Office Unified Modelling System. Various levels of spatial and temporal thinning were applied to all the satellite sounder data and Atmospheric Motion Vectors used in the ACCESS 4DVAR assimilation system. Additional experiments were also conducted that assessed the impact of using SSMI/S data from F16. Cyclone strength, track and surface rainfall were used as verification metrics for three cyclones from the 2012/2013 Australian cyclone season. Preliminary results show that increasing the use of satellite data has a bigger effect on cyclone track forecasts than cyclone intensity forecasts.

Name:	ANA OKTAVIA SETIOWATI
Email:	ana_via32@yahoo.com
Association / Organisation:	BMKG
Role / Position:	Head of Satellite Data Management Subdivision
Type of presentation:	Presentation (talk)

Satellite Meteorology –derived Products for disaster monitoring at BMKG

Meteorological Satellite Data play important rules in meteorological and climatological which support the end to end system, Meteorological Early Warning System (MEWS), of daily operational services at BMKG. We would like to introduce some satellite imagery product which are currently used to support for aviation meteorological information and public meteorological information. These products are: Cb cloud distribution, heavy rainfall potential areas, volcanic ash detection, and hotspot/forest fire. The information of the volcanic ash existance in the troposphere is important to be support aviation safety information. The problems relating this matter is not only its horizontal spreading, but also the accuracy of estimated height of the ash plume is still a major problem. In this study, identification of volcanic ash was performed using Split Windows and Multispectral Image Enhancement Techniques by calculating Three-band Volcanic Ash Product (TVAP). In addition, a method to estimate the plume height was also developed by iteratively performing trajectory simulation using HYSPLIT model until the yielded trajectory matches satellite observations. Global wind data from GDAS (Global Data Asimilation System) were used in HYSPLIT simulation. The methods were then applied to four cases of Mt. Merapi (November 5 and 10, 2010), Mt. Soputan (Juli 3, 2011), and Mt. Shinmoe-dake eruptions (Februari 3, 2011). The results are compared with volcanic ash map reported by Volcanic Ash Advisory Centre (VAAC) Darwin and the products of higher resolution Terra / Aqua Moderate Resolution Imaging Spectroradiometer (MODIS) satellite. Besides, information based on forecasting or observation regarding the existance of Cumulonimbus (Cb) cloud type is also essential for aviation safety. This kind of Cb information is provided in METAR weather report. In line with this, satellite data can be used complimently to detect Cb clouds in larger area and specific time, particularly during nighttime observation, using an automated Cb detection systems. In this study, we identify Cb type cloud by using the threshold and split window technique of MTSAT channels, and the percentage of Cb cloud amount and its growth rate are derived from detected Cb coverage area. These products will be useful to support daily operational of aeronautical meteorology services of BMKG. Keywords: volcanic ash identification, Cb cloud detection, MTSAT, split windows

Name:	Fuzhong Weng
Email:	Fuzhong.Weng@noaa.gov
Association / Organisation:	NOAA Center for Satellite Applications and Research
Role / Position:	Chief, Satellite Meteorology and Climatology Division
Type of presentation:	Presentation (talk)

Improving Hurricane/Typhoon Prediction through Assimilation of Suomi NPP Data in HWRF

The Advanced Technology of Microwave Sounder (ATMS) and the Cross-track Infrared Sounder (CrIS) on board Suomi National Polar-Orbiting Partnership (SNPP) satellite provide data for profiling atmospheric temperature and moisture under all weather conditions and supporting continuing advances in data assimilation and NWP modeling. As of today, both ATMS and CrIS radiances are well calibrated and the SDR data (or Level1B radiances) have reached a provisional level for user applications. However, in operational Hurricane Weather Research and Forecast Model (HWRF), the satellite radiances have not been directly assimilated. This study will present our research results from direct assimilation of satellite sounding radiances from NOAA, METOP and SNPP satellites in HWRF. The NCEP's Gridded Statistical Interpolation (GSI) scheme is configured for effective assimilation of upper-level satellite sounding channels from CrIS/IASI and ATMS/AMSU. The quality control and bias correction schemes in GSI are revisited and revised for optimal radiance assimilation. It is demonstrated that uses of ATMS and CrIS in HWRF improve the forecasts in track and intensity in 2012 and 2013 hurricane seasons.

Name:	Vinod Kumar
Email:	V.Kumar2@bom.gov.au
Association / Organisation:	Bureau of Meteorology
Role / Position:	Professional Officer
Type of presentation:	Poster

Evaluation of SSMIS Radiances for assimilation in ACCESS NWP System

Microwave radiances measured remotely by sensors onboard polar-orbiting satellites have the advantage of being less sensitive to clouds than infrared radiances and hence can be used to gather information on a wider range of atmospheric conditions, especially where cloud radiative effects are dominant. These instruments have therefore become an important component in operational NWP data assimilation (DA) systems. The Australian Bureau of Meteorology operationally assimilates microwave radiances from AMSU carried onboard NOAA-16, -18, -19, and Meteorological Operations (MetOp) platforms. Considering the proven advantage of using microwave radiances in DA, the Bureau is trying to augment the existing microwave observing systems used in its NWP suites with data from new platforms such as Special Sensor Microwave Imager/Sounder (SSMI/S) onboard the Defense Meteorological Satellite Program (DMSP) – F16 to F18 satellites. SSMIS offers capabilities associated with radiometer channels having common fields of view, uniform polarizations, and fixed spatial resolutions across the active scene scan sector, making it one of the most complex and unique operational satellite passive microwave imager/sounders flown. This enhanced capability makes SSMIS potentially an important data source for the Bureau's ACCESS NWP system. Further, since all satellites which currently carry AMSU are either over or are nearing their notional operational lifetime of five years, assimilation of SSMIS data will allow the Bureau to partly offset any information loss from the current observing systems due to instrument failure. The main objective of the present study is to assess the suitability of SSMIS data for active operational assimilation in the ACCESS NWP systems. Observation system experiments are undertaken in which SSMIS data from the DMSP-F16 satellite are added to the current operational observational inputs to ACCESS. A comparison of SSMIS with AMSU data has shown that the SSMIS data is very similar in quality to the AMSU data. The benefit of adding SSMIS is presented through an examination of the short-range forecast (background) fits to AMSU observations. The inclusion of SSMIS in a full operational system results in slightly improved forecast accuracy in the southern hemisphere. The impact is however neutral in the northern hemisphere.

Name:	Agnes Lane
Email:	a.lane@bom.gov.au
Association / Organisation:	Australian Bureau of Meteorology
Role / Position:	Group Leader User Requirements and Liaison
Type of presentation:	Presentation (talk)

Satellite User Requirements in WMO Region-V (South-West Pacific)

RA-V has established a Task Team on Satellite User Requirements (TT-SUR), to identify and document the needs for satellite observation data and derived products of RA-V members, in the areas of interest of WMO Programmes and Co-sponsored programmes. This presentation will describe the procedure for establishing regional requirements for satellite data and products, including details of the Task Team's preliminary findings.

Name:	Mitch Goldberg
Email:	Mitch.Goldberg@noaa.gov
Association / Organisation:	NOAA
Role / Position:	NOAA JPSS Chief Scientist
Type of presentation:	Presentation (talk)

JOINT POLAR SATELLITE SYSTEM'S OPERATIONAL AND RESEARCH APPLICATIONS

The Joint Polar Satellite System is NOAA's new operational satellite program and includes the Suomi National Polar-orbiting Partnership (NPP) as a bridge between NOAA's operational Polar Orbiting Environmental Satellite (POES) series, which began in 1978, and the first JPSS operational satellite scheduled for launch in 2017. JPSS provides critical data for key operational and research applications, and includes:

Weather forecasting – data from the JPSS Cross-track Infrared Sounder (CrIS) and the Advanced Technology Microwave Sounder (ATMS) are needed to forecast weather events out to 7 days. Nearly 85% of all data used in weather forecasting are from polar orbiting satellites.

Environmental monitoring – data from the JPSS Visible Infrared Imager Radiometer Suite (VIIRS) are used to monitor the environment including the health of coastal ecosystems, drought conditions, fire, smoke, dust, snow and ice, and the state of oceans, including sea surface temperature and ocean color.

Climate monitoring – data from JPSS instruments, including OMPS, CERES and TSIS will provide continuity to climate data records established using NOAA POES and NASA Earth Observing System (EOS) satellite observations. These data records provide a unified and coherent long-term observation of the environment; the records and products are critical to climate modelers, scientists, and decision makers concerned with advancing climate change understanding, prediction, mitigation and adaptation strategies, and policies.

To bridge the gap between products and applications, the JPSS Program has established a proving ground program to optimize the use of JPSS data with other data sources to improve key products and services. At the user conference, a number of operational and research applications will be discussed, including the use of CrIS and ATMS for improved weather forecasting, the use of VIIRS for environmental monitoring of sea ice, smoke, fire, floods, droughts, coastal water quality (e.g. harmful algal blooms), and OMPS for monitoring ozone and aerosol and sulfur dioxide.

Name:	Masanori OBAYASHI
Email:	m_obayashi@met.kishou.go.jp
Association / Organisation:	Japan Meteorological Agency
Role / Position:	Director, Satellite Prigram Division
Type of presentation:	Presentation (talk)

Status of Current and Future Satellite Programs of Japan Meteorological Agency

Currently, MTSAT-2 is operational in imaging over the East Asia and Western Pacific regions, and MTSAT-1R serves as its backup. The operation of MTSAT-2 has been extremely stable since its operation was started in July 2010, and it has been distributing HRIT imagery with 100% availability in the last 12 months. Utilizing the backup satellite, MTSAT-1R, JMA conducts rapid scan observations with 5-minute intervals around Japan in summer in the Northern hemisphere, to provide high-frequent cloud imagery to aviation users for their flight safety. As follow-on satellites of the MTSAT series, JMA plans to launch Himawari-8 in 2014 and commence its operation in 2015 to replace the current satellite, MTSAT-2. JMA also plans to launch Himawari-9 in 2016 as a backup and successor satellite. Himawari-8 and -9 will have ability to observe the Earth every 10 minutes with 16 channels. The special feature is that it has 3 visible channels corresponding to Red, Green and Blue, with which it will be possible to produce a true color image. Advanced Himawari Imager (AHI) for Himawari-8 was shipped to Japan in September 2013, and the final integration of Himawari-8 is on-going. Himawari-8 and -9 will not carry a device for direct dissemination. Instead, all imagery taken from the satellites will be distributed via the Internet. With a view to support users with a limited Internet access, JMA will distribute lighter imagery through the Internet. In addition, JMA will disseminate a limited set of imagery via a commercial telecommunication satellite. In this case, it will be needed to install new equipment for receiving the data from the commercial telecommunication satellite. JMA will be releasing detailed information on the equipment in spring next year.

Name:	James F.W. Purdom
Email:	jpurdom2001@yahoo.com
Association / Organisation:	WMO, Special Advisor to DOBS
Role / Position:	Special Advisor on Integrated Observing Systems
Type of presentation:	Presentation (talk)

Satellite Imagery and Sounding Data and Severe Thunderstorm development and Evolution

This presentation will address the development and evolution of intense and severe thunderstorms. A brief discussion of satellite data and severe weather will be discussed using selected examples. The question of overshooting thunderstorm tops, their structure and what they signify will be addressed. This will be followed by a look at why hyperspectral sounding from geostationary satellites is a critical component of for understanding thunderstorm intensity, its development and future evolution. Suggestions will be made concerning what research and product development should be underway with low Earth orbiting satellites' hyperspectral sounding data to help understand thunderstorm development and evolution and to prepare for the coming generation of geostationary imagers and hyperspectral sounders. If 30 minutes are available for this presentation it would be appreciated, but please no special effort.

Name:	Allen Huang
Email:	allenh@ssec.wisc.edu
Association / Organisation:	SSEC/CIMSS, UW-Madison
Role / Position:	Distinguished Scientist
Type of presentation:	Presentation (talk)

1. Status of Community Satellite Processing Package (CSPP) 2. Sounding and Tracking Observatory for Regional Meteorology (STORM) - The Unprecedented 4-D Weather Cube Capability

1. Working closely with the NOAA Suomi NPP/JPSS program, CIMSS/SSEC continues to expand International MODIS/AIRS Processing Package (INAPP) effort, and to facilitate the use of polar orbiter satellite data through the development of a newly conceived Community Satellite Processing Package (CSPP) to support the Suomi NPP and JPSS, and subsequently build up over time, to support GOES-R and other international polar orbiting and geostationary meteorological and environmental satellites for the global real time user community. This paper highlights more than 12 years of success of IMAPP as a pathway to the development of a freely available software package to transform VIIRS, CrIS, and ATMS (Raw Data Records) RDRs (i.e. Level 0) to Sensor Data Records (SDRs) (i.e. Level 1), and SDRs to Environmental Data Records (EDRs) (i.e. Level 2) in support of Suomi NPP and subsequently the JPSS missions under the CSPP framework. Summary will be given to report on the current software release and the initial experimental and operational use of SDR and EDR of VIIRS, CrIS and ATMS in National Weather Service (NWS) field offices' daily operation. 2. GeoMetWatch (GMW), a private US company and its partners, Advanced Weather Systems (AWS), and Space Science and Engineering Center (SSEC), are developing an advanced sensor dubbed, "Sounding & Tracking Observatory for Regional Meteorology (STORM)". STORM is a derivative of GIFTS which has more than 1000 hours of comprehensive testing. GMW is licensed to observe and deliver simultaneous imaging and sounding products. Each STORM sensor package is designed to make measurements in: • Pan Imaging band at 300m ground sample distance (GSD). • Visible/Near IR bands (0.5 - 3.5 micron) at 500m GSD. • Ultra-spectral IR Data (4.3-15.2 micron) with 0.6-2.5 cm-1 spectral resolution at 2km GSD, depending upon customer requirements. In this presentation, we will report the current progress, challenges, and opportunities of such aspiring project and to discuss the realization of the first of a global constellation of next-generation geostationary hyperspectral observatories to be deployed first in the Asia/Oceania area. Focus will be on the unprecedented 4 dimensional (4-D) weather observation capability for applications in natural disaster, aviation, and other weather sensitive core industries to Australia.

Name:	JO HYE YOUNG
Email:	jalnanwoni@naver.com
Association / Organisation:	Korea Aerospace Research Institute (KARI)
Role / Position:	Researcher
Type of presentation:	Presentation (talk)

Mission Planning for Two Years Normal Operation of COMS

Mission Planning for Two Years Normal Operation of COMS Hye-Young JO, Young-Min CHO, Bang-Yeop Kim Korea Aerospace Research Institute, Daejeon, Korea Communication Ocean Meteorological Satellite (COMS) is the Korea's first geostationary earth observation satellite which has three missions, meteorological observation, geostationary ocean color imaging and Ka-band communications. It has three different payloads to perform the missions, respectively. The COMS was successfully launched onto geostationary earth orbit on Jun 27, 2010 and it is currently under normal operation service since April 2011. The COMS is operated 24 hours a day 365 days a years. The COMS missions of the meteorological observation and the ocean imaging are performed by daily mission commands from the Satellite Ground Control System (SGCS) in the Satellite Operation Center (SOC) of the Korea Aerospace Research Institute (KARI). The mission planning for COMS normal operation is conducted by the Mission Planning Subsystem (MPS) which is a part of the SGCS. The COMS mission operations are classified into daily, weekly, monthly, and seasonal operation, which are planned by the MPS. The MPS performs everyday the mission planning of the COMS normal operation including the resolution for the conflicts among satellite missions such as the meteorological observation, the ocean monitoring and the satellite maneuver. In this paper, we describe the mission planning for COMS normal operation in terms of the ground station configuration and the characteristics of daily, weekly, monthly, and seasonal mission planning activities. The successful mission planning is confirmed with the result of the normal operation during the two years of the normal operation from April, 2011 to March, 2013.

Name:	JO HYE YOUNG
Email:	jalnanwoni@naver.com
Association / Organisation:	Korea Aerospace Research Institute (KARI)
Role / Position:	Researcher
Type of presentation:	Presentation (talk)

Mission Planning for Two Years Normal Operation of COMS

Mission Planning for Two Years Normal Operation of COMS Hye-Young JO, Young-Min CHO, Bang-Yeop Kim Korea Aerospace Research Institute, Daejeon, Korea Communication Ocean Meteorological Satellite (COMS) is the Korea's first geostationary earth observation satellite which has three missions, meteorological observation, geostationary ocean color imaging and Ka-band communications. It has three different payloads to perform the missions, respectively. The COMS was successfully launched onto geostationary earth orbit on Jun 27, 2010 and it is currently under normal operation service since April 2011. The COMS is operated 24 hours a day 365 days a years. The COMS missions of the meteorological observation and the ocean imaging are performed by daily mission commands from the Satellite Ground Control System (SGCS) in the Satellite Operation Center (SOC) of the Korea Aerospace Research Institute (KARI). The mission planning for COMS normal operation is conducted by the Mission Planning Subsystem (MPS) which is a part of the SGCS. The COMS mission operations are classified into daily, weekly, monthly, and seasonal operation, which are planned by the MPS. The MPS performs everyday the mission planning of the COMS normal operation including the resolution for the conflicts among satellite missions such as the meteorological observation, the ocean monitoring and the satellite maneuver. In this paper, we describe the mission planning for COMS normal operation in terms of the ground station configuration and the characteristics of daily, weekly, monthly, and seasonal mission planning activities. The successful mission planning is confirmed with the result of the normal operation during the two years of the normal operation from April, 2011 to March, 2013.

Name:	Helen Beggs
Email:	h.beggs@bom.gov.au
Association / Organisation:	Centre for Australian Weather and Climate Research, Bureau of Meteorology
Role / Position:	Ocean Remote Sensing Scientist
Type of presentation:	Presentation (talk)

A Study of Diurnal Warming in the Tropical Warm Pool using Sea Surface Temperature from Multiple Satellites

Helen Beggs[1], Sandra Castro[2], Leon Majewski[3], Gary Wick[4], Chris Merchant[5], Pierre Le Borgne[6], Christopher Griffin[1] and Chelle Gentemann[7]
[1]CAWCR, Bureau of Meteorology, Docklands, Vic 3008, Australia, h.beggs@bom.gov.au, c.griffin@bom.gov.au
[2]University of Colorado, Boulder, Colorado, USA, Sandra.Castro@colorado.edu
[3]Bureau of Meteorology, Docklands, Vic 3008, Australia, l.majewski@bom.gov.au
[4]NOAA/ESRL/PSD, Boulder, Colorado, USA, Gary.A.Wick@noaa.gov
[5]University of Edinburgh, Edinburgh, UK, c.merchant@edu.ac.uk
[6]CMS, Meteo-France, Lannion, France, Pierre.leborgne@meteo.fr
[7]Remote Sensing Systems, Santa Rosa, California, USA, gentemann@remss.com

Thermal stratification of the ocean surface layer is driven by net heat exchange between the ocean and atmosphere, turbulent mixing and absorption of insolation. Under most conditions there is net loss of heat from the ocean with the skin, or interfacial layer, being cooler than the water below. During the day, however, under calm winds and clear skies, a warm layer can develop in the top 5-10m of the surface. Diurnal warm layers have typical temperature differences relative to the body of water below on the order of 0.5-3K, but in some cases can reach values up to 7-8K. The Tropical Warm Pool (TWP), located in the western Pacific and eastern Indian Oceans, exhibits widespread occurrences of diurnal warming events of the sea surface temperature (SST), with some extreme events exceeding 5K over small spatial/time scales. It was therefore considered to be an ideal region for a coordinated study of diurnal warming observations and models, particularly with recent availability of accurate, hourly SST observations from the MTSAT-1R satellite, available through the Integrated Marine Observing System (IMOS).

A comprehensive dataset, the TWP+, has been compiled by the Bureau of Meteorology in collaboration with the Group for High Resolution SST (GHRSST: http://www.grhrsst.org), IMOS, Météo-France, University of Edinburgh and Remote Sensing Systems. The data set comprises SST observations from buoys, ships and eight satellites, and high-resolution model forecasts of ocean/atmospheric parameters at the ocean surface over the region 25°S to 15°N, 90°E to 170°E for the period 1 January to 30 April 2010. The data are used to quantify diurnal warming events and test diurnal variation models as part of the GHRSST Tropical Warm Pool Diurnal Variability (TWP+) Project (https://www.ghrsst.org/ghrsst-science/science-team-groups/dv-wg/twp/).

The paper will describe the GHRSST TWP+ Project and data set, including SST data from the MTSAT-1R, NOAA-18, NOAA-19, METOP-A, Aqua and Coriolis satellites and their use to quantify the amplitude, frequency and spatial coverage of diurnal warming events over the TWP+ domain.

Name:	Ruixia Liu
Email:	liurx@cma.gov.cn
Association / Organisation:	China Meteorological Administration
Role / Position:	association researcher
Type of presentation:	Presentation (talk)

The Use of FengYun Satellite data in short-range Precipitation forecasting in China

NWP Model is the main tool of weather prediction. How good the prediction of NWP model depends not only on the model's ability but also to a great extent on accuracy of an initial field of the forecast. Initial conditions for numerical weather predictions is produced by data analysis and assimilation system which can ingest data from various atmospheric observation systems. If mesoscale high moisture field in initial field of NWP model cannot be reflected correctly, it will result in bias between forecast and real observation, and result in the Spin-Up problem of model which is the time taken for an NWP model to reach a state of statistical equilibrium under the applied forcing. By solving the spin-up problem, short-range forecasting can be improved, thereby improving hazardous weather warnings. The motivation for this research is to mitigate the Spin-Up problem by providing better initial conditions using satellite data and estimate the impact of satellite data in precipitation forecast. Satellite observations play a growing role in many aspects of the work of weather forecast. In this paper, we assimilated FengYun satellite data into LAPS (The Local Analysis and Prediction System) model which is developed by NOAA ESRL. The analyzed 3D cloud parameter by LAPS was used to initialize GRAPES model to predict precipitation in 2008 in China. Three prediction experiments have been carried out including “cold start”, “Hassat” and “Hasnosat” and estimated the impact of satellite data on precipitation forecast. The results indicate that FengYun Satellite data can improve the 1-6h precipitation forecast and eliminate the Spin-Up problem in the first 6h to some extent.

Name:	FANG Xiang
Email:	fangxiang@cma.gov.cn
Association / Organisation:	National Satellite Meteorological Center, CMA
Role / Position:	Senior Research Enginner
Type of presentation:	Presentation (talk)

Introduction of Meteorological Satellite Remote Sensing Application Platform

With the development of FY-2 Geostationary meteorological satellite series and FY-3 polar orbit satellite series, It is important to provide professional application tools for users. Currently, NSMC/CMA develops meteorological satellite remote sensing application system, which comprises SWAP(Satellite Weather Application Platform) and SMART(Satellite Monitoring Analysis Remote-sensing Toolkit). SWAP is one part of Ground Application System of FY-2 Satellite. It provides the weather forecasters a highly efficient, interactive tool for displaying and analyzing cloud image. It provides users several function modules, such as automatic data downloading and processing, image display and image animation, overlay of multiple meteorological data, monitoring and analysis of tropical cyclone and severe convection, supporting the regional observation of FY-2F, and thematic image generation, etc. The module of tropical cyclone consists of location and relocation, interactive drawing of typhoon spire, automatic fitting of spire, extraction of the dark area of vapor channel, extraction of regional character and extrapolation of typhoon route. The module of severe convection monitoring can detect and track convection clouds automatically. SMART is a comprehensive application platform of FY-3 and other polar orbiting meteorological satellite data. It mainly focus on remote sensing application of disaster and environment. This platform includes three subsystems, Application Supporting System, Monitoring & Analysis System and Product Dissemination System. Application Supporting System is responsible for management of automatic procedures running on server, management of process such as obtaining external data, monitoring the mediate data, managing the final output and configuration of operational environment of sever etc. Monitoring and analysis System is the core of SMART. It provides several functions: Multi-source data display, Remote sensing image processing, Information extraction and classification, GIS and remote sensing combination, thematic product generation and Statistical analysis etc. Product Dissemination System accomplishes following tasks: real-time or near real-time distribution of the products generated by Monitoring and Analysis System and On-line service for public and government. Based on these two platforms, the abilities of remote sensing application in NSMC will be promoted significantly.

Name:	Ruixia Liu
Email:	liurx@cma.gov.cn
Association / Organisation:	China Meteorological Administration
Role / Position:	association researcher
Type of presentation:	Presentation (talk)

The Use of FengYun Satellite data in short-range Precipitation forecasting in China

NWP Model is the main tool of weather prediction. How good the prediction of NWP model depends not only on the model's ability but also to a great extent on accuracy of an initial field of the forecast. Initial conditions for numerical weather predictions is produced by data analysis and assimilation system which can ingest data from various atmospheric observation systems. If mesoscale high moisture field in initial field of NWP model cannot be reflected correctly, it will result in bias between forecast and real observation, and result in the Spin-Up problem of model which is the time taken for an NWP model to reach a state of statistical equilibrium under the applied forcing. By solving the spin-up problem, short-range forecasting can be improved, thereby improving hazardous weather warnings. The motivation for this research is to mitigate the Spin-Up problem by providing better initial conditions using satellite data and estimate the impact of satellite data in precipitation forecast. Satellite observations play a growing role in many aspects of the work of weather forecast. In this paper, we assimilated FengYun satellite data into LAPS (The Local Analysis and Prediction System) model which is developed by NOAA ESRL. The analyzed 3D cloud parameter by LAPS was used to initialize GRAPES model to predict precipitation in 2008 in China. Three prediction experiments have been carried out including “cold start”, “Hassat” and “Hasnosat” and estimated the impact of satellite data on precipitation forecast. The results indicate that FengYun Satellite data can improve the 1-6h precipitation forecast and eliminate the Spin-Up problem in the first 6h to some extent.

Name:	LIU Jian
Email:	liujian@cma.gov.cn
Association / Organisation:	National Satellite Meteorological Center, CMA
Role / Position:	professor,
Type of presentation:	Presentation (talk)

Progress on FengYun Satellite Data Sharing and Service

Progress on FengYun Satellite Data Sharing and Service LIU Jian and QIAN Jianmei Xiandi Xuzhe National Satellite Meteorological Center, CMA, Beijing, China The paper mainly introduces some information about FENGYUN series satellite data resource and the way hot to get FENGYUN satellite data. The first polar orbit FENGYUN satellite (FY1-A) was launched in 1988 and the first geostationary FENGYUN satellite (FY2-A) was launched in 1997. Now, there are 7 operational satellites, including three polar orbit satellites and four geostationary satellites. FENGYUN -3C will be launched in September. Users can get FENGYUN satellite data though many ways. NSMC became WMO/ DCPC in 2012. Users can search 34 kinds of satellite products, including FY-2 and FY-3 data on the DCPC web site. CMACast is an important way to get FENGYUN satellite data. It is maintained by the National Meteorological Information Centre and works as a major component of CMA's national meteorological data dissemination system.CMACast is also a major component of WMO IGDDS and GEONETCast systems. FENGYUNCast was integrated into GEONETCast in 2007 and has been operating as a Regional GEONETCast Network Centre (GNC) since then. CMACast has replaced FENGYUNCast as China's contribution to GEONETCast. With enlarged bandwidth, improved user and data management mechanisms and enriched data contents, CMACast has achieved the ability to offer all services within the framework of GEONETCast and will provide much better services to users in Asia Pacific Region. Through CMACast, users can get many kinds of FY-2 satellite data, such as FY-2 images, sand storm morning image, precipitation estimation, total cloud amount, radiation, sea surface temperature, snow cover, cloud classification. Some FY-3 payloads' level 2 and level 3 data, such as VIRR、MULSS、MERSI、VASS、IRAS、MWHS、ERBM、TOU also are broadcasted by CMACast. Web service is another way to get satellite data. FENGYUN satellite data service network page (http://satellite.cma.gov.cn) has online operation for many years. The number of registered user is about 30000. The satellite service web can provide24 kinds of satellite data covered FY, NOAA, EOS, GOES and MTSAT. Until now, the shared data amount is 2.8PB. With the development of satellite, so many kinds of product are produced and more and more users use satellites. All these put forward higher requirement on the sharing ability of satellite data. FENGYUN satellite data web use advanced archived technology to extend the FENGYUN satellite dataonline preservation to carry out convenient and efficient data service.

Name:	Qiang Guo
Email:	guoqiang@cma.gov.cn
Association / Organisation:	National Satellite Meteorological Center, China Meteorological Administration
Role / Position:	Professor
Type of presentation:	Presentation (talk)

FY-2 On-orbit Operational Calibration Approach (CIBLE) and its Applications in FY-2D/E/F Satellites

Before 2012, the on-orbit operational calibration methods of FY-2 satellites were dominated by cross-calibration with the wide-band sensors AVHRR/HIRS or the high spectral resolution ones IASI/AIRS recommended by GISCS. During the last several years, the self-developed calibration of inner blackbody corrected by lunar emission (CIBLE) has been established and operationally working in FY-2F/E/D satellites in Jul.21, 2012, Mar.27, 2013 and May 21, 2013, respectively. The two kernels of CIBLE include lunar calibration and inner blackbody calibration. It is indicated that, the difficult problem of how to precisely calibrate the radiometric response varying frequently with the environmental thermal field for infrared bands for FY-2 satellite has been solved by CIBLE, which has been considered as the most important technical breakthrough in calibration society for geostationary meteorological satellite in China. Compared with the synchronous observations of MTSAT-2 in the cold temperature region of below 230K, the calibration biases of CIBLE for FY-2D/E/F satellites have been convinced to be about 1-2K@220K. The real-time CIBLE results could be achieved in both the NOM files through website and the S-VISSR date stream with only 2 minutes delay from the beginning of observation. By using the latest CIBLE outcomes, the performances of some typical quantitative products, i.e. AMV, OLR and CLC have also been greatly improved. Particularly, it is validated by ECMWF that the RMSE of WV-AMV for FY-2E satellite remains 4-5 m/s and the bias of IR-AMV for FY-2D satellite has been decreased by about 1.5 m/s after using CIBLE approaches.

Name:	Qiang Guo
Email:	guoqiang@cma.gov.cn
Association / Organisation:	National Satellite Meteorological Center, China Meteorological Administration
Role / Position:	Professor
Type of presentation:	Presentation (talk)

FY-2 On-orbit Operational Calibration Approach (CIBLE) and its Applications in FY-2D/E/F Satellites

Before 2012, the on-orbit operational calibration methods of FY-2 satellites were dominated by cross-calibration with the wide-band sensors AVHRR/HIRS or the high spectral resolution ones IASI/AIRS recommended by GISCS. During the last several years, the self-developed calibration of inner blackbody corrected by lunar emission (CIBLE) has been established and operationally working in FY-2F/E/D satellites in Jul.21, 2012, Mar.27, 2013 and May 21, 2013, respectively. The two kernels of CIBLE include lunar calibration and inner blackbody calibration. It is indicated that, the difficult problem of how to precisely calibrate the radiometric response varying frequently with the environmental thermal field for infrared bands for FY-2 satellite has been solved by CIBLE, which has been considered as the most important technical breakthrough in calibration society for geostationary meteorological satellite in China. Compared with the synchronous observations of MTSAT-2 in the cold temperature region of below 230K, the calibration biases of CIBLE for FY-2D/E/F satellites have been convinced to be about 1-2K@220K. The real-time CIBLE results could be achieved in both the NOM files through website and the S-VISSR date stream with only 2 minutes delay from the beginning of observation. By using the latest CIBLE outcomes, the performances of some typical quantitative products, i.e. AMV, OLR and CLC have also been greatly improved. Particularly, it is validated by ECMWF that the RMSE of WV-AMV for FY-2E satellite remains 4-5 m/s and the bias of IR-AMV for FY-2D satellite has been decreased by about 1.5 m/s after using CIBLE approaches.

Name:	Qiang Guo
Email:	guoqiang@cma.gov.cn
Association / Organisation:	National Satellite Meteorological Center, China Meteorological Administration
Role / Position:	Professor
Type of presentation:	Presentation (talk)

FY-2 On-orbit Operational Calibration Approach (CIBLE) and its Applications in FY-2D/E/F Satellites

Before 2012, the on-orbit operational calibration methods of FY-2 satellites were dominated by cross-calibration with the wide-band sensors AVHRR/HIRS or the high spectral resolution ones IASI/AIRS recommended by GISCS. During the last several years, the self-developed calibration of inner blackbody corrected by lunar emission (CIBLE) has been established and operationally working in FY-2F/E/D satellites in Jul.21, 2012, Mar.27, 2013 and May 21, 2013, respectively. The two kernels of CIBLE include lunar calibration and inner blackbody calibration. It is indicated that, the difficult problem of how to precisely calibrate the radiometric response varying frequently with the environmental thermal field for infrared bands for FY-2 satellite has been solved by CIBLE, which has been considered as the most important technical breakthrough in calibration society for geostationary meteorological satellite in China. Compared with the synchronous observations of MTSAT-2 in the cold temperature region of below 230K, the calibration biases of CIBLE for FY-2D/E/F satellites have been convinced to be about 1-2K@220K. The real-time CIBLE results could be achieved in both the NOM files through website and the S-VISSR date stream with only 2 minutes delay from the beginning of observation. By using the latest CIBLE outcomes, the performances of some typical quantitative products, i.e. AMV, OLR and CLC have also been greatly improved. Particularly, it is validated by ECMWF that the RMSE of WV-AMV for FY-2E satellite remains 4-5 m/s and the bias of IR-AMV for FY-2D satellite has been decreased by about 1.5 m/s after using CIBLE approaches.

Name:	Qiang Guo
Email:	guoqiang@cma.gov.cn
Association / Organisation:	National Satellite Meteorological Center, China Meteorological Administration
Role / Position:	Professor
Type of presentation:	Presentation (talk)

FY-2 On-orbit Operational Calibration Approach (CIBLE) and its Applications in FY-2D/E/F Satellites

Before 2012, the on-orbit operational calibration methods of FY-2 satellites were dominated by cross-calibration with the wide-band sensors AVHRR/HIRS or the high spectral resolution ones IASI/AIRS recommended by GISCS. During the last several years, the self-developed calibration of inner blackbody corrected by lunar emission (CIBLE) has been established and operationally working in FY-2F/E/D satellites in Jul.21, 2012, Mar.27, 2013 and May 21, 2013, respectively. The two kernels of CIBLE include lunar calibration and inner blackbody calibration. It is indicated that, the difficult problem of how to precisely calibrate the radiometric response varying frequently with the environmental thermal field for infrared bands for FY-2 satellite has been solved by CIBLE, which has been considered as the most important technical breakthrough in calibration society for geostationary meteorological satellite in China. Compared with the synchronous observations of MTSAT-2 in the cold temperature region of below 230K, the calibration biases of CIBLE for FY-2D/E/F satellites have been convinced to be about 1-2K@220K. The real-time CIBLE results could be achieved in both the NOM files through website and the S-VISSR date stream with only 2 minutes delay from the beginning of observation. By using the latest CIBLE outcomes, the performances of some typical quantitative products, i.e. AMV, OLR and CLC have also been greatly improved. Particularly, it is validated by ECMWF that the RMSE of WV-AMV for FY-2E satellite remains 4-5 m/s and the bias of IR-AMV for FY-2D satellite has been decreased by about 1.5 m/s after using CIBLE approaches.

Name:	SUMAN GOYAL
Email:	suman_goyal61@yahoo.co.in
Association / Organisation:	India Meteorological Depaertment, New Delhi, India
Role / Position:	Scientist-E
Type of presentation:	Presentation (talk)

(1) Application of satellite data for monitoring and prediction of severe weather systems in Indian region. (2) Mesoscale Convective Systems in association with Tropical Cyclone over Bay of Bengal

(1)Indian region experiences a number of severe weather phenomenon including tropical cyclones, thunderstorms, heavy rain/snowfall and fog etc. The eastern and northeastern part of India gets affected by severe thunderstorms during pre-monsoon months (April-May). These thunderstorms are locally named as "Kalbaishakhi" which means killing hazard in the month of Baishakh (April). These severe thunderstorms associated with thunder, squall lines, lightening and hail cause extensive losses to life and property. The casualty due to lightening associated with thunderstorms in this region is the highest in the world. In India 72% of tornadoes are associated with the above thunderstorms. Another severe weather event over India is tropical cyclone which affects coastal India mainly eastern coast. Though the frequency of tropical cyclones over north Indian Ocean is less as compared to other ocean basin, the impact of the cyclones in term of loss of life & property is quite significant. Hence, early warning of these disturbances with improved monitoring & predictions plays major role to mitigate the disaster. Extreme north India is affected in winter season during passage of western disturbances causing snowfall over the region and dense fog over northern plains Various applications of satellite data and products are presented here with for effective monitoring and nowcasting of above mentioned meteorological hazards. The primary tools for detecting thunderstorms are weather radar and satellite imagery. Since radar network in India is not enough to monitor the thunderstorms half hourly satellite images are used for monitoring and nowcasting of thunderstorms. North Indian Ocean is a data sparse region with limited buoy and ship data and without the facility of aircraft reconnaissance, unlike other Ocean basins. So remotely sensed observation & products through satellite plays a major role in monitoring and predicting genesis, intensification & movement of cyclonic disturbances over North Indian Ocean. Day time fog is monitored by using visible images obtained from geostationary satellite kalpana-1, however to monitor night time fog products from polar orbiting satellites NOAA Metop are used. In the absences of adequate number of meteorological observatories basic satellite imageries and products are available to forecasters. Satellite data are assimilated in various NWP models like Wind, Radiance etc. Assimilation of satellite data are helpful in (a) Bogussing (b) Initial error (c) Track and Intensity forecast As a future plan data and products of INSAT 3D will be utilized as and when they will be available for operational use. (2)North Indian Ocean is prone to tropical cyclone (TC) in the month of April – June and October – December. Nearly 5 -6 TCs form over this region out of which only 2 -3 develops into severe TC. It is well known that a mature TC has a nearly axisymmetric structure. The early stages of a TC are extremely complex and their understanding presents a challenge to researchers worldwide. Better understanding of the role, mesoscale convective systems (MCS) in the formative stage of TC will increase the ability to predict their characteristic including intensification and movement. Objective of the study is to analysis the interaction of multiple mesoscale structures during different stages of TC. In this study kalpana-1 half hourly satellite infrared (IR) imageries are used to observe the interaction between MCSs and their environment. Average areas of mesoscale convective systems (MCS) are calculated for different cloud top

temperatures (CTTs) region i.e. -30. -40, -50, -60, -70 °C and also for different stages of TC based on 5 numbers of TCs covering almost all months favorable for cyclogenesis. Result indicate that merger of mesoscale convective vortices is a common precursor event during TC genesis and hence the evolution of mesoscale vortices in association with cyclonic vortex can be used to predict cyclogenesis.

Name:	feng lu
Email:	lufeng@cma.gov.cn
Association / Organisation:	National Satellite Meteorological Center,CMA
Role / Position:	Deputy director of Office of System Development(OSD)
Type of presentation:	Presentation (talk)

Toward a seamless transition of FY-4

Chinese next generational geostationary meteorological satellite FY-4A will be launched on 2015, The major payload onboard the FY-4A are AGRI(advanced geo, radiation imager),GIIRS(Geo. interferometric Infrared sounder) , LMI(Lighting mapping Imager) and SEMS(space environment monitor suit),in this paper ,the transition plane from FY-2 to FY-4 will be presented. The specifications of FY-4 major payload, the satellite observation mode, current and planned FY-4 data products will be described.

Name:	YANG Jun
Email:	junyang@cma.gov.cn
Association / Organisation:	National Satellite Meteorological Center
Role / Position:	Director-General
Type of presentation:	Presentation (talk)

Updates on CMA Satellite Program

The FY-3 is the second-generation polar-orbiting meteorological satellites of China. There are 11 instruments mounted on the board including the Visible and Infrared Radiometer (VIRR), Infrared Atmospheric Sounder (IRAS), Microwave Temperature Sounder (MWTS), Microwave Humidity Sounder (MWHS), Medium Resolution Spectral Imager (MERSI), Microwave Radiation Imager (MWRI), Solar Backscatter Ultraviolet Sounder (SBUS), Total Ozone Unit (TOU), Earth Radiation Measurement (ERM), Solar Irradiance Monitor (SIM), and the Space Environment Monitor (SEM). These 11 instruments are working together to perform global, three-dimensional, quantitative, and multi-spectral observations under all weather conditions. The first two satellites in the FY-3 series, i.e., FY-3A and FY-3B have been launched successfully on May 27, 2008 and Nov 5, 2010 respectively. FY-3A is on a morning-orbit and FY-3B is on an afternoon-orbit. As a satellite constellation, FY-3A and FY-3B comprehensively improved meteorological observations in spectral wavelength, spatial coverage and temporal frequency.

The status of current FY-2 geostationary programme will be reported. The programme has produced 6 satellites FY-2A/B/C/D/E/F capable of S-VISSR imagery observation. Currently FY-2D and FY-2E are operationally active, which are positioned at 86.5E and 105.0E respectively, two satellites alternatively observe to transmit image every 15 minutes during rainy season from June-September, and every 30 minutes from October-May. The FY-2F, the latest one of FY-2 series, was located on 112E provide rapid scan service every 6 minutes for severe weather and typhoon monitoring. To keep the operational continuity, an extended plan with three identical satellites has been approved. The next generation of Chinese geostationary satellite FY-4 will be also discussed. The first experimental satellite FY-4A is expected to be launched in 2015, which will carry a 14 channel radiation imager, an interferometric infrared sounder, a lightning imager and space weather monitoring package

Name:	LU Qifeng
Email:	luqf@cma.gov.cn
Association / Organisation:	National Satellite Meteorological Center
Role / Position:	Reseacher
Type of presentation:	Presentation (talk)

Monitoring the Data Quality and Stability of the FY-3 Sounders and Microwave Imager

FY-3A and FY-3B, launched in May 2008 and Nov 2010, are the first two in a series of seven polar orbiting meteorological satellites due to be launched by China's Meteorological Administration in the period leading up to 2020. The FY-3A/B payload includes four instruments of particular interest for numerical weather prediction (NWP): microwave temperature and humidity sounders, a microwave imager, and an infrared sounder. The data quality and data stability were initially monitored and accessed by the standard deviation of first guess departure and its time series, through NWP fields from three centers of ERA-Interim, NCEP and CMA/T639. An analysis of first-guess departures has shown the data to be of good quality and good stability overall. These initial results are encouraging and build confidence that the following series of FY-3 instruments will be widely used in NWP data assimilation systems. The work also has witnessed the power of operational NWP systems as tools for diagnose a wide range of instrument and ground segment performance issues and resulted in an improved understanding, in a NWP context, of the characteristics of the FY-3 sounders (IRAS, MWTS and MWHS) and microwave imager (MWRI).

Name:	Teruyuki Nakajima
Email:	teruyuki.nakajima@aori.u-tokyo.ac.jp
Association / Organisation:	Atmosphere and Ocean Research Institute (AORI), University of Tokyo
Role / Position:	Professor
Type of presentation:	Presentation (talk)

Derivation of atmospheric aerosol and cloud parameters from the satellite sensors on board Himawari 8-9, GCOM-C, EarthCARE, and GOSAT2 satellites

There are various important future satellite projects for improved aerosol remote sensing. I like to discuss prospects and strategies for utilizing sensors on board Himawari-8 and -9 (launch year of 2014, 2016), GCOM-C (2016), EarthCARE (2016), and GOSAT-2 (2018) satellites. Advanced Himawari Imager (AHI) of Himawari-8 and -9 has 16 channels with 500m to 2km FOV on geostationary orbit. Their global coverage by every 10 minutes is useful for monitoring volcanic plume, forest fire smoke and air pollution plume. JMA has a plan to develop standard products of Asian mineral dust and volcanic plumes. The Second generation GLobal Imager (SGLI) on board the GCOM/C polar orbiter will be equipped with 19 channels (two are polarized multi-angle channels) and 250m to 1km FOV. The EarthCARE satellite will carry cloud profiling radar (CPR), near ultra-violet high resolution wavelength lidar (ATLID), multi spectral imager (MSI) with seven wavelengths and 500m FOV), and broad-band radiometer (BBR). This package was designed for accurate earth radiation budget observation less than 10 Wm-2. Lidar and imager combination makes it possible to construct a 3D atmospheric field, by which aerosol and cloud radiative forcings are accurately evaluated. Recent studies show that the large uncertainties in the aerosol radiative forcing estimates are caused by large uncertainties in global observation and modeling of aerosol and cloud vertical stratifications as well as those in the aerosol optical properties. Platform design of the GOSAT-2 satellite just started. Analysis of data from the GOSAT-1 satellite showed that an accurate correction of the optical path length increased by aerosols is one of major problems for improving the column CO2 loading retrieval better than 1%. One strategy is to utilize multi-wavelength information in satellite-received radiances from near ultraviolet to thermal infrared spectral regions. This overview clearly shows that the new era of the next generation satellites needs clever and comprehensive strategy of algorithm development for accurate aerosol and cloud remote sensing. Coupled algorithms of active and passive sensors, multi-pixel, multi-sensor, and polarization algorithms, combined use of satellite observation and atmospheric modeling are among those promising algorithms. I like to discuss some of these new algorithms.

Name:	Yuriy Kuleshov
Email:	y.kuleshov@bom.gov.au
Association / Organisation:	Australian Bureau of Meteorology
Role / Position:	Theme Leader
Type of presentation:	Presentation (talk)

A Climatology of Lightning Activity in Australia Derived from Satellite Remote Sensing Observations

Andrew Dowdy, The Centre for Australian Weather and Climate Research (CAWCR), Australian Bureau of Meteorology, Melbourne, Australia. Email: a.dowdy@bom.gov.au, phone: +613 9669 4722. Yuriy Kuleshov, National Climate Centre, Australian Bureau of Meteorology, Melbourne, Australia. Email: y.kuleshov@bom.gov.au, phone: +613 9669 4896. Abstract Lightning activity throughout Australia is investigated using a range of different data sets. A climatology of lightning occurrence is examined for the period 1995 to 2010 based on lightning data obtained by two satellite instruments - Lightning Imaging Sensor and Optical Transient Detector. As the satellite instruments detect total lightning flashes (i.e. both cloud and ground flashes), data from ground-based lightning flash counters are used to scale the satellite data to obtain ground flash densities and to verify them for individual locations. A climatological map of lightning ground flash density is produced, covering the Australian region, representing the most comprehensive map of its sort to date. The period of data used here is twice as long as available for previous studies of ground flash densities in this region. For the first time, we present (i) maps detailing the seasonal variability of the ground flash densities and (ii) examinations for the maritime regions surrounding the Australian continent. A notable feature of the climatology is that the maximum ground flash density during the cooler months occurs over the ocean to the east of the continent, potentially related to a local maxima in extratropical cyclone occurrence in this region. Results of this study are discussed in relation to hazards associated with lightning occurrence.

Name:	Yuriy Kuleshov
Email:	y.kuleshov@bom.gov.au
Association / Organisation:	Australian Bureau of Meteorology
Role / Position:	Theme Leader
Type of presentation:	Presentation (talk)

A new satellite-era tropical cyclone best track dataset and an enhanced data portal for the Southern Hemisphere and the western North Pacific Ocean

A new satellite-era tropical cyclone best track dataset and an enhanced data portal for the Southern Hemisphere and the western North Pacific Ocean Yuriy Kuleshov1, Roald de Wit1 , Terry Atalifo2, Bipendra Prakash2, Alipate Waqaicelua2, Masashi Kunitsugu3, Philippe Caroff4, Fabrice Chane-Ming5 1National Climate Centre, Bureau of Meteorology, Melbourne, Australia 2Fiji Meteorological Service, RSMC Nadi, Fiji 3National Typhoon Center, Japan Meteorological Agency, RSMC Tokyo, Japan 4Meteo-France, RSMC la Réunion, Ile de la Réunion, France 5Laboratoire de l'Atmosphère et des Cyclones, Université de la Réunion - Faculté des Sciences, Ile de la Réunion, France The Pacific Australia Climate Change Science and Adaptation Planning (PACCSAP) program is dedicated to help Pacific Island countries and Timor Leste gain a better understanding of how climate change will impact their regions. One of the key PACCSAP projects is focused on developing a tropical cyclone archive, climatology and seasonal prediction for the regions. As part of the project, historical tropical cyclone archive has been examined and a revised satellite-era best track dataset has been prepared. Data from the Regional Specialised Meteorological Centre (RSMC) Nadi, Fiji and Tropical Cyclone Warning Centres (TCWCs) in Brisbane, Darwin and Wellington for 1969-1970 to 2010-2011 tropical cyclone seasons have been carefully examined. Errors and inconsistencies which have been found during the quality control procedure have been corrected. To produce a consolidated data set for the South Pacific Ocean, best track data from these four centres have been used. In addition, tropical cyclone best track data for the western North Pacific Ocean for 1977-2011 seasons prepared at RSMC Tokyo and for the South Indian Ocean for 1969-2011 prepared at RSMC la Réunion and TCWC Perth have been added to the dataset. As a result, new design of the Southern Hemisphere/Pacific Tropical Cyclone Data Portal (http://www.bom.gov.au/cyclone/history/tracks/) incorporates best track data for the Western Pacific both south and north of the equator and for the South Indian Ocean. The portal has been developed using the OpenLayers web mapping library. Main features of the portal include dynamic map navigation, presenting detailed cyclone information for a selected region in the Southern Hemisphere and western North Pacific Ocean and displaying changes in tropical cyclone intensity over the lifetime of a cyclone. One of the unique features of the portal is its enhanced functionality for spatial and temporal selection for cyclones in selected areas.

Name:	Prof. John Le Marshall
Email:	j.lemarshall@bom.gov.au
Association / Organisation:	Bureau of Meteorology
Role / Position:	Research Program Leader
Type of presentation:	Presentation (talk)

An Analysis of The Benefit Of Earth Observations From Space On Australian And Global Numerical Weather Prediction.

An Analysis of The Benefit Of Earth Observations From Space On Australian And Global Numerical Weather Prediction. John Le Marshall(1,3), Jin Lee(1), Paul Gregory(1) Jim Jung(2), Robert Norman(3), and Rolf Seecamp(1). (1) Bureau of Meteorology, Australia, (2) Joint Center for Satellite Data Assimilation, USA, (3) RMIT University, Melbourne, Australia Earth observations from space (EOS), taken by advanced instruments on current and future satellite missions will increasingly provide large volumes of data related to Earth System State. Key benefits from assimilating these EOS, particularly from an Australian Region and southern hemisphere perspective have been documented. The benefits described are in relation to synoptic scale and severe weather forecasts. Instruments providing these benefits include the Atmospheric Infrared Sounder, those carried by the COSMIC Constellation and the GOES and MTSAT imager. Examples of the beneficial impact of these data are provided. Recent examples are Observing System Experiments, based on the application of these data to the operational forecast systems at NCEP and at the Australian Bureau of Meteorology. It is found in an era where populations are increasing in areas subjected to severe weather and while extreme weather events remain a considerable problem, that EOS significantly extend the life of numerical forecasts. For example in a study using both the NCEP and Australian operational forecast systems the life of a high quality numerical forecast is extended by a factor of four over the southern hemisphere by using EOS. The examples shown in this study underline the great importance and great benefit of EOS for those in both the southern and the northern hemisphere. It also underlines future improvements in the exploitation of EOS which will further enhance their benefit to NWP.

Name:	W. Paul Menzel
Email:	paulm@ssec.wisc.edu
Association / Organisation:	University of Wisconsin
Role / Position:	Senior Scientist
Type of presentation:	Presentation (talk)

Applications of uniform space-time gridding method for comparisons of satellite radiances and derived products

To overcome the complexities associated with combining or comparing multi-sensor data, a statistical gridding algorithm has been developed for projecting data from their unique instrument domain to a uniform space–time domain. The algorithm has two components: 1) a spatial gridding phase in which geophysical properties are filtered on the basis of a set of criteria (e.g., time of day or viewing angle) and then aggregated into nearest neighbor clusters as defined by equal-angle grid cells and 2) a temporal gridding phase in which daily statistics are calculated per grid cell from which longer time-aggregate statistics are derived. The sensitivity of the gridding algorithm is demonstrated using a month of level 1 Visible Infrared Imaging Radiometer Suite (VIIRS) and Cross track Infrared Sounder (CrIS) radiances as an example. Algorithm sensitivity is tested for grid size, number of days in the definition of a time average, viewing angle, and minimum number of observations per grid cell per day. This gridding algorithm greatly facilitates the intercomparison of satellite derived products as well. Its simplicity lends transparency to understanding the behavior of a given parameter and makes it useful for both research and operational use.

Name:	Yoshiaki HONDA
Email:	yhonda@mtf.biglobe.ne.jp
Association / Organisation:	Center of Environmental Remote Sensing, Chiba University
Role / Position:	Associate professor
Type of presentation:	Presentation (talk)

Study on possibility of vegetation biomss analysis using meteorological satellite

In this paper, we introduce a Biomass (AGB) algorithm using BRF of forest canopy and the ground observation method developed by using Unmanned Aerial Vehicle (UAV) in order to contribute the algorithm development and its validation. Mainly, multi-angular spectral observation method and simple BRF model have been developed for estimating slant view response of forest canopy. The BRF model developed by using multi-angular measurement has been able to obtain structural information from vegetation canopy. In addition, we have conducted some observation campaigns on typical forest in Japan in collaboration with other science team experienced with vegetation phenology and carbon flux measurement. Primary results of these observations are also be demonstrated.

Name:	STEVEN J. GOODMAN
Email:	steven.j.goodman@noaa.gov
Association / Organisation:	NOAA/NESDIS
Role / Position:	SENIOR SCIENTIST FOR THE GOES-R PROGRAM
Type of presentation:	Presentation (talk)

The GOES-R Proving Ground: Accelerating User Readiness for the Next Generation of Geostationary Operational Satellites

GOES-R, Himawari 8/9, and Meteosat Third Generation (MTG) will produce a great leap forward in observing system capabilities, while at the same time providing a significant challenge to ensure that the users are ready to exploit the vast improvements in spatial, spectral and temporal resolutions. In order to ensure user readiness, forecasters and other users must have access to prototype advanced products well before launch, and have the opportunity to provide feedback to product developers to ensure that the end products truly meet their needs.

The GOES-R Proving Ground engages the National Weather Service (NWS) forecast and warning communities, and other U.S. and international users in pre-operational demonstrations of select products with GOES-R spectral, spatial, radiometric, and temporal sampling attributes. In the PG, developers and forecasters test and apply algorithms for new GOES-R satellite data and products using proxy data sets from numerous satellites (TERRA, AQUA, GOES, MSG, Suomi-NPP, and TRMM), ground-based measurements, and computer simulated products.

User education, outreach and training are critical components of user readiness. The Proving Ground is both a recipient and a source of education and training. Training material is developed to prepare the participants conducting evaluations at the NOAA Testbeds, e.g., the Hazardous Weather Testbed's Spring Experiment and Aviation Weather Center winter and summer experiments. The Proving Ground provides a rich source of training material for COMET and the WMO VLAB, which benefits user communities the world over.

Plans for the future include new and expanded partner relationships between the Proving Ground and JPSS, JMA, and EUMETSAT to go beyond the standard GOES-R product stovepipe and introduce more blended and fused products to simulate how forecasters will integrate the GOES-R information with other forecast tools. The Proving Ground demonstrations are expanding beyond the NWS operational users to include participation from international (e.g., European Severe Storms Laboratory) and broadcaster communities.

This presentation will show examples of the proxy and simulated GOES-R products and the feedback provided by ofrecasters at the Storm Prediction Center, the National Hurricane Center, and the Aviation Weather Center.

Name:	Michael Hewson
Email:	m.hewson@uq.edu.au
Association / Organisation:	Climate Research Group The University of Queensland
Role / Position:	Postdoctoral Research Fellow
Type of presentation:	Poster

Comparing Remotely Sensed and Modelled Aerosol Optical Properties; a Case Study for Brisbane Australia

For a project which examined an aerosol indirect effect on rainfall for Brisbane Australia, a geo-spatial analysis of aerosol size distribution was made with Doppler rain radar sourced rain intensity and satellite remote sensing (MODIS) derived cloud effective radius. Since passive remote sensing of areal aerosol is not possible in cloudy conditions, the chemistry transport version of the Weather Research and Forecasting model (WRF-Chem) was used to produce aerosol optical property maps. The question was - to what extent does the modelled aerosol match observations? To answer this, MODIS, Aeronet and WRF-Chem aerosol optical properties were statistically compared in clear sky conditions around Brisbane. The WRF-Chem aerosol transport and gas phase chemistry scheme combinations that best match aerosol optical property observations was determined. A range of issues and assumptions pertaining to comparing satellite observed and modelled aerosol optical properties are discussed.

Name:	Park, Chul Min
Email:	cmpark@kari.re.kr
Association / Organisation:	Korea Aerospace Research Institute
Role / Position:	Researcher
Type of presentation:	Presentation (talk)

A Study on INRSM Performance Improvement based on Platform Integration using Single Multi-Core System

A Study on INRSM Performance Improvement based on Platform Integration using Single Multi-Core System Chul-Min Park, Do-Chul Yang, Eun-Joo Kwon, Han-Dol Kim, Sun-Hee Woo, Bang-Yeop Kim Korea Aerospace Research Institute (KARI) Abstract COMS (Communication, Ocean and Meteorological Satellite) is the Korean geostationary satellite located at 128.2°E and has the hybrid mission of meteorogical observation, ocean monitoring and telecommunication service. To perform the missions, COMS has 3 defferent payloads which are the Meteorological Imager (MI), the Geostationary Ocean Color Imager (GOCI) and the Ka-band communication payload. COMS needs to have INRSM (Image Navigation and Registration system module) to compensate geometric errors of image for MI and GOCI, which are optical payloads . However, COMS INRSM takes lots of time to accomplish geometric correction although INRSM performs the distributed processing for the landmark determination and the image resampling, which are the most time-consuming work. The performance improvement of COMS INRSM is highly needed. This paper analyzes the causes of the processing delay and suggests a new COMS INRSM design for enhancing the performance focusing on the timeliness. The analysis shows that the network traffic volume is one of the significant causes of time-consuming. In order to reduce this traffic volume, the current distributed platforms of INRSM are modified to a single multi-core system. All programs for INRSM, such as OS, Compiler, DB, Samba, are upgraded and installed in one integrated platform. In addition, the existing distributed processing method is replaced by a multi-processing and multi-threading method suitable for the integrated platform. To verify the feasibility of the suggested design, both the image processing and the quality performance test are performed. The image processing performance test is to measure the speedup and the image quality performance is to analyze the quality of the image processing performance. From these tests it can be seen that the processing time in the integrated INRSM decreases dramatically and the image quality maintains a comparable performance to that of the existing INRSM. Therefore, it can be concluded that the new INRSM adopting a multi-processing and multi-threading method in a single multi-core system shows a satisfactory performance.

Name:	Mark Todd
Email:	Mark.Todd@innovation.gov.au
Association / Organisation:	Space Coordination Office DIICCSRTE
Role / Position:	Policy Officer
Type of presentation:	Presentation (talk)

Australia's Satellite Utilisation Policy

TBA

Name:	Ashim Kumar Mitra
Email:	ashimmitra@gmail.com
Association / Organisation:	India Meteorological Department
Role / Position:	Scientist
Type of presentation:	Presentation (talk)

Characteristics of dust storms over the Indian region using real time multi-satellite observations from the direct broadcast receiving system at IMD

In this study, observations from microwave satellites, visible and infrared instruments have been analyzed to detect dust storm over north and north-west part of India during the pre-monsoon 2012. This study investigated the approach to utilize the multi satellite data of Moderate Resolution Imaging Spectroradiometer (MODIS) on-board the Terra and Aqua satellite and the Advanced Microwave Sounding Unit (AMSU) on-board NOAA satellite to study the characteristics of dust storms from real time direct broadcast (DB) receiving system installed at three places of India Meteorological Department (IMD). The dust storm detection is based on the infrared brightness temperature (BT) difference between channels at 11 and 12 µm and polarized BT difference between two channels of 89 GHz and 23.8 GHz. The Total Ozone Mapping Spectroradiometer (TOMS) Aerosol Index (AI) and AMSU-A 23 GHz channel BT from NOAA satellite over the north and north-west part of India have also been analyzed. The result indicated the characteristic behavior between BT and AI during the different phases of the dust storm.The integrated approach suggested the potential to use high resolution data of microwave as well as thermal-infrared using multi-satellite observations from real time direct broadcast system for the detection of severe, moderate or weak dust storms very well. The approach is found to be promising for operational application.