**Japan Geoscience Union Meeting 2011**
(May 22-27 2011 at Makuhari, Chiba, Japan)


ACG032-01 Room:105 Time:May 27 08:30-08:45

# Past, Present and Future in Reanalysis

Hirotaka Kamahori[1*]

[1]Meteorological Research Institute

It is going to pass 20 years since ECMWF performed ERA-15 reanalysis. During this 20 years, many re-analyses were produced also in USA and Japan, and now we can obtain the ensemble mean of re-analyses. In these situations, it has been recognized that the qualities of re-analysis products must be not comparable with observation data, and that verification of their error evaluation is necessary. Of course, it is unchanged that a re-analysis product is the essential database in various research fields including meteorology and oceanography. Important is to understand the application limit in the re-analysis products, and to utilize them within the application limits. This is also recognized by re-analysis producing groups themselves, and they are trying to evaluate quality of re-analyses with AMIP type experiments specialized re-analyses for specific purposes and so on. As examples of such efforts, I like to introduce AMIP type experiment or specialized re-analysis using long history observations planed at MRI. The AMIP experiment is performed to understand model climatology. As a specialized re-analysis, we are planning one for climate change research. In conventional re-analyses in which all available observations are utilized, resultant analysis fields are suffered from history of observations especially from satellite data, and their quality depend on time. Therefore, it is difficult to separate natural variability and artificial variability by observation history. In the re-analysis we planning, only long history data such as surface or upper air observations are utilized to suppress artificial variability in circulation fields. We will be able to finally extract signals of climate change with such re-analysis.

As a second point, we can point out re-analyses for specific serious phenomena. It is not only interest in meteorological research but also important in various decision making, to reproduce the qualitative meteorological fields of a past serious affair, and to discuss detailed circumstance and predictability of the weather phenomena. We at MRI performed re-analysis and re-forecast of Isewan Typhoon, because 2009 was the 50th anniversary of Isewan Typhoon. We can precisely predict storm tidal surge in Nagoya port comparable with observations, using current forecast model and data assimilation system of JMA. We can also show pseudo weather radar images and pseudo meteorological satellite images of Isewan Typhoon that were not available in those days yet. On the other hand, ECMWF carried out the D-day reanalysis in which the Normandy landing operation was carried out, and showed possible prediction of the weather in the day (June 6, 1944) with 3-day lead time, using current forecast model and data assimilation system of ECMWF. Of course, more than 50 years ago, the numerical forecast model and data assimilation system were not available and people cannot know qualitative weather situation in that time. In the present, we can reproduce circulation fields and detailed weather in that time if we use the state-of-the-art technology and definite observations. If even observation data are saved about the other serious affairs, a similar re-analysis and re-forecast experiments are possible. If observations for such affairs are discovered, we like to try again quantitative reproduction of the weather condition. These trials will be expected to contribute future development of meteorology.

Keywords: Data Assimilation, Reanalysis, Reforecast, Database for climate change research, Data Integration

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ACG032-02 Room:105 Time:May 27 08:45-09:00

# The TIGGE database

Mio MATSUEDA[1*]

[1]JAMSTEC

The World Meteorological Organization (WMO) began The Observing System Research and Predictability Experiment (THORPEX) project in 2005 to accelerate improvements in the accuracy of 1-day to 2-week forecasts of high-impact weather for the benefit of society, the economy, and the environment. The THORPEX Interactive Grand Global Ensemble (TIGGE) is a key component of THORPEX, providing ten operational medium-range ensemble forecast data (BoM, CMA, CMC, CPTEC, ECMWF, JMA, KMA, Meteo-France, NCEP, and UKMO) at close to real time. The key objectives of TIGGE are briefly as follows: (a) an enhanced collaboration on development of ensemble prediction, internationally and between operational centres and universities; (b) a deeper understanding of the contribution of observation, initial and model uncertainties to forecast error; and (c) test concepts of a TIGGE Prediction Centre to produce ensemble-based predictions of high-impact weather, wherever it occurs, on all predictable time ranges. In this talk, details of the TIGGE database and some researches using the TIGGE data will be introduced.

Keywords: THOREX, TIGGE, numerical weather prediction, ensemble forecast, medium-range forecast

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# AFES-LETKF ensemble reanalysis 2

Takeshi Enomoto[1]*

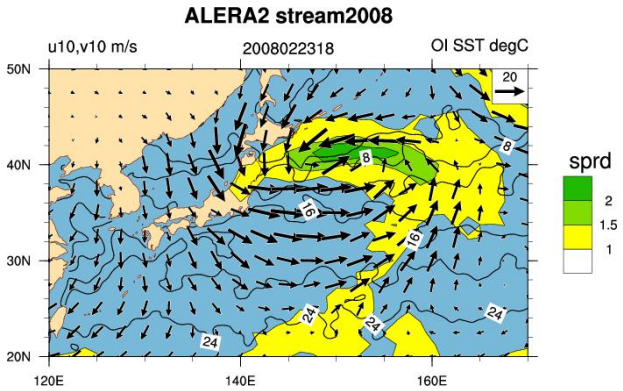
[1]Earth Simulator Center, JAMSTEC

Ensemble reanalysis is multiple estimates of the atmospheric state (analyses). Ensemble forecast is produced from multiple initial conditions. A data assimilation technique is employed to merge ensemble forecast and observations to obtain multiple analyses. Ensemble members approximate the probability density function of the atmosphere. The ensemble mean is the optimal estimate of the atmosphere and the ensemble spread represents the analysis error. Error of the day is unique to ensemble data assimilation, absent in conventional long-term reanalysis datasets.

Using reanalysis data common features of a particular phenomena are extracted by making statistics but features peculiar to a single case has to be omitted. It is sometimes difficult to get enough samples for rare phenomena such as severe weather. Ensemble reanalysis provides the same numbers of sample for each analysis time to enable quantitative discussions on uncertainty without averaging out the peculiar features of each event.

Such attractive features enable a new kind of dynamical process and predictability research (Enomoto et al. 2010), evaluation of observations and optimal observing system design. Using ALERA (AFES-LETKF experimental ensemble reanalysis, Miyoshi and Yamane 2007) as a reference observing system experiments (OSE's) have been conducted (Moteki et al. 2007; Inoue et al. 2009; Moteki et al. 2010, QJRMS in press).

In March 2010 JAMSTEC established Observing system Research and Ensemble Data Assimilation development and research team (OREDA) under the Earth Simulator Center. Using an ensemble data assimilation system composed of updated AFES and LETKF a stream from January 2008 is running on the second generation of the Earth Simulator (ES2) as ALERA2, a successor of ALERA (Fig 1). This stream serves as a reference to OSE's for PALAU 2008, Mirai cruise in the Arctic Ocean 2008 and T-PARC will be conducted. For Mirai cruise in the Arctic Ocean 2010 and VPREX 2010 in Vietnam and Philippines, a stream has been started from August 2010. ALERA2 will be available online from the Earth Simulator Center to encourage studies utilizing unique features of ALERA2.




Keywords: atmospheric general circulation, ensemble Kalman filter, error of the day

**Japan Geoscience Union Meeting 2011**
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ACG032-04 Room:105 Time:May 27 09:15-09:30

# Ocean reanalysis data produced by Japan Coastal Ocean Predictability Experiment (JCOPE)

Yasumasa Miyazawa[1*], RuoChao Zhang[1]

[1]JAMSTEC

Using an ocean forecast system JCOPE2, we have created the reanalysis data with high horizontal resolution of 1/12 degree to describe the oceanic variability associated with the Kuroshio-Kuroshio Extension, the Oyashio, and the mesoscale eddies from 1993 to present. The products made by an eddy-resolving ocean model combined with the three-dimensional variational data assimilation well reproduced the mean water mass property in the western North Pacific and the interannual variations of the Kuroshio-Kuroshio Extension and the Oyashio coastal branch. We have provided the reanalysis data for many researchers to facilitate various kinds of studies using the ocean reanalysis data. In this presentation, we show some examples of the analyses using our reanalysis data. For example, we found that both the mean kinetic energy of the Kuroshio Extension axis at the first meandering crest and southward intrusion of the Oyashio coastal branch were closely related with the horizontal distribution of both the Oyashio Water and North Pacific Intermediate Water within the appropriate interannual time scale.

Keywords: Ocean General Circulation Model, reanalysis, remote sensing data, in-situ data, data assimilation

**Japan Geoscience Union Meeting 2011**
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ACG032-05 Room:105 Time:May 27 09:30-09:45

# Global cloud-system resolving simulation data using NICAM

Tomoe Nasuno[1*]

[1]JAMSTEC

Global cloud-system resolving numerical model (GCRM) is a very useful tool to investigate atmospheric phenomena associated with cloud and precipitation on the whole globe. Nonhydrostatic Icosahedral Atmospheric Model (NICAM) is the first GCRM in the world that is designed for this purpose. NICAM has been operated using the mesh size of 3.5 km for week-long simulations and 7-14 km for seasonal simulations on the Earth Simulator. We have already performed several series of NICAM simulations and opened the data to international and domestic collaborators. We are also tackling finer mesh size simulations and extension of integration period on the state-of-the-art supercomputers. The major focus of our studies using the NICAM data has been on diurnal to seasonal scale atmospheric phenomena in the tropics (e.g., diurnal variation of precipitation, intraseasonal variability, Madden-Julian Oscillation, tropical cyclogenesis, seasonal march of Asian summer Monsoon), and we can expect new perspective on these subjects with upgraded computational equipments. There also will be new research areas where the NICAM simulation data has high potential (e.g., extratropical phenomena).

As to the evaluations of the model, we have been keen on validating cloud and precipitation properties in comparison with satellite data, and based on the evaluations, improved the model physical processes (e.g., cloud microphysics, turbulent processes). Now, it is high time to make combined use of NICAM simulation data and recently released observational and analysis data for research activity and ultimate validation of the model. Especially, land-surface and atmosphere-ocean processes, which are highly relevant to seasonal and regional variabilities, will be of key processes.

In the presentation, overview of research results using NICAM and available simulation dataset will be introduced, as a prelude to future collaborations.

Keywords: global cloud-system resolving simlation data, NICAM

**Japan Geoscience Union Meeting 2011**
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# Multi-century control simulations by MIROC

Masahiro Watanabe[1*]

[1]AORI, The University of Tokyo

Climate model called MIROC has contributed to the IPCC fourth assessment report (AR4) by carrying out a number of experiments. We now have a new version of MIROC which will be used for the IPCC fifth assessment report (AR5). Among those data, I'll intriduce multi-century simulations with fixed radiative forcing, i.e., control runs, using both old and new versions of MIROC, in order to open discussion for potential usefulness of those long climate fields for impact studies and else.

Keywords: GCM, multi-century simulations

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ACG032-07 Room:105 Time:May 27 10:00-10:15

# Spatial reproducibility of bias corrected daily precipitation compiled from climate models

Yoshihiko Iseri[1*], Shinjiro Kanae[1], Yoshihiro Shibuo[2]

[1]Tokyo Institute of Technology, [2]University of Tokyo

Future climate projection has been done by several GCMs (Global Climate Model) and RCMs (Regional Climate Model) and their projections have been, for instance, used to evaluate the impacts of future climate change on hydrological cycles. However, because the outputs of GCM/RCM contain biases and thus, for more reliable climate impact studies, it is important to perform bias correction of GCM/RCM outputs before those data are used for impact studies. Several bias correction methods have been proposed so far. For example, some of those methods are adjustment of GCM/RCM output average value to the observed average value, the use of ratio between GCM/RCM output average to observation average. A popularly used bias correction method is to utilize CDF (Cumulative Distribution Function) of GCM/RCM and observations in order to covert model CDF into the CDF of observation.

However, an issue to be considered is that these methods are applied to each grid point independently when these bias correction methods are employed, and thus this might destroy the spatial structure of target variables. Moreover, considering that the bias corrected products are sometimes used as inputs for spatially distributed hydrological models, we should be careful about the spatial structure of target variables, in particular that of precipitation data.

This study employed several bias correction methods for climate model outputs and examined the characteristics of bias corrected products by particularly focusing on the representation of spatial structure of precipitation. We would like to also mention the reproducibility of extreme precipitations of those methods.

Keywords: global climate model, regional climate model, bias, daily precipitation, spatial distribution, extreme event

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ACG032-08 Room:105 Time:May 27 10:15-10:30

# Multivariate Analysis for Visualization of Oceanic Global Circulation Simulation

Daisuke Matsuoka[1*], Fumiaki Araki[1], Shinichiro Kida[1], Hideharu Sasaki[1], Bunmei Taguchi[1]

[1]Earth Simulator Center, JAMSTEC

Visualization of numerical simulation data is necessary to understand intuitively natural phenomena or structures. Effective setting of transfer function (which maps the data value to color or opacity) is essential to producing an informative picture or movie. However, setting a good transfer function by trial and errors or craftsmanship is not an efficient way to handle large scale dataset.

We, then, research the generation method of transfer function to obtain effective visualization results. In this work, the feature extraction methods from the ocean global circulation simulation (OFES) data and the visualization methods which emphasis the feature are development. The features such as ocean currents, water mass or vortices are extracted by using a multivariate analysis which clustering from temperature, salinity, fluid velocity and etc. Good visualization results with emphasis features can be made by using these extracted features. In this presentation, we will report the application examples to visualize the currents of the Kuroshio / Kuroshio Extension region and the water mass of the meridional overturning circulation.

Keywords: visualization, multivariate analysis, transfer function, oceanic global circulation simulation

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ACG032-09 Room:105 Time:May 27 10:45-11:00

# Global-scale modeling of groundwater recharge and water table depth using a LSM with groundwater representation

Sujan Koirala[1*], Hannah G. Yamada[1], Pat J.-F. Yeh[2], Taikan Oki[2], Shinjiro Kanae[1]

[1]Tokyo Institute of Technology, [2]University of Tokyo

Traditionally, global-scale land surface models (LSMs) mainly focused on energy balance at land surface, often simplifying runoff scheme while largely neglecting the groundwater process. But, explicit representation of groundwater process is necessary in models for proper estimation of groundwater resources in current and future climate conditions. In this study, an explicit shallow groundwater representation was integrated into a LSM, Minimal Advanced Treatments of Surface Interaction and Runoff (MATSIRO). The model with groundwater representation was then applied in global-scale to estimate the major groundwater resources related variables namely, groundwater recharge and water table depth (WTD).

The global terrestrial mean annual groundwater recharge is estimated to be around 31,500 km3 yr-1. It is larger than previous estimations (around 15, 000 km3 yr-1) by Doll and Fiedler (2008) and Wada et al. (2010). In both previous model-based estimates, the model parameters were explicitly calibrated to match the river discharge in various river basins, ignoring the physical process of moisture flow in soil and actual soil moisture condition. Also, if the water table is in equilibrium condition, long-term mean groundwater recharge should be of similar magnitude to long-term mean base runoff. The recharge estimated in this study is much closer to multi-model ensemble mean base runoff (30200 km3 yr-1) from second phase of Global Soil Wetness Project (GSWP-2). On the spatial context, humid regions have the largest groundwater recharge. Quantitatively, Amazon and Congo river basins contribute around 20 % of global groundwater recharge and the estimation of this study is much larger in these regions compared to previous estimates of groundwater recharge. The recharge is low for arid and semi-arid regions mainly because of small precipitation input, high evaporative loss, and strong upward capillary flux from groundwater reservoir to unsaturated soil zone.

Similarly, WTD has been estimated in global scale. Climate and soil characteristics are found to be major controlling factors for large-scale mean WTD. Simulated WTD is shallow in regions with either large infilitration, which is governed by climatic condition, or poor drainage condition, which is governed by soil characteristics. The WTD is deeper for dry regions whereas it is shallow for humid regions. However, further heterogeneity in WTD is provided by soil type, for e.g., grid cells with loamy soil (large permeability) have deeper WTD than the regions with clay (low permeability).

Keywords: Global, Land surface model, Groundwater recharge, Water table depth

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ACG032-10 Room:105 Time:May 27 11:00-11:15

# JAXA's global environmental monitoring dataset derived from space-borne optical sensors

Masahiro Hori[1*], Hiroshi Murakami[1], Koji Nakau[1], Akiko Ono[2]

[1]Japan Aerospace Exploration Agency, [2]Chiba University

Japan Aerospace Exploration Agency (JAXA) started to receive satellite data of around Japan acquired by Moderate Resolution Imaging Spectroradiometer (MODIS) onboard NASA's polar orbiting earth observing satellite, Terra and Aqua at Hatoyama receiving station since June 28, 2004. Oceanic geophysical parameters such as ocean color and aerosol optical thickness over ocean and so on have been generated from the MODIS data and opened to the public in near real-time through JAXA's web page (MODIS Near real time homepage http://kuroshio.eorc.jaxa.jp/ADEOS/mod_nrt/). New parameters, i.e., photosynthetically available radiation (PAR) and snow cover extent (SCE) of around Japan area, are started to be generated and their brows images and binary data have been distributed every half month on a JAXA's earth environmental monitoring web site (JAXA Satellite Monitoring for Environmental Studies: JASMES http://kuroshio.eorc.jaxa.jp/JASMES/index.html) since December 2008. In 2009 the analysis area of JASMES parameters is extended to global area using the data of 5km resolution calibrated radiance archived at NASA's ftp site and additional geophysical parameters (water stress trend (WST) and wildfire hotspots (WF)) were added. In 2010 MODIS data received at Thailand are also being introduced in the JASMES system and three geophysical parameters (normalized difference vegetation index (NDVI), chlorophyll-a (CLA), aerosol optical thickness(AOT)) are under preparation. Thus JASMES will have three analysis area (Japan, Thailand, and global) and seven geophysical parameters (PAR, SCE, WST, WF, NDVI, CLA, and AOT) in the beginning of JFY2011.

Keywords: satellite observation, optical sensor, photosynthetically available radiation, snow cover, water stress, wildfire

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ACG032-11 Room:105 Time:May 27 11:15-11:30

# Global Soil Moisture Dataset by AMSR-E satellite observation

Hideyuki Fujii[1*]

[1]JAXA

Land surface hydrological quantities have a significant impact on seasonal changes and inter-annual variations of the climate through their interactions with the atmosphere. In particular, variations in soil moisture content affect the heat balance of the land surface. Information on soil moisture conditions over large regions is important for understanding, modeling, and forecasting climate changes. Monitoring of soil moisture is also important in understanding ecological processes and in estimating agricultural harvest yield fluctuations because soil moisture is the water source for vegetation.

Microwave remote sensing using satellites is an effective method for collecting global information on land surface hydrological quantities. The method has two advantages: being able to periodically perform observations over large regions regardless of whether it is night or day, and the sensitivity of these instruments to land surface hydrological quantities due to liquid water having an extremely high dielectric constant in the microwave band compared with soil. In this presentation, we will introduce results of global soil moisture monitoring using the Advanced Microwave Scanning Radiometer for Earth Observing System (AMSR-E). The AMSR-E is a dual polarization radiometer with six frequency bands from 6GHz to 89GHz. It was developed in 2002 by the National Space Development Agency of Japan (NASDA), now the Japan Aerospace Exploration Agency (JAXA), and launched on the Aqua satellite of the U.S. National Aeronautics and Space Administration (NASA). Aqua is still operational and the AMSR-E is also operating normally except for part of the 89GHz system.

The 10-36GHz algorithm (Fujii et al., 2009) was applied to the AMSR-E data to estimate soil moisture. In this algorithm, a look-up table method is used for the estimation of soil moisture from the observed brightness temperatures. Because the water content of vegetation affects the sensitivity of the microwave remote sensing of soil moisture, we used a method for simultaneously retrieving the soil moisture and vegetation water content from two indices , PI and ISW, which are respectively the polarization and frequency differences divided by the average value of brightness temperature. The vegetation coverage correction of look-up table is also performed using the normalized difference vegetation index (NDVI) published as part of the Moderate Resolution Imaging Spectroradiometer (MODIS) vegetation indices (16-Day L3 Global 1 km V5) by the Land Processes Distributed Active Archive Center (LP-DAAC). The AMSR-E data have been archived for more than eight years. In this presentation, some results of AMSR-E soil moisture monitoring will be presented and discussed.

In addition, a future plan on our algorithm development for next satellite program will be also introduced. The JAXA is planning to launch the satellite GCOM-W1 with the Advanced Microwave Scanning Radiometer-2 (AMSR2) onboard in JFY 2011. The GCOM-W1 is the first satellite of the Global Change Observation Mission (GCOM) which consists of two satellite observing system and three generations of each satellite series to continue the observations for 10 to 15 years. The AMSR2 is a successor of AMSR-E. Basic performance of AMSR2 will be similar to that of AMSR-E based on the minimum requirement of data continuity of AMSR-E, with several enhancements including additional channels in C-band receiver. To contribute to the long-term earth observation through the GCOM program, we are trying to modify our soil moisture algorithm to improve accuracy of soil moisture and to make new products related to the land hydrology.

Keywords: AMSR-E, GCOM, Soil moisture

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ACG032-12 Room:105 Time:May 27 11:30-11:45

# Long-term water and climate data set by AMSR-E and GCOM-W

Misako Kachi[1*], Keiji Imaoka[1], Hideyuki Fujii[1], Kazuhiro Naoki[1], Daisaku Uesawa[1], Akira Shibata[1], Tamotsu Igarashi[1]

[1]Japan Aerospace Exploration Agency

Japan Aerospace Exploration Agency (JAXA) has developed and provided the Advanced Microwave Scanning Radiometer for EOS (AMSR-E) to U.S. Aqua satellite, which was launched in 2002 and is operating, and AMSR-E data is being archived almost nine years. Furthermore, the Advanced Microwave Scanning Radiometer 2 (AMSR2), which is a successor instrument to AMSR-E, will be carried by the first satellite of Global Change Observing Mission (GCOM) - Water (GCOM-W1), which is scheduled to be launched in the Japanese Fiscal Year of 2011 to be placed in front of the Aqua satellite on the A-train orbit. GCOM-W1 is not a name of single satellite mission. It is a part of global and long-term observation program with two complementary medium-sized satellites and three generations (10-15 years) for stable data records. Therefore, period of data set, which is produced by multi-generation GCOM-W and AMSR-E, will be more than twenty years.

AMSR2 is developing based on AMSR-E currently operational, and its basic performance and observation frequencies will be similar to that of AMSR-E based on the minimum requirement of data continuity of AMSR-E, with several enhancements. Standard product of AMSR2 will be the same to current seven geophysical parameters derived by AMSR-E; they are precipitable water, cloud liquid water, precipitation, sea surface temperature, sea surface wind speed, sea ice concentration, snow depth, and soil moisture. Currently, Earth Observation Research Center (EORC) produces some research products from AMSR-E, such as subset database for tropical cyclones, and all-weather sea surface wind speeds. All-weather sea surface wind speeds product estimates wind speeds over strong wind and/or heavy rainfall regions around tropical cyclones, where standard algorithm usually cannot calculate wind speeds. Improvements of such products and introduction of new research products are planned toward GCOM-W1 era. Reprocessing of AMSR-E data with new algorithms, which are developed for AMSR2 standard products, also enable us to produce long-term and homogeneous water and climate data set.

AMSR-E standard products are available from JAXA's online system called the Earth Observation Data and Information System (https://www.eoc.jaxa.jp/iss/jsp/indexEn.html). Images and data of research products are also distributed by EORC AMSR/AMSR-E Web Site (http://sharaku.eorc.jaxa.jp/AMSR/index.html). Construction of new online data distribution system for AMSR2 standard products is currently underway to reflect requirements from users. AMSR-E products will be also available via this system. EORC is also preparing GCOM web site (http://suzaku.eorc.jaxa.jp/GCOM/index.html) for both AMSR-E and AMSR2 research products.

Keywords: satellite observation, microwave radiometer, global water cycle, climate, long-term data

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ACG032-13 Room:105 Time:May 27 11:45-12:00

# Precipitation Observation from Space -Tropical Rainfall Measuring Mission and Global Precipitation Measurement Mission-

Takuji Kubota[1*], Misako Kachi[1], Riko Oki[1], Shuji Shimizu[1], Naofumi Yoshida[1], Masahiro Kojima[1], Kenji Nakamura[2], Yukari N. Takayabu[3]

[1]Japan Aerospace Exploration Agency, [2]Nagoya University, [3]University of Tokyo

Satellite observation is a unique and effective tool to cover a large area homogeneously in a short time. Its advantage is obvious when it observes geophysical parameters varying both in temporally and horizontally, like precipitation. The Tropical Rainfall Measuring Mission (TRMM) satellite is the first satellite mission focused on ”rainfall” observation. TRMM is a joint mission between Japan and the U.S. and was launched in November 1997. The major objective of the TRMM satellite is to determine accurate rainfall amount associated with tropical convective activities, which is a drive source of global atmospheric circulation. To this purpose, the TRMM carries the world’s first satellite-borne Precipitation Radar (PR) developed by Japan, in addition to conventional instruments, such as an infrared imager and microwave imager (TRMM Microwave Imager; TMI). The combined use of PR and the TMI has greatly improved the estimation of rainfall amount. It has also revealed the three-dimensional structure of tropical cyclones over the ocean, which was rarely observed before the TRMM satellite. The success of TRMM shows the potential of satellite remote sensing contributions for understanding the water cycle on Earth and improving weather forecasts. More than 12 years after the satellite’s launch, it continues to perform excellent observations and provide valuable meteorological and climatological data relating to precipitation.

We have operated ”JAXA/EORC Tropical Cyclone Database” (http://sharaku.eorc.jaxa.jp/TYP_DB/index_e.shtml) using the TRMM datasets and the passive microwave imager datasets of the AMSR and the AMSR-E. We have picked up the data and images of the typhoons and the hurricanes, and constructed the database by them.

We have also provided ”Latent Heat Research Product” (http://www.eorc.jaxa.jp/TRMM/lh/index.html) since May 2008. The latent heat research product is based on the Spectral Latent Heating (SLH) algorithm (Shige, Takayabu et al., 2004, 2007) from the TRMM PR information. Heating profile lookup tables were derived from numerical simulations of tropical clouds utilizing a cloud-resolving model.

Currently, the Global Precipitation Measurement (GPM) mission, led by Japan and the U.S., is scheduled under international collaboration to fulfill various user requirements that cannot be achieved by the single TRMM satellite. One major characteristic of the GPM mission as follow-on and expansion of the TRMM satellite is operation of the GPM core satellite, which will carry a dual-frequency precipitation radar (DPR) and a passive microwave radiometer, with a non-sun-synchronous orbit as a ”calibrator” to other satellites. The other is its collaboration with a constellation of several other satellites developed by each international partner (space agency), each of which will carry passive microwave radiometers and/or microwave sounders, to increase observation frequency. Although the TRMM satellite focused on observation of the tropics, the GPM mission covers broader areas including high latitudes. Generation of global rainfall map product is one of major target of the GPM mission.

Global Rainfall Map with high frequency and accuracy will contribute to various applications such as weather, flood forecast, agriculture, and more. JAXA has developed and operates global rainfall map production system, a prototype for GPM era, in near-real-time since October 2008, and hourly and 0.1-degree resolution binary data and images available via internet (http://sharaku.eorc.jaxa.jp/GSMaP/). The algorithms are based on outcomes from the Global Satellite Mapping for Precipitation (GSMaP) project (Okamoto et al., 2005; Aonashi et al., 2009; Ushio et al., 2009). Near-real-time data is utilized in various areas, such as science researches, weather forecast/service, flood warning and rain analysis over river basin, oceanographic condition forecast, agriculture, and teaching.

Keywords: satellite, precipitation, TRMM, GPM, radar, microwave radiometer

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# Estimation of radiation budget using geostationary satellites by the VL project

Hideaki Takenaka[1*], Munehisa Yamamoto[1], Masamitsu Hayasaki[1], Atsushi Higuchi[1], Naoko Saito[1], Hiroaki Kuze[1], Fumihiko Nishio[1], Tamio Takamura[1], Satoru Fukuda[2], Teruyuki Nakajima[2], Arata Okuyama[3], Yuki Kosaka[3], Ryuichiro Nakayama[3], Owada Hiromi[3], Tomoaki Ono[3]

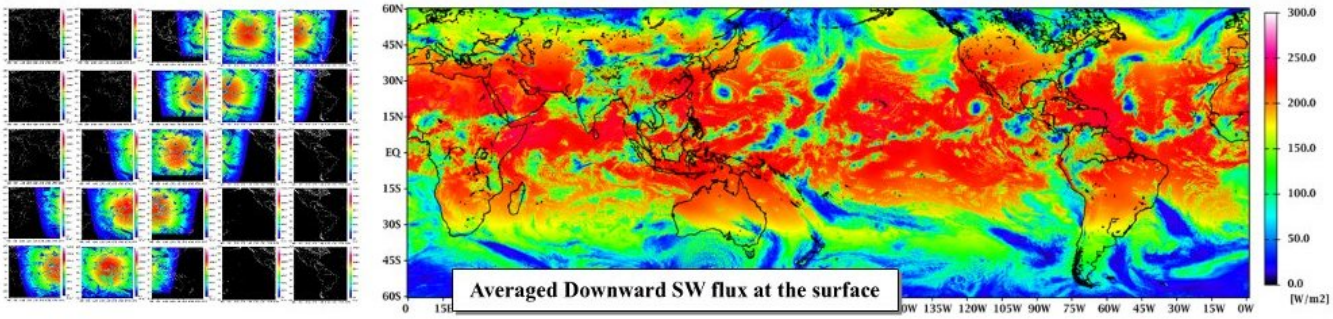
[1]CEReS, Chiba University, [2]AORI, Tokyo University, [3]MSC, JMA

Clouds can cool the Earth by reflecting solar radiation and also can keep the Earth warm by absorbing and emitting terrestrial radiation. They are important in the energy balance at the Earth surface and the Top of the Atmosphere (TOA) and are connected complicatedly into the Earth system as well as other climate feedback processes. Aerosols reflects solar radiation and cools the earth, and it is called a direct effect. Moreover, aerosols influences the condensation of the cloud particles by indirect effect. Thus, cloud and aerosol are one of the important element in Earth energy system, and it's important to be estimate radiation budget to better understand climate and environmental change.

Geostationary satellite observations are useful for estimating the upward and downward radiation budget at the surface and the TOA over wide regions and at high temporal resolution. We develop a vicarious calibration technique for the global analysis. An accurate calibrated data propose the better accuracy for analysis of cloud and radiation budget. (In this study, five satellites: GMS-5, GOES-8, GOES-10, METOSAT-5, METEOSAT-7 are used for analysis). An accurate calibrated data propose the better accuracy for analysis of cloud and radiation budget. Additionally, the possibility of aerosol-cloud-radiation interaction is discussed.

- Formation of a Virtual Laboratory for Diagnosing the Earth's Climate System -

In order to diagnose the earth's climate system under severe stress such as a global warming, the cooperative research centers (CCSR, HyARC, CAOS, and CEReS, ) construct "Virtual Laboratory", and research climate and environmental studies cooperatively with properties of each center. CEReS activities are Geostationary satellites global data archives and construction of Satellite information data base. Moreover, development of atmospheric radiation budget product. We aim at the contribution to a climate model and the better understanding of the climate system.




Keywords: Radiation budget, Goestationary satellite, Virtual laboratory

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(May 22-27 2011 at Makuhari, Chiba, Japan)


ACG032-15 Room:105 Time:May 27 12:15-12:30

# Precursory changes of earthquakes

Tadanori Ondoh[1*]

[1]Space Earth Environment Laboratory

Precursory changes of earthquakes of M>6.o in the ionosphere, atmosphere and groundwater are studied from time variations of ionosphweric foF2,foEs, seismic clouds, radio noises,and Radon concentration changes around the epicenter before M7.2 Hyogoken-nanbu earthquake of Jan. 17,1995,M7.0 Izu oshima-Kinkai one of Jan. 14, 1978 and M6.8 Chengkung one,Taiwan of Dec.13, 2006. Radon concentration is in inverse proportion to the water and air temperature. The groundwater Radon concentration in Nishinomiya well increased from 78 days before this earthquake, suddenly became the minimum, and rapidly to the maximum 9 days before Jan. 17, 1995. Then, it returned to the normal level. The rapid Radon decrease to the minimum suggests an arrival of some warm matter such as the magma from the deep origin.

Keywords: Earthqouakes, Precursory phenomena, Radon concentration changes, Ionosphere, Atmosphere, Groundwater

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ACG032-16 Room:105 Time:May 27 12:30-12:45

# Data distribution system for global warming projection under Kakushin Program

Michio Kawamiya[1*]

[1]JAMSTEC

The Kakushin Program is performing model calculations in prospect of finishing most of the experiments in the CMIP5 protocol within FY2010 (ending this March). Preliminary analysis on the model results so far shows some interesting implications regarding, among others, predictability of Pacific Decadal Oscillation (PDO), the impact of future land use change on global carbon cycle, future changes in Quasi-Biennial Oscillation (QBO) due to global warming, and ocean acidification in the Arctic Ocean. On the other hand, collaborations are underway with scientists from information technology and impact assessment fields, so that the simulation data can be utilized in even more meaningful ways than before. In particular, collaboration with Data Information and Analysis System (DIAS) and activities of Task Group on Climate Scenario are noteworthy. It is expected that one can freely download Kakushin's simulation data early in FY2011 from the DIAS server, acting also as a gateway of the Earth System Grid, the official data distribution system of CMIP5.

Keywords: global warming, earth system grid, impact assessment, numerical simulation, DIAS

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ACG032-17 Room:105 Time:May 27 14:15-14:30

# Development of a database of quick-look plots for the earth and space science data

Daiki Yoshida[1*], Akinori Saito[1], Takuya Tsugawa[2], Yusuke Akiya[1], Toshiyuki Shimizu[3], Masatoshi Yoshikawa[3]

[1]Grad. Sch. of Science, Kyoto Univ., [2]NICT, [3]Grad. Sch. of Informatics, Kyoto Univ.

A database of quick-look plots of the earth and space science data has been developed and called DAGIK (Data-showcase system for Geoscience in KML). Although there are many projects that make the access and usage of the earth and space data much easier, the users still have difficulties to find the data with that they are not familiar. Quick-look plot is an easy way to show the novice users outline of the data; how the data looks like, when and where the data was observed. Most of the databases of the earth and space data provide quick-look plot on their WWW sites to help users to browse the data. As the metadata bases help to find data, a ”one-stop” database of quick-look plots is useful for users to find data that the users don’t use regularly. To construct such a database of quick-look plots, metadata of the plots should be embedded in the plot files. KML is one of the data formats that can contain plots and metadata. It is in XML. There are several browsers of KML, such as Google Earth and NASA world wind. DAGIK is a network-based database using KML files for the geoscience plots. We term such database of quick-look plots as ”data-showcase system”. It is a showcase of data for users to browse. The users who find an interesting data will use database or meta database following the link in the quick-look plots that contains metadata. We believe that the metadata of plots is a useful tool for easy data access as the metadata of data. In the presentation, we introduce DAGIK as an implementation of the data-showcase system.

Keywords: data-showcase, database, data visualization, virtual globe, KML

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# Analysis of the Environmental Conditions for Local-Scale Heavy Rainfall with Operational Meteorological Analysis Data

Tetsuya Takemi[1*], Syohei Nomura[1]

[1]Kyoto University

Local-scale extreme weather such as heavy rainfall, tornadoes, and gusty winds occur within a short period of time, and thus the prediction of their occurrence is extremely difficult. Nevertheless, the diagnosis and prediction of these local-scale extreme events are critically important, because those events sometimes spawn significant disasters and are expected to occur more frequently and more intensely under global warming and urban heat island. One of the approaches to diagnosing and predicting extreme weather is to deploy an observational network with high spatial and temporal resolutions and to enhance surveillance systems. One of the examples is a now-casting technique by high-frequency radar observational network for local-scale heavy rainfall. Such an approach has an advantage of real-time observations; however, it is not easy to identify pre-event conditions. In addition, local-scale extreme weather develops not deterministically but randomly. Therefore, there will be another approach that evaluates the degree of the development potential for extreme weather. If we should predict high/low probability for the development of extreme weather, such forecast information would be quite useful. How to evaluate the potential of the occurrences will matter at this point. Considering that local-scale extreme weather is mostly due to the existence of cumulonimbus clouds, it is important to evaluate the potential for the occurrence of a cumulonimbus cloud and/or organized convective systems. The environmental conditions for the development of cumulonimbus clouds are related to the stability of atmospheric stratification and the shear and convergence/divergence due to the spatial variation of winds. To examine the stability and wind conditions three-dimensional atmospheric data are required; these data should have a high temporal resolution owing to the short timescales of cumulonimbus clouds. Furthermore, it is important to examine the environmental conditions in mesoscales (i.e., O(100 km) scales) in investigating the occurrence of local-scale extreme weather. For this purpose objective meteorological analysis data are useful, and previous studies used such data to show the environmental conditions for past extreme events. The aim of this study is to investigate, with the use of the operational mesoscale objective analyses by Japan Meteorological Agency (JMA), the environmental conditions for local-scale heavy rainfall over the Kanto plain in summer under synoptically undisturbed conditions. The synoptically undisturbed conditions were determined as having no significant influences of fronts and typhoons, and the days with no rainfall in the morning and high temperature around noon were chosen. Atmospheric stability, vertical wind shear, and convergence/divergence of surface winds are examined to indicate the characteristic features of the environments for local-scale rainfall over the region. From the investigations, we will show how the operational meteorological analysis data can be used for diagnosing the occurrence of local-scale extreme weather. The present results are based on those included in Nomura and Takemi (2011, SOLA).

Keywords: Objective analysis data, Local heavy rainfall, Atmospheric stability, Stability index, Kanto plain, Urban

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# Doppler radar on R/V Mirai: Observing precipitating systems for 13-years

Masaki Katsumata[1*]

[1]JAMSTEC

”Mirai” is the only one research vessel which equipped permanently-installed Doppler radar. As she have been cruised various fields in tropics, mid-latitude or arctic ocean, the Doppler radar on R/V Mirai captued vast variety of the precipitaton systems; Madden-Julian Oscillation (MJO), intraseasonal variation (ISV), typhoons and tropical depresssions, extratropical cyclones, polar low, arctic stratus, etc. In the presentation, we will introduce the specification and quality of the dataset, as well as images and analyses for some cases.

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ACG032-20 Room:105 Time:May 27 15:00-15:15

# Construction of a river network map and a floodplain topography dataset for use in river-floodplain modeling

Dai Yamazaki[1*], Shinjiro Kanae[2], Taikan Oki[1]

[1]The University of Tokyo, [2]Tokyo Institute of Technology

River-floodplain models are useful for the validation of the land surface processes in GCMs, estimation of the carbon and nutrient cycle in floodplains, as well as flood forecasts and water resources assessments. River routing calculation requires a ”river network map” which describes the upstream-downstream relationship within the interested basin, while ”floodplain topography” data is essential for flooding scheme in order to describe the relationship between water storage, water level, and inundated area. Here we introduce a new method to construct the ”river network map” and the ”floodplain topography” datasets, which can be applied to any interested basins at flexible spacial resolutions.

The proposed method requires a ”global high-resolution DEM” (e.g. SRTM3 at 90-m resolution) and the ”flow direction map” derived from the high-resolution DEM (e.g. HydroSHEDS at 90-m resolution). Those high-resolution datasets can be directly used for river-floodplain modeling, but the size of the calculation domain is limited under the current computer resources. Thus, the high-resolution datasets should be converted to a low-resolution ”river network map”, but common algorithms such as taking the averaged elevation within the low-resolution grid-box may reduce the information of detailed topography which regulates the hydrodynamics in river channels and floodplains. Instead of taking the averaged elevation, the new algorithm resamples the representative points from high-resolution datasets which is considered to be essential for organizing the ”river network map” at low-resolution. Because the detailed topography is not flattened by the new resampling algorithm, the ”floodplain topography” can be extracted from the high-resolution DEM as the sub-grid-scale parameters of the low-resolution ”river network map”.

We also performed hydrological simulations by a global river-floodplain model using the ”river network map” and ”floodplain topography” datasets derived by the proposed method. Explicit representation of the sub-grid-scale ”floodplain topography” significantly improves the predictability of ”river discharge” compared to the previous models which only consider river channels. The validation against in-situ and satellite observations suggests that the river-floodplain modes can also represent ”water surface elevation” and ”inundated area” realistically. The output datasets from the global river-floodplain model (i.e. ”river discharge”, ”water surface elevation”, and ”inundated area”) are also helpful for various kinds of hydrological researches.

Keywords: River, Floodplain, Modeling, DEM

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# Long-term rainfall data and data rescue in Asian monsoon region

Jun Matsumoto[1*], Hisayuki Kubota[2], Ikumi Akasaka[2], Nobuhiko Endo[2], Jun-Ichi Hamada[2], Kooiti Masuda[2], Masumi Zaiki[3], Manabu D. Yamanaka[2], Shuichi Mori[2], Hideyuki Kamimera[2], Taiichi Hayashi[4], Toru Terao[5], Fumie Murata[6], Masashi Kiguchi[7], Yusuke Yamane[8], Junpei Hirano[1]

[1]Tokyo Metropolitan University, [2]JAMSTEC, [3]Seikei University, [4]Kyoto University, [5]Kagawa University, [6]University of Tokyo, [7]Kochi University, [8]Tokoha University

As for the long-term Asian monsoon variations, datasets in India, such as All Indian Homogeneous Monthly Rainfall (1871-2008), and Longest Instrumental Rainfall Series of the Indian Regions (1813-2006), have been famous and now available freely from the web page of the Indian Institute of Tropical Meteorology (IITM). On the other hand, the rainfall data during and prior to the World War-II have been very limited in other Asian monsoon countries. Under the International Asian monsoon project, MAHASRI (Monsoon Asian Hydro-Atmosphere Scientific Research and prediction Initiative) in GEWEX/WCRP, we have tried to reveal the long-term precipitation changes in Asian monsoon region by installing own observation network, and/or by rainfall data collection including data rescue for the old document data. We found the rainfall and typhoon track data during Spanish and American colonial periods in the Philippines on paper format, and then try to digitized these data including those in other countries with financial supports by the Data Integration and Analysis System (DIAS) of the National Key Technology, the Ministry of Education, Culture, Sports, Science and Technology, Japan funded JAMSTEC, by the Global Environment Research Fund (B-061 and B-092) of the Ministry of the Environment, Japan funded Tokyo Metropolitan University, and by the various Grant-in-Aid for Scientific Research of the Japan Society for the Promotion of Science for the authors. Long-term rainfall variations since the pre-World War II period and data rescue in Asian monsoon region will be introduced in the presentation.

Keywords: rainfall, Asian monsoon, typhoon, long-term climate changes, data rescue

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# Historical typhoon track dataset during the early 20th century over the western north Pacific

Hisayuki Kubota[1*], Jun Matsumoto[2], Edwin Ginn[3]

[1]JAMSTEC, [2]Tokyo Metropolitan University, [3]Hong Kong Observatory

Typhoon provides fresh water to the land but it can cause disaster when it makes landfall due to strong winds and heavy rain. Recently the variability of typhoon activity becomes a great concern because it may be affected by global warning. Over the Western North Pacific (WNP) basin, typhoon best track data are available from 1945. Before that due to the difference of typhoon definition, there is no available database. In this study, we collected and digitized the historical typhoon track data during the early 20th century. We created new typhoon definition, performed quality check by comparing station pressure data, connected to the current best track data and made 100 years typhoon track dataset over the western north Pacific. The purpose of this study is to understand the typhoon variability during the 20th century. Now we have four different sources of historical typhoon track data. By comparing different sources we are improving the typhoon track data.

It is important to keep the quality of the historical typhoon track data as close as current best track data to make the dataset reliable. We would like to discuss how to keep this quality of the dataset and the availability of the dataset to other communities.

Keywords: typhoon, western north Pacific, data rescue, climate change