Japan Geoscience Union Meeting 2013
(May 19-24 2013 at Makuhari, Chiba, Japan)

U02-P01 Room:Convention Hall Time:May 20 18:15-19:30

Prototyping Integrated River Basin Management Based on the Data Integration and Analysis System (DIAS)

Toshio Koike[1*]

[1]UTokyo/EDITORIA

Increased water cycle variability impacts primarily through water, biological processes and human dimensions with implications for land use and societal development. It is critically important to recognize the fundamental linkages among water; land use, including deforestation; carbon cycle and ecosystem services; and food-, energy- and health- securities. By sharing coordinated, comprehensive and sustained water cycle and related Earth observations and information for sound decision making, we are now in developing effective interdisciplinary collaborations for working together based on coordinated and integrated efforts and subsequently to both mitigation and adaptation benefits at a river basin scale. Building resilience to the climate change and variability is essential for establishment toward the final goal, the sustainable development of Earth's societies and ecosystems.

Keywords: water cycle, river basin, resilience, Earth observation, data integration

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U02-P02 Room:Convention Hall Time:May 20 18:15-19:30

CEOS Water Portal, one of the DIAS distributed data systems

Kaori Kuroiwa[1*], KUDO, Yoshiyuki[1], TAKAGI, Masao[1], MIURA, Satoko[2]

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

The CEOS Water Portal is a one of the DIAS (Data Integration and Analysis System) data distributed systems.
The CEOS Water Portal system is distributed in the sense that, while the portal system is located in Tokyo, the data is located in archive centers which are globally distributed. For example, some in-situ data is archived at the National Center for Atmospheric Research (NCAR) Earth Observing Laboratory in Boulder, Colorado, USA. The NWP station time series and global gridded model output data is archived at the Max Planck Institute for Meteorology (MPIM) in cooperation with the World Data Center for Climate in Hamburg, Germany. Part of satellite data is archived at DIAS storage at the University of Tokyo, Japan.

This portal does not store data. Instead, according to requests made by users on the web page, it retrieves data from distributed data centers on-the-fly (by OPeNDAP protocol etc.) and lets them download and see rendered images/plots.
The CEOS Water Portal intends to extend its users to include decision makers and officers like river administrators by facilitating a feedback loop. One example of data and information flow centered on the CEOS Water Portal is shown below.

(1)Scientists get various data needed for Model Calculation (WEB-DHM, for example) via the portal.
(2)Scientists use Model output data and do analysis.
(3)Scientists register their use cases into the portal.
(4)Decision makers and officers can refer and acquire use cases and data easily.

The portal is available at http://waterportal.ceos.org and the demo will be presented touching on some use cases.

Keywords: CEOS, Water Portal, DIAS, Satellite data, In-situ data, Model output data

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U02-P03 Room:Convention Hall Time:May 20 18:15-19:30

A Global Environmental Database Project at the National Institute for Environmental Studies and its contribution to DIAS

Hideaki Nakajima[1*], NOJIRI, Yukihiro[1], SAIGUSA, Nobuko[1], SHIRAI, Tomoko[1], MACHIDA, Toshinobu[1], MUKAI, Hitoshi[1]

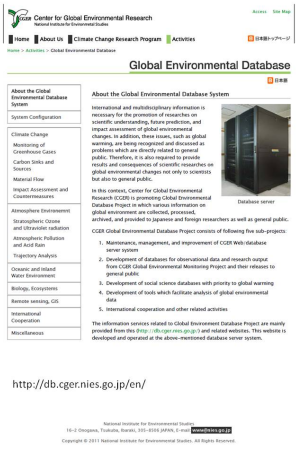
[1]National Institute for Environmental Studies

We, the Office for Global Environmental Database, at the Center for Global Environmental Research (CGER), in National Institute for Environmental Studies (NIES), has been constructing and providing databases on several topics related to earth's global environment since early 2000s. The tasks of our project are divided into 5 major categories: 1) To construct, maintain, and renew database servers which provides our databases. 2) To construct databases and provide public/related researchers with data which were gathered by earth environmental monitoring project in our institute. 3) To construct databases on social environmental sciences related to global warming. 4) To develop convenient tools to analyze earth environmental datasets. 5) To achieve international cooperation on database-related issues.

Currently, we are providing the following databases from our server in NIES (number of databases): A) Databases on global warming: Related to greenhouse gases observations (7). Related to carbon sources/sinks (8). Related to material flow (10). Related to effect and measure of global warming (3). B) Databases on atmospheric environment: Related to stratospheric ozone layer/UV (6). Related to air pollution/acid rain (10). Related to trajectory analysis (1). C) Databases on marine/lake environment (8). D) Databases on biology (3). E) Databases on satellite remote sensing/GIS (7). F) Databases on international cooperation (7). G) Databases on other topics (6).

Current status and future plan of database project in NIES will be presented. Also, a perspective on contribution of our database for DIAS/GRENE which started in FY2011 will be presented.

Keywords: database, global environment, global warming, climate change, DIAS, GRENE



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U02-P04 Room:Convention Hall Time:May 20 18:15-19:30

FORMOSAT-3/COSMIC Temperature in the Middle Atmosphere - Comparison with SABER & MLS Temperatures and Reanalyses Data

Chen-Jeih Pan[1*], Uma Das[1]

[1]National Central University, Taiwan

GPS radio occultations by FORMOSAT-3/COSMIC constellation of micro-satellites provide refractivity profiles, which are processed real-time by the COSMIC Data Analysis and Archive Center (CDAAC) at the University Corporation for Atmospheric Research (UCAR) to give profiles of temperature and water vapour in the lower atmosphere and electron density in the upper atmosphere. The 'atmprf', i.e., atmospheric profile, product gives temperature from surface to 0.2 hPa (˜ 60 km). This is a dry temperature data product that does not include relative humidity in the inversion process and hence is reliable in the stratosphere and lower mesosphere from 100 to 0.2 hPa and erroneous in the troposphere (< 100 hPa). For lower atmosphere investigations the 'wetprf' product is available which includes the relative humidity term in the data inversion process. In the current study we compare the COSMIC 'atmprf' data with other satellite temperatures (SABER/TIMED and MLS/Aura) from 50 to 0.2 hPa and reanalyses outputs (NCEP, ERA-Interim, and UKMO) at 100, 10, 1 and 0.5 hPa pressure levels. Temperature differences between seasonal medians in different latitude regions show that the COSMIC temperatures are greater than SABER temperatures by 2-3 K in the lower altitudes (> ˜5 hPa) and lower by 5-6 K at higher altitudes (< ˜1 hPa). From 5 to 1 hPa the differences change from negative to positive. This pattern is very systematic in all latitude regions and during all seasons. On the other hand, differences between COSMIC and MLS median temperatures are very small below ˜0.5 hPa and oscillate between +/- 1 K. Above ˜0.5 hPa the COSMIC temperatures are greater by 7-8 K. When compared to reanalyses outputs, COSMIC seasonal means match NCEP and ECMWF seasonal mean temperatures very well, especially at 100 and 10 hPa. The global differences are in between +/- 1 K at 100 hPa and +/- 2 K at 10 hPa. At 1 hPa the differences between COSMIC and ECMWF are greater, especially at high latitudes. On the other hand COSMIC and UKMO seasonal mean temperatures do not agree with each other except during summer and winter at lower altitudes where the differences are in between +/- 2 K. We thus conclude from this study that COSMIC temperatures obtained from radio occultations of GPS are of good quality and match very well with other satellite temperatures retrieved from limb emission measurements and also reanalyses outputs. The COSMIC mission can thus provide more data at greater temporal and spatial resolutions for further studies and investigations of the middle atmosphere. We take this opportunity to introduce this database to the middle atmosphere community for investigating the various geophysical processes in the stratosphere, stratopause, and lower mesosphere. We believe that this database would be extremely useful in investigating the planetary waves, tides, and gravity waves, and phenomenon like the sudden stratospheric warmings, double stratopause, two-way coupling of the troposphere-stratosphere-troposphere (by merging with the 'wetprf' dataset), and its effect on weather and climate, etc.

Keywords: FORMOSAT-3/COSMIC, Middle Atmosphere, GPS RO, Data Validation

Japan Geoscience Union Meeting 2013
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U02-P05 Room:Convention Hall Time:May 20 18:15-19:30

The IUGONET project and its international cooperation on development of metadata database for upper atmospheric study

Akiyo Yatagai[1*], Yukinobu Koyama[2], Tomoaki Hori[3], Shuji Abe[4], Yoshimasa Tanaka[5], Atsuki Shinbori[1], Satoru UeNo[6], Norio UMEMURA[3], Yuka Sato[5], Manabu Yagi[7], Bernd Ritschel[8], Toshihiko Iyemori[2]

[1]RISH, Kyoto University, [2]World Data Center for Geomagnetism, Kyoto University, [3]Solar-Terrestrial Environment Laboratory, Nagoya University, [4]International Center for Space Weather Science and Education, Kyushu University, [5]National Institute of Polar Research, [6]Kwasan and Hida Observatories, Kyoto University, [7]Graduate School of Science, Tohoku University, [8]Scientific Infrastructure, GeoForschungsZemtrum Potsdam

The upper atmospheric observational study is the area which institutional and international collaborations are crucially important. In order to investigate the mechanism of long-term variations in the upper atmosphere, we need to combine various types of in-situ observations and to accelerate data exchange. The Japanese Inter-university Upper atmosphere Global Observation NETwork project (2009?2015), IUGONET, is an inter-university program by the National Institute of Polar Research (NIPR), Tohoku University, Nagoya University, Kyoto University, and Kyushu University to build a database of metadata for ground-based observations of the upper atmosphere. The IUGONET institutions have been archiving observed data by radars, magnetometers, photometers, radio telescopes, helioscopes, etc. in various altitude layers from the Earth's surface to the Sun. The IUGONET has been developing systems for searching metadata of these observational data, and the metadata database (MDB) has already been operating since 2011. It adopts DSPACE system for registering metadata, and it uses an extension of the SPASE data model of describing metadata, which is widely used format in the upper atmospheric society including that in USA. Hence, these systems can be extended to incorporate other formatted data which are used in the STP community, and we are incorporating the metadata of the data obtained by the cooperative institutions such as NAOJ, NICT and Kakioka Magnetic Observatory of JMA.

The European Union project ESPAS (2011?2015) has the same scientific objects with IUGONET, namely it aims to provide an e-science infrastructure for the retrieval and access to space weather relevant data, information and value added services. It integrates 22 partners in European countries. The ESPAS also plans to adopt SPASE model for defining their metadata, but search system is different. Namely, in spite of the similarity of the data model, basic system ideas and techniques of the system and web portal are different between IUGONET and ESPAS. In order to connect the two systems/databases, we are planning to take an ontological method. The SPASE keyword vocabulary, derived from the SPASE data model shall be used as standard for the description of near-earth and space data content and context. The SPASE keyword vocabulary is modeled as Simple Knowledge Organizing System (SKOS) ontology. The SPASE keyword vocabulary also can be reused in domain-related but also cross-domain projects. The implementation of the vocabulary as ontology enables the direct integration into semantic web based structures and applications, such as linked data and the new Information System and Data Center (ISDC) data management system.

Keywords: database, metadata, atmosphere, earth science, international collaboration

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U02-P06 Room:Convention Hall Time:May 20 18:15-19:30

Data analysis software developed by the IUGONET project

Yoshimasa Tanaka[1*], Atsuki Shinbori[2], Tomoaki Hori[3], Yukinobu Koyama[4], Shuji Abe[5], Norio UMEMURA[3], Manabu Yagi[6], Satoru UeNo[7], Yuka Sato[1], Akiyo Yatagai[2]

[1]National Institute of Polar Research, [2]Research Institute for Sustainable Humanosphere (RISH), Kyoto University, [3]Solar Terrestrial Environment Laboratory, Nagoya University, [4]Data Analysis Center for Geomagnetism and Space Magnetism, Kyoto University, [5]International Center for Space Weather Science and Education, Kyushu University, [6]Planetary Plasma and Atmospheric Research Center, Graduate School of Science, Tohoku University, [7]Kwasan & Hida Observatories, School of Science, Kyoto University

The Inter-university Upper atmosphere Global Observation NETwork, IUGONET, is an inter-university project by the National Institute of Polar Research, Tohoku University, Nagoya University, Kyoto University, and Kyushu University to build the infrastructure to access, visualize, and analyze the upper atmospheric data accumulated by the five institutions. In this presentation we introduce the data analysis software, UDAS (iUgonet Data Analysis Software), developed by the IUGONET project.

It is essential to comprehensively analyze various kinds of observational data to clarify the mechanism of long-term variations in the upper atmosphere. However, the observational data are individually archived at each institution and the file format of the data is usually different from each other. Since it is difficult to unify the file format because of a variety of data type and limited human resources, we developed data analysis software that can handle the various file formats. UDAS is a plug-in software of TDAS (THEMIS Data Analysis Software suite) that is written in IDL (Interactive Data Language). Once the data providers make the procedures for loading their data, UDAS can download the data files onto the user's computer through the internet and load variables to the IDL workspace. Furthermore, UDAS provides GUI for beginners of IDL. The formal version of UDAS has been released at the IUGONET website in February, 2012.

Keywords: metadata, upper atomosphere, long-term variation, analysis software, database

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U02-P07 Room:Convention Hall Time:May 20 18:15-19:30

Database of optical and radio wave observation network of the Tohoku University

Manabu Yagi[1*], Takahiro Obara[1], Masato Kagitani[1], Mizuki Yoneda[1], Atsushi Kumamoto[1], Hiroaki Misawa[1], Fuminori Tsuchiya[1], Kazumasa Iwai[2], Naoki Terada[1], Takayuki Ono[1], Hiroyo Ohya[3]

[1]PPARC, Tohoku Univ., [2]National Astronomical Observatory, [3]Chiba Univ.

Planetary Plasma and Atmospheric Research Center (PPARC) of the Tohoku University is now in progress to build a upper atmosphere, planetary, and space physics database under collaboration with the Inter-university Upper atmosphere Global Observation NETwork (IUGONET). The core data of the database are planetary and solar radio observation by Iitate Planetary Radio Telescope (IPRT) and Jupiter/galaxy decameter radio receiver working in Iitate observatory, that is one of the observatory of Tohoku University. Recently, development of database of LF/VLF wave observation at Athabasca, Ny-Alesund, and Asia VLF observation network (AVON) are undergoing under collaboration with Chiba University. In the presentation, we will introduce the observations of solar radio burst with high time resolution using the AMATERAS spectrometer of IPRT, as well as lightning and precipitation of high energy electrons into the atmosphere observed by LF/VLF wave. We will also introduce the optical observation of auroral image and geomagnetic data observed in Alaska.

Keywords: database, upper atmosphere, radio observation, optical observation