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

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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

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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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ACG032-03 Room:105 Time:May 27 09:00-09:15

AFES-LETKF ensemble reanalysis 2

Takeshi Enomoto[1]*

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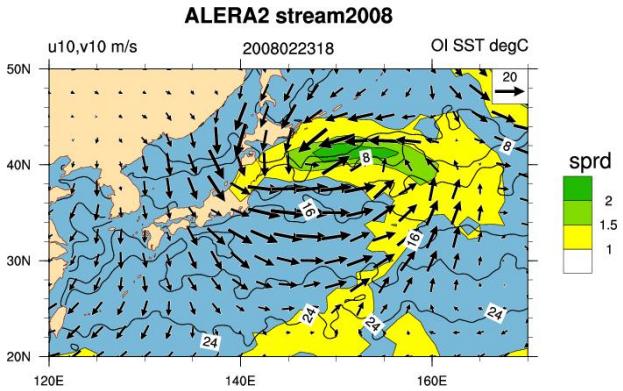
Ensemble reanalysis is multiple estimates of the atmospheric state (analyses). Ensemble forecast is produced from multiple initial conditions. A data assimilation technique is employed to merge ensemble forecast and observations to obtain multiple analyses. Ensemble members approximate the probability 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

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

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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

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Global cloud-system resolving simulation data using NICAM

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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

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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

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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

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

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

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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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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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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]

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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

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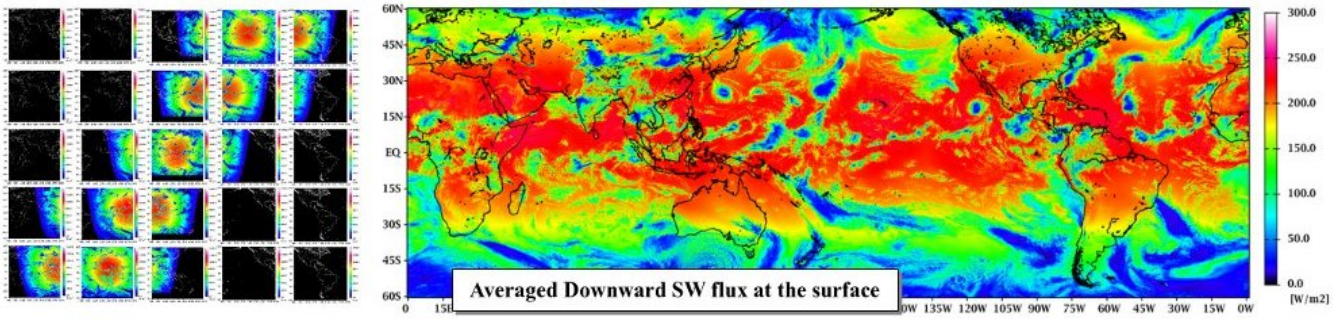
Clouds can cool the Earth by reflecting solar radiation and also can keep the Earth warm by absorbing and emitting terrestrial radiation. They are important in the energy balance at the Earth surface and the Top of the Atmosphere (TOA) and are connected complicatedly into the Earth system as well as 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

Japan Geoscience Union Meeting 2011
(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

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

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

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

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

Japan Geoscience Union Meeting 2011
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ACG032-18 Room:105 Time:May 27 14:30-14:45

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

Japan Geoscience Union Meeting 2011
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ACG032-19 Room:105 Time:May 27 14:45-15:00

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.

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

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

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

ACG032-21 Room:105 Time:May 27 15:15-15:30

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

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

ACG032-22 Room:105 Time:May 27 15:30-15:45

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

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

ACG032-P01 Room:Convention Hall Time:May 27 16:15-18:45

JAMSTEC Climate Observation and Synthesis

Shuhei Masuda[1*]

[1]JAMSTEC

The spation-temporal coerage of hydrographic data is still sparse. To obtain more accurate/dense estimation of the global ocean, 4-dimensional variational (4D-VAR) data assimilation system has been developed which is capable of providing an optimal synthesis of the obseravational data and a climate model by solving a nonlinear least square problem. The obtained dynamically self-consistent 4-dimensional dateset can offer greater infomation content on ocean climate changes than can be derived from models or data alone.

Keywords: ocean, climate change, data assimilation, four-dimensional variational method

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

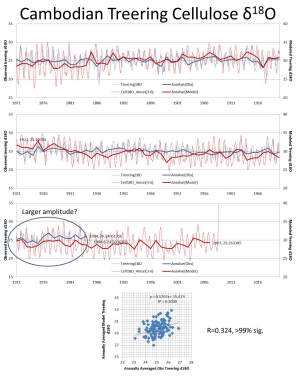
ACG032-P02 Room:Convention Hall Time:May 27 16:15-18:45

A 140-year historical global reanalysis for water isotopes

Kei Yoshimura[1]*

[1]AORI, Univ Tokyo, [2]IIS, Univ Tokyo

Yoshimura et al. [2008] completed 30-year Reanalysis-”nudged” isotope-incorporated AGCM simulation. In their method, large scale forcing was taken from NCEP/DOE Reanalysis 2, and water isotopes were fully predicted, including their sources and sinks, without utilizing any water isotope observations. Several direct comparisons between the dataset and isotope measurements revealed that the dataset is accurate enough to serve as an alternative to water isotope assimilation analysis. Thus the dataset was found to be very useful for investigating the atmospheric behavior responsible for isotope variability in precipitation and vapor. Moreover, Stott et al. [in prep] has shown that the model simulates the history of decadal variability during the late 20th century as reconstructed from d18O of cellulose extracted from the annual rings of the long-lived Bristlecone Pine from White Mountain in Southern California. The close match between the simulated and measured isotope records is a further validation of the model’s ability to accurately simulate regional-scale atmospheric behavior over the Southwestern US. This is particularly important because tree ring chronologies from these long-lived trees have been used previously to reconstruct recurrent decadal-length drought throughout 20th century and beyond. Using the new isotope enabled GCM allows us to investigate questions such as how isotopically distinct sources of atmospheric moisture have changed in the past and whether such changes arise from similar and recurrent ocean/atmospheric variability. The initial simulation is however, too short to investigate longer-term variability. Therefore, in the present study we begun to extend the model simulations to include AD1871 to AD2008, using the so-called ”20thC Reanalysis” atmospheric dataset [Compo et al., 2010]. One of the preliminary results includes a simulation of sea surface d18O, which can now be compared to coral records. The preliminary results indicate the simulated surface water d18O closely matches coral-based reconstructions from the Philippine Sea. Additional details of this investigation and its potential implications will be presented at the meeting.



Keywords: water isotopes, climate proxy, coral, tree ring cellulose, 20th century reanalysis

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

ACG032-P03 Room:Convention Hall Time:May 27 16:15-18:45

Ocean reanalysis dataset produced with the ocean data assimilation system of the Meteorological Research Institute

Yosuke Fujii[1*], Norihisa Usui[1], Takahiro Toyoda[1], Koji Ogamwa[1], Takanori Iwao[1], Masafumi Kamachi[1]

[1]Meteorological Research Institute

In the Meteorological Research Institute (MRI), we have been developing an ocean data assimilation system, named the Multivariate Ocean Variational Estimation System/ MRI Community Ocean Model (MOVE/MRI.COM). It is composed of the ocean general circulation model developed in MRI (MRI.COM), and the Three-dimensional Variational (3DVAR) analysis scheme using coupled temperature-salinity Empirical Orthogonal Function (EOF) modal decomposition. MOVE/MRI.COM has three variations with different resolutions and horizontal domains. MOVE-G has a nearly global domain (75S-75N) and the horizontal resolution of 1 degree with meridional equatorial refinement to 0.3 degree within 5S-5N. MOVE-NP has a domain extending over the North Pacific (15S-75N, 100E-160W) and the horizontal resolution of 0.5 degree. Another variation is MOVE-WNP which has the domain extending over the western North Pacific around Japan (15-65N, 117E-160W) and the resolution of 0.1 degree. These systems are operationally employed in the Japan Meteorological Agency (JMA) for the monitoring and forecasting of the ocean state around Japan and the equatorial Pacific associated with the El Nino phenomenon, as well as the seasonal forecasting.

We implement ocean reanalysis experiments repeatedly using different variations of MOVE/MRI.COM with different configurations, and the several results of the experiments are saved as reanalysis datasets for use of oceanic and climate studies. For example, MOVE-G RA07 is a result of the reanalysis experiment in the period of 1950-2009 using MOVE-G. This dataset has been employed for analyses of the ocean heat content, salinity variability, the current fields, etc. We also has a high resolution reanalysis dataset with the resolution of 0.1 degree produced with MOVE-WNP, and used for the analyses of the Kuroshio variability etc.

Keywords: Ocean Dataset, Ocean Reanalysis, Data Assimilation, 3DVAR

Japan Geoscience Union Meeting 2011
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ACG032-P04 Room:Convention Hall Time:May 27 16:15-18:45

Re-calibrated NOAA/AVHRR Daily-PAL Dataset

Atsushi Higuchi[1*], Yasunori Kurosaki[2], Kenji Tanaka[3]

[1]CEReS Chiba University, [2]ARIC Tottori University, [3]DPRI Kyoto University

Long-term dataset revealed by satellite observations are important for the terrestrial studies. The longest records are daily observations by the AVHRR boarded on NOAA spacecrafts. However, NOAA/AVHRR data are affected by spacecraft orbital delay. The Pathfinder AVHRR over Land (PAL) used a time-dependent calibration method. This presentation introduce how to re-calibrate PAL to reduce the effect of time-dependent calibration. In addition, we will promote the new-re-calibrated dataset.

Keywords: Vegetation, Satellite Data, global, long-term

Japan Geoscience Union Meeting 2011
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ACG032-P05 Room:Convention Hall Time:May 27 16:15-18:45

JAXA's sea-ice dataset derived from passive microwave sensors

Kazuhiro Naoki[1*], Masahiro Hori[1], Keiji Imaoka[1], Mieko Seki[2]

[1]Japan Aerospace Exploration Agency, [2]Remote Sensing Technology Center of Japa

Japan Aerospace Exploration Agency (JAXA) plans the launch of Global Change Observation Mission ? Water (GCOM-W) in 2011. A variety of products are planned for observe the parameter related at the water cycle. The sea-ice product estimates the sea-ice concentration, the sea-ice vector, and the thin ice region. Moreover, a long-term of observation is important in the understanding of the environmental variation. The passive microwave sensor from space has been observed for over 30 years since 1978. Therefore, the sea-ice area was able to be observed to be minimized in 2007. The observation frequency of GCOM-W is the same as the Advanced Microwave Scanning Radiometer (AMSR) series. Therefore, the observation of the sea ice change can be continued to aftertime. However, the data of Scanning Multichannel Microwave Radiometer (SMMR) and Special Sensor Microwave/Imager (SSM/I) is necessary go back to the past. The observation frequency is almost the same as these sensors. However, the resolution and the incidence angle are different. Therefore, the correction between each satellite is needed for the presumption of a consecutive sea-ice area. We are making the data set of the corrected long-term area change.

Keywords: GCOM-W, sea-ice product, passive microwave sensor, sea-ice area, long-term dataset

Japan Geoscience Union Meeting 2011
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ACG032-P06 Room:Convention Hall Time:May 27 16:15-18:45

GeoScience Data Release in DIAS

Hiroko Kinutani[1*], Toshiyuki SHIMIZU[2], Masatoshi YOSHIKAWA[2], Masaru KITSUREGAWA[1], Toshio KOIKE[1]

[1]The University of Tokyo, [2]Kyoto University

Amount of earth science data use by geoscientist, such as satellite observation data, sensor data or the result of simulation, is rapidly growing in the era of the data intensive science. Our project, DIAS (Data Integration and Analysis System) started in 2006, has a purpose of constructing data infrastructure that can integrate earth observation data, numerical model outputs, and socio-economic data effectively. DIAS also has a purpose to create knowledge enabling us to solve earth environment problems and to generate socio-economic benefits. The number of researchers of DIAS exceeds 150 and they participate from multi-disciplinary research fields; hydrological cycle, weather, ocean, agriculture, biodiversity, ecosystem, information science, etc.

Four years has elapsed from the start of the development of DIAS, and various kinds of geosciences data has been accumulated in DIAS.

We have decided to release these data, for converting them into more useful information and creating additional scientific or social value. And we, data providers, multiple disciplines' researchers, and system developers, have discussed many times for developing the systems for data release, and finally in last October, we released data to public.

The data in DIAS is classified into 4 categories:

1. Datasets created by DIAS researchers,
2. Datasets created at antecedent projects or related projects,
3. Mirror-data (research purpose satellite data, research purpose model output data, and research purpose Metrological data), And
4. Working datasets created by DIAS researchers.

The target categories of data release are 1, 2, and 3.

The applicable fields of datasets are agriculture, biodiversity, climate, disaster, ecosystem, energy, hydrological cycle, weather, etc.

In order to use data in different fields from data providers' research field, it is important to provide not only data itself but also documents written by data providers based on their knowledge.

We have developed a document centric metadata registration system.

We asked data providers to create metadata and document describing the dataset to be released using this system.

We asked to create 2 kinds of metadata and document, Japanese and English. That is, Japanese document about overseas' dataset, or English document about Japanese dataset is available. This is our outreach effort for both Japanese and overseas people.

We have discussed about the following issues carefully:

1. The unit of dataset to manage and retrieve, and
2. Representation in both Japanese and English.

We have decided about "what is the unit of dataset" through discussion between data providers and system developers with actual data one by one.

As a result, there are datasets composed of millions of files, and at the same time there are datasets composed a few files.

However, each file in the same dataset has the same dataset agreement and reference agreement.

And user access right is also managed by the unit of dataset.

We have developed our systems, such as search system and file download system, with both English and Japanese interfaces.

The functions necessary for data release are:

1. Seamless operation among data look down, data discovery and data download.
2. User management including new user registration
3. Access right management for each user and dataset
4. Report of data download history to data provider

To achieve these functions, we have developed the user management system, the DIAS look down and discovery system, and the access management system.

Anyone can use the DIAS look down and discovery system by accessing http://dias-dss.tkl.iis.u-tokyo.ac.jp/ddc/finder, and can download data files through the system. User registration is required before file download.

Keywords: DIAS, Release of Geoscience data, Data Centric Science

Japan Geoscience Union Meeting 2011
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ACG032-P07 Room:Convention Hall Time:May 27 16:15-18:45

Data archive to the GEOSS/Asian Water Cycle Initiative (AWCI)

Katsunori Tamagawa[1*], Eiji Ikoma[1], Hiroko Kinutani[1], Tetsu Ohta[1], Misa Oyanagi[1], Toshio Koike[1], Masaru Kitsuregawa[1]

[1]The University of Tokyo

Under the framework of GEOSS, representatives of hydrological and meteorological organizations and science communities in Asia gathered together, and began to discuss about how to address the water-related issues in Asia in cooperative ways by making maximum use of GEOSS. This is the Global Earth Observation System of Systems / Asian Water Cycle Initiative (GEOSS/AWCI).

Observation convergence is essential for making possible advanced research into the water cycle phenomena and for transformation of the scientific findings into the information usable for policy- and decision-makers to develop effective policies and make sound decisions in an Integrated Water Resources Management (IWRM) manner. GEOSS/AWCI approach for converging earth observation satellites, in-situ reference site networks, and operational observation systems, for integration of the observed data, numerical weather prediction model outputs, geographical information, and socio-economic data, and for dissemination of usable information is adopted from and designed in cooperation with the GHP (former Coordinated Energy and Water Cycle Observations Project (CEOP)) of the Global Energy and Water Cycle Experiment (GEWEX), World Climate Research Programme (WCRP).

As originally produced by the various sources, the data is in a wide variety of formats and structures. GEWEX/GHP had developed a prototype data integration, analysis, and dissemination system that has been further elaborated and expanded into the Data Integration & Analysis System (DIAS), which was launched in 2006 as part of the Earth Observation and ocean Exploration System, which is one of five National Key Technologies defined by the 3rd Basic Program for Science and Technology of Japan. DIAS provides cooperative opportunities for constructing GEOSS/AWCI data archives, and developing data integration and analysis functions. A Standardized Metadata Model has been developed in cooperation with the international standardization communities in order to assure full interoperability of the DIAS system.

The basis for the GEOSS/AWCI collaborative framework is the mutual consensus among participating countries and international organizations that defines data sharing and exchanging policy and responsibilities for data processing, management and archiving.

The purpose of this poster is the introduction of the GEOSS/AWCI and its data archiving activity.

Keywords: GEOSS/AWCI, in-situ data, water cycle, DIAS

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ACG032-P08 Room:Convention Hall Time:May 27 16:15-18:45

Comparison of Microbaroms at SYOWA Station, Antarctica and Woomera Prohibited Area, Australia

Yoshiaki Ishihara[1*], Masa-yuki Yamamoto[2], Masaki Kanao[3], Yoshihiro Hiramatsu[4], Muneyoshi Furumoto[5]

[1]NAOJ, [2]Kochi Univ. of Tech., [3]NIPR, [4]Kanazawa Univ., [5]Nagoya Univ.

Infrasound is sub audible sound (pressure wave), and that frequency range is cut-off frequency of sound (e.g., 3.21 mHz for 15 degree Celsius isothermal atmosphere) to 20 Hz (that is lowest frequency of human audible band). This frequency range is one of the new horizons of the remote sensing in the Earth's atmosphere, for example, a large earthquake in Sumatra region generated great Tsunami also produced such kinds of waves in atmosphere and shaking Earth itself by free vibration mode as well as affected even upon the upper atmosphere. Last decade, for the purpose of monitoring nuclear tests, a global infrasound network is constructed by CTBTO. The CTBT-IMS infrasound network has 60 infrasound stations and each station contains at least 4 infrasound sensors (arrayed station), they can detect a some-kiloton TNT level atmospheric explosion in range of some 1000 kilometers. This network is enough for monitoring nuclear tests, but much sparse for detecting and analyzing in detail of natural infrasound phenomena.

We organize a community called Infra-Sound Observation Project (ISOP) for propose of to develop *regional scale* infrasound observational networks in the Japanese Islands and around the Japanese Antarctic Stations. Now, the networks are construction and pilot observation phase. A Chaparral sensor was firstly put on the field of the Japanese Main Antarctic Station (SYOWA Station) as a part of the JARE 49 expedition in 2008. Until now, we have continued single sensor pilot observation to assess reliability of the observation system under the extreme climate condition of Antarctica.

In this talk, we will show current status of pilot observation and briefly summarize characteristics of infrasound recorded at SYOWA Station, Antarctica. In addition, at June 2010, we had done infrasound observation of reentry of the HAYABUSA at Woomera Prohibited Area (WPA), Australia. So, we will make a comparison between microbaroms detected at SYOWA station and that detected at WPA.

Keywords: Infrasound, microbaroms, ocean atomosphere coupling, Syowa Station

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Development of the dataset of bias-corrected GCM outputs for water resources management

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In order to use the data outputted by a General Circulation Model (GCM) in climate impact studies, it is vital that a bias-correction method be applied to it. In hydrological impact studies, the correction of precipitation and temperature generates satisfactory results. Many correction methods have been proposed. Several studies have investigated their correction ability in detail; however, it has been noted that a number of these studies have used the aforementioned methods without adequate validation. Moreover, these methods have not been compared adequately. The objective of this study is to compare the results of the bias-correction methods. Because of their high cost of calculation, we applied these methods to monthly averaged temperature and total monthly precipitation data obtained from GCMs that are available from the Phase 3 of the Coupled Model Intercomparison project (CMIP3) although many previous studies focused on and proposed daily scale methods. This study focuses on the statistical characteristics of bias-corrected data. Therefore, the methods proposed using previous methods were organized from this viewpoint. Two analyses were conducted in this study. The first is reproductive experiment, which has the calculation span including the period in which observation data exist. In this experiment, the data from 1948 to 1968 were used as baseline period data, and that from 1978 to 1998 were corrected using these methods. The corrected data are compared with the observed data. For evaluation, we split the world into six climate zones. These methods are evaluated by comparing the reproducibility of statistical characteristics such as the mean and standard deviation of bias-corrected data in each climate zone. The second is a future projection experiment. In this experiment, the bias-corrected data of the future period have been generated, and the future data corrected using different methods were compared. The results revealed the characteristics of individual methods. Although the mean of the series calculated using each bias-correction method does not differ greatly, the standard deviation and extreme values exhibit a significant difference. The difference between the results of the bias-correction of GCM models is minor to be the mean of the bias-corrected data but not minor to be the standard deviation or extreme values. Furthermore, in the future projection experiment, the distribution of the bias-corrected CMIP3 GCM data indicates significant differences in their values of standard deviation and extremes. From this analysis, the existence of a non-negligible difference between the results obtained from each method is apparent. Therefore, researchers should notice when a bias-correction method is applied to remove model bias in CMIP3 GCMs, else it will generate considerable bias in the analyses.

Keywords: bias correction, climate change impact assessment, temperature, precipitation

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Operational air quality monitoring data in Japan

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Hourly concentration of air pollutants are operationally observed in Japan. Monitored concentrations are available through web page of the Atmospheric Environmental Regional Observation System (AEROS; ”soramame-kun” in Japanese). After December 2010, we make spatial distributions of major four pollutants (sulfur dioxide (SO2), nitrogen oxides (NOx), photochemical oxidant (Ox), and suspended particulate matter (SPM)) and predicted surface wind fields which is obtained from the mesoscale model of the Japan Meteorological Agency. Archived images can available after April 2009.

Keywords: regional-scale air pollution, operational air quality monitoring

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Overview of geostationary satellites dataset by the VL project and characteristics of global cloud activities

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As one of the main targets of the ongoing project, ”Formation of a virtual laboratory for diagnosing the earth’ s climate system”, in the Center for Environmental Remote Sensing (CEReS), Chiba University, archiving, processing, and publishing geostationary meteorological satellites: GMS series and MTSAT by JMA, FY2 series by CMA, Meteosat and MSG series by the EUMETSAT, and GOES series by NOAA. Each raw data format is entirely different, and there are few sites to archive and provide all of the data in long term. CEReS processed re-sampled dataset in the geo-coordinates in recent 12 years in simple and almost the same file format. The spatial resolution of 0.04 degree for 2 or 3 IR channels and 0.01 degree for the VIS channel, in a latitude range of 60 degree in north and south hemispheres. All of the re-sampled data except Meteosat and MSG series because of their data policy is available via anonymous ftp sites. From this dataset, CEReS has been developing merging techniques among the satellites with well calibration, and algorithms to retrieve the earth’s radiation budget and physical parameters such as cloud optical thickness, cloud liquid water, direct and diffuse radiation at the top of the atmosphere and the surface, and so on.

Recently several low orbit earth observing satellites carrying cloud / precipitation radar and microwave imager are available to investigate cloud / precipitation characteristics. Their sensors directly detects cloud / precipitation system compared with VIS and IR sensors, however, it is never free from sampling problems (i.e. sampling frequency with bias in local time). Although it is something classical technique, one of the best advantages of the earth observations by geostationary satellites is to obtain IR and VIS data with high resolution in both space and time. This dataset available in global regions, therefore, it would greatly contribute to study on global cloud characteristics. As one of the interested characteristics, global distributions of peak local time with amplitudes of the cloud activities derived from IR band are investigated. Time distributions are generally consistent with previous studies, but their amplitudes are more distinct.

Keywords: geostationary meteorological satellite, virtual laboratory

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Security assessment of Food, Energy and Water resources

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Nobody could live without food. But FAO of the United Nations estimated that a total of 925 million people are undernourished, suffering from hunger in 2010. Moreover, world food demand in the future is expected to increase by population and economic growth. In this century, future food security is a serious challenge which we face. In addition to that, we should consider bioenergy. It is of large significance as a renewable energy source and reduction effects of carbon dioxide. What is more, bioenergy can avoid geopolitical risk because these materials are plants which spread widely. It is predicted that world primary energy in 2050 is 2.4 times as large as present primary energy. In addition, there are concerns about depletion of fossil fuel. Bioenergy which has above mentioned merits is expected to be a major energy carrier in the future. It has been suggested that 4 billion people by 2100 may be falling into high water stress due to changed water resources and increased water demand. 70% of global water consumptive accounts for the amount of agricultural water use are likely to continue increasing production of foods and bioenergy due to population growth. It is concerned that competitions for limited land and water between food and bioenergy occur water depletion. So, estimation which deals with food, bioenergy and water all together from past to future is required for realizing sustainable water use.

Firstly, we focused on the objective to assess the impact on water resources in global scale of the 20th century by considering only irrigated agricultural area changes, which is most important water use sector accounting for about 90% of total consumptive use, without under climate change. As a first step, we make the global spatial database of historical irrigated agricultural area change. Then, the water cycles were simulated on global-scale at resolution of 1.0 degree x 1.0 degree using this irrigated area data and an integrated global water resources model (H08). H08 can simulate both natural flow and anthropogenic water withdrawals etc. In the model, our three experiments were performed to simulate with human impact using volumetric fraction of withdrawal from only river, large reservoirs and NNBW (Non-local Non renewable Blue Water) which is the conceptual water source represents groundwater etc. As a result, agricultural water supply change from NNBW during the past 50 years agreed well with the observed groundwater abstraction. In addition, spatial distribution of the change from NNBW appeared many of the well-known hot spots of groundwater depletion: northeast Pakistan and the Ogallala Aquifer etc. This result was successful in simulations of global water withdrawals from groundwater.

Secondly, we modeled global energy crop potential. Three different land-cover types were chosen as potential area for cultivation of biofuel-producing crop: fallow land, grassland, and portion of forests (excluding areas sensitive for biodiversity such as frontier forest). We attempted to estimate the maximum global bioenergy potential and it was estimated to be 1120EJ (274EJ in fallow land, 770EJ in grassland, and 76EJ in 10% of forest). It is 2.4 times as large as primary energy and same as predicted primary energy in 2050. Finally, in order to handle this global challenge, we need to assess food security in terms of water, land and energy. In advance of the assessment, we estimate world food demand in the future with making several scenarios, such as one assuming that food consumption per capita will keep the present values or one assuming that hunger will be eradicated all over the world. We estimated that the demand of cereals (incl. fodder) will increase by 20˜70% until 2050.

About our future plan, we will simulate water supply and demand by increasing of food production and bioenergy on water cycles in the 21st century.

Keywords: Food demand, Bioenergy, Water resources, Integrated global water resources model: H08

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Erroneous variations of cloud cover obtained from the ISCCP data caused by satellites replacement

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This study examines variations in the Equivalent Black Body Temperature (TBB) and cloud cover during 1983-2008. These data were obtained from the International Cloud Climatology Project (ISCCP) D-series data. The ISCCP can observe cloud almost globally with using geostationary and polar orbiter satellites. The ISCCP calibrate the values of the TBB observed by each satellite with using those of NOAA-Afternoon (NOAA-A) polar orbiter satellites series for the purpose of dealing equally with observed values of each radiometer which has a different sensitivity. However, it has been found that the calibrated TBB has erroneous variations at a temperature of about 280K or higher. Shown in Fig.1 are the differences between the averaged TBB at a high temperature range obtained from ISCCP-calibrated GMS which are geostationary satellites series of Japan and that from non-calibrated GMS. Note that although Figure.1 shows the TBB of GMS, the differences clearly change as NOAA-A series (NOAA-7, 9, 11, 14, 16, 18) change from old one to new one. The erroneous effects of the inter-calibration show only at two temperature range which are higher than about 280K, or lower than about 220K.

Next it has been found that the erroneous variation of the TBB leads to erroneous variations of cloud cover. The difference between monthly averaged cloud cover from GMS and that from NOAA-A clearly changes from plus to minus while NOAA-A series change from NOAA-11 to NOAA-14, whereas differences of cloud cover between METEOSAT series which are another geostationary satellites and NOAA-A don't show such a sudden change through that time. In addition, the TBB of NOAA-A doesn't clearly change at a high temperature range from this term. These results suggest that the sudden change of cloud cover differences is regarded as the result of changing cloud cover of GMS. Since the decrease in the TBB at a high temperature range leads to decreases in the estimated clear sky TBB, in which case it becomes more difficult to detect cloud fractions from differences between the TBB of cloud and that of clear sky. The remarkable decrease of GMS cloud cover is believed to be due to the above mechanism. These analyses are carried out in such a way that the satellite from which we obtained data doesn't change its monthly averaged view angle for the period of the 25-year observation. This is because cloud cover observed from satellites is much larger near the edge than that in the center of their view areas. This error is called 'view angle dependence'.

The ISCCP inter-calibration lead to a decrease by 1.8K in the averaged TBB of GMS at a high temperature range in GMS region from the TBB averaged before the time which NOAA-A series change form NOAA-11 to NOAA-14 to the TBB averaged after the time. This leads to decreases in GMS Cloud cover to 3.0%, in which case long-term variations of GMS cloud cover show -2.2% per decade in the same period and area. As it is considered that a trend of NOAA-A cloud cover shows +0.5% per decade in the same situation, the inter-calibrations is thought of leading a considerable decreasing trend into GMS cloud data. Moreover it is predictable that the inter-calibrations will affect more severely on cloud height data because they are estimated directly from the TBB on the cloud top.

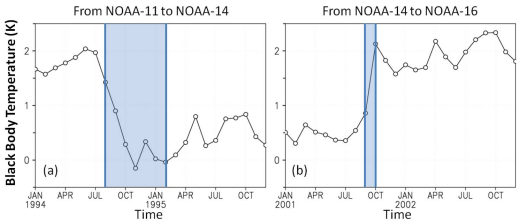

Figure 1. Differences between TBB obtained from ISCCP-calibrated GMS and those from non-calibrated GMS over the ocean close to GMS footprint. TBB are averaged monthly within higher temperatures than 280K. Blue lines represent time of NOAA-A series changing and blue shade in Fig. (a) express a term of data missing of NOAA-A. Intervals of the time axis are 3 month.

Keywords: cloud cover, satellite observations, ISCCP, satellite zenith angle, climate change

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Validation of the MRI/NPD-NHM over the tropical western Pacific

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We validate the mesoscale atmospheric model (MRI/NPD-NHM) over the tropical western Pacific during the 2008 and 2010 boreal summer. The calculations were originally conducted to support the observation project PALAU2008/2010. We focus on the variables related to typhoons (rainfall, vorticity, etc.) and discuss the possibility of the model.