CEOP
An Element of the World Climate Research Programme (WCRP), initiated by the Global Energy and Water Cycle Experiment (GEWEX)

Coordinated Enhanced Observing Period

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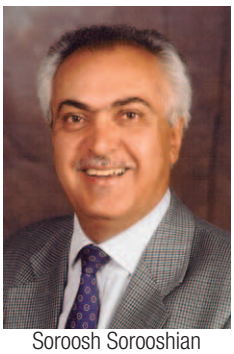
CEOP Phase 2: An Important Effort for Future Climate Observational and Research Studies

Soroosh Sorooshian, Chairman of the World Climate Research Programme (WCRP) International Global Energy and Water Cycle Experiment (GEWEX) Scientific Steering Group (SSG)


Soroosh Sorooshian

In the relatively short period since it was conceived in the late 1990s and endorsed by the Global Energy and Water Cycle Experiment (GEWEX) Scientific Steering Group (SSG) and the World Climate Research Programme (WCRP) Joint Scientific Committee (JSC) in 2001, CEOP has developed a comprehensive mechanism for coordinating observations and the archival of data sets associated with its global network of reference sites, ranging from in-situ and satellite observations, to model-generated information. CEOP elements include specialized methodologies to integrate observations based on coordination among field science groups, space agencies, and numerical weather prediction centers at all scales from local to global.

Having had the opportunity to experience the evolution of CEOP as an international project, there are a number of interesting observations which I wish to share with you. First, when we presented the case for CEOP Phase I to JSC, it was mildly criticized for "being only another data/observation effort" and without a well-defined scientific agenda. Shortly after the initial CEOP data sets became available and scientists started to formulate plans to examine a number of climate-related science questions, concerns were raised about the territorial domain and the ownership by various programs of specific scientific topics. CEOP's proposed Monsoons System Studies, specifically, the CEOP Inter-monsoon Model Study (CIMS), is a case in point. As a result of concerns over CIMS in June 2005 a Pan-Monsoon Workshop was held in Irvine, California, which brought together colleagues from all WCRP projects with the goal of articulating some of the common scientific monsoon questions that all projects, including CEOP, could help to address.

My reason for giving the specific example of CIMS is to highlight a few points. First, if it wasn't for CEOP, I am not certain that we would have had such a workshop anytime soon. Second, is this single workshop sufficient to streamline all WCRP activities related to monsoons? The answer is no – but we certainly are moving in the right direction. I anticipate that a number of other CEOP science initiatives will touch some sensitive cords and hence result in steps to achieve a greater degree of coordination and synergism between programs. In my view, JSC, under the COPES framework, has a key role to play in this regard. But this by no means is a suggestion of "passing the buck" entirely to JSC. At our most recent GEWEX SSG meeting in Dakar, a number of issues were identified which require coordination within GEWEX, specifically between our panels (GHP, GMPP and GRP) and CEOP. I am not suggesting that we should have excessive top-down coordination but more coordination between panel leaders could be helpful. At the end of the day, it is the teams of scientists who write successful proposals that obtain the funds necessary to carry out the research on issues such as monsoons, precipitation, extremes, etc. It is my personal belief that we have to be extremely careful of not creating too many high level coordination committees and panels who have no funding power and, if their priorities are not in sync with each other, may confuse the funding agencies with too many acronyms. Sensitivity to the national approaches that work for the scientists to obtain resources to carry out research should be respected and not jeopardized by mixed signals coming from the top.

In closing, thanks to CEOP, we are finally facing the reality that many of the burning climate-related questions that WCRP is trying to address under the COPES framework cut across different projects. It is my personal belief that we should worry less about the turf issues and support sound scientific efforts. This is the main reason why the GEWEX SSG in its recent (January 2006) meeting in Dakar, Senegal, endorsed the basic framework of the CEOP Phase II Implementation/Science Plan. We all recognize that there is no such a thing as a "perfect" plan for any science program. It is always a "work-in- progress." Hence I salute all of you who are giving so much of your time and energy to CEOP and making it the model of a truly grassroots and broad-based international effort. For those in doubt, I strongly encourage you to participate in one of CEOP's frequently held conference calls. Each of these calls involves as many as 15 scientists from almost all continents dealing with issues related to observations, data management, model outputs and scientific research. Needless to say, the leadership provided by Toshio Koike for CEOP and the support given by Japan for this effort is unmatched and truly appreciated by all in GEWEX .

Contents:

CEOP Phase 1 Reference Site Data Set Availability

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The achievement of the primary science goals of CEOP Phase 1 would not be possible without ready access to the high quality observations of sub-surface, surface, near surface and upper air parameters being made at the 35 CEOP reference sites. The procedures that have been developed and implemented by the CEOP Reference Sites and the CEOP Central Data Archive (CDA) at the National Center for Atmospheric Research (NCAR) Earth Observing Laboratory (EOL) (formerly UCAR/JOSS) for consistent formats and quality assurance have been vital to this process. The CEOP Phase 1 Reference Site data set is a unique global data set that will be useful for model evaluation and validation studies as well as research into the global energy and water cycles. Another important aspect of CEOP Phase 1 is that it has shown the advantage of coordinated international data activities between Reference Site operators, the research community, operational centers and data management groups.

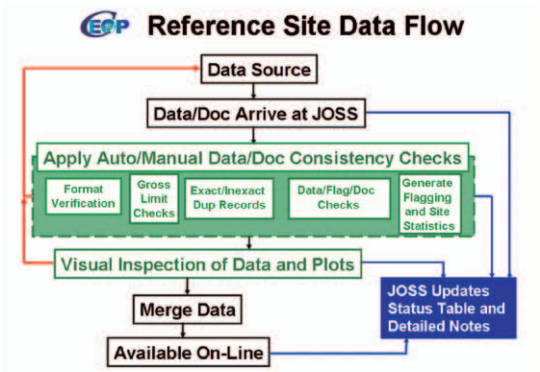

Figure 1: Data flow chart for CEOP Phase 1 Annual Cycle Data Sets (EOP-3 and EOP-4)

The Preliminary Enhanced Observing Period (EOP-1) took place from July to September 2001 and a prototype composite reference site data set was developed by NCAR/EOL. As many sites were still in development during this phase, only 16 sites submitted data for inclusion in this data set. These data were converted by NCAR/EOL to a common format and underwent quality checks prior to data release. Two types of data sets were developed for the preliminary period: a surface meteorology, flux and radiation data set and a soil heat flux, moisture and temperature data set. Both data sets were at an hourly resolution. This prototype data set was released in February 2003 and is available at the following URL: http://www.joss.ucar.edu/ghp/ceopdm/archive/eop1_data/. These data have been utilized in a number of model validation studies (e.g. Rockel, et al., CEOP Newsletter 8, Hirai and Matsumura, CEOP Newsletter 6). The prototype data set was thoroughly evaluated during the CEOP Reference Site Manager's Workshop and 2nd CEOP Implementation Planning Meeting in March 2003. Several improvements were agreed upon for the following annual cycle data sets and NCAR/EOL developed the CEOP Reference Site Data set Procedures Report to outline the new data and metadata formats and requirements (http://www.joss.ucar.edu/ghp/ceopdm/refdata_report/).

The full annual cycle data sets include EOP-3 (October 2002 to September 2003) and EOP-4 (October 2003 to December 2004). Among the changes from EOP-1, the annual cycle data sets are comprised of four 30-minute resolution data sets: a surface meteorology and radiation (SFC), meteorological tower (TWR), soil temperature and moisture (STM), and flux (FLX). Additionally, high resolution sounding data (SONDE) in the native format are made available. In another change, the GEWEX Continental Scale Experiments and Reference Site managers coordinate the format conversion and initial quality assurance. The initial submissions for these data sets started in October 2003. Each data set that is submitted to EOL undergoes a process that is shown in Figure 1. All submitted data sets and documents are first inventoried via a set of specialized web pages. A suite of automated checks are conducted that ensure the data are in the proper format, ensure the values are reasonable for a location on Earth, summarize the usage of the data quality flags, etc. Time series plots are created and manually examined for each parameter measured for each station included in a Reference Site. Finally, a number of other manual checks are conducted to examine for consistency between the submitted data and documentation. Whenever potential problems are identified in the course of these checks, they are communicated back to the data provider for confirmation or correction. Once all issues have been resolved, the data are made available via the CEOP EOP-3 and EOP-4 Reference Site Data Archive web page (http://www.joss.ucar.edu/ghp/ceopdm/archive/). The EOP-3 and EOP-4 data sets have also recently been used in CEOP research (e.g. Rockel, et al., CEOP Newsletter 8).

A summary of the data available as of 19 December 2005 is included in Table 1. A total of 8 Reference Sites have two complete annual cycles (EOP-3 and EOP-4) available from the CDA. These include the BALTEX Cabauw and Lindenberg, CAMP Himalayas, GAPP Bondville and ARM Southern Great Plains (SGP), LBA Brasilia and Manaus, and Other ARM North Slope of Alaska (NSA) and Tropical Western Pacific (TWP) reference sites. Another 10 reference sites have the complete first annual cycle (EOP-3) data set available. Finally, another 7 reference sites have data available from the first half of EOP-3 (October 2002 to March 2003). The remaining 10 Reference Sites have submitted data sets to the CDA, however potential issues or questions have not been finalized and the Reference Sites are in the process of evaluating these items before the data will become available.

Acknowledgement

The authors acknowledge the significant efforts of each of the Reference Site managers and Continental Scale Experiment representatives in coordinating the collection and reformatting of the data from their sites and making it available in a timely manner.

CSE	Reference Site	FLX	SFC	STM	TWR	SONDE
BALTEX	Cabauw					
	Lindenberg					
	Sondakylä					
CAMP	Chao-Phraya					
	Equatorial Island					
	Himalayas					
	Korean Haenam					
	Korean Peninsula					
	Mongolia					
	Northeast Thailand					
	N. South China Sea					
	Siberia Taiga					
	Siberia Tundra					
	Tibet					
	Tongyu					
	Western Pacific Ocean					
GAPP	Bondville					
	Ft. Peck					
	Oak Ridge					
	SGP					
LBA	Brasilia					
	Manaus					
	Pantanal					
	Santarem					
Other	ARM NSA					
	ARM TWP					

Table 1: CEOP Reference Site data sets available as of 19 December 2005. Data sets that have the complete EOP-3 and EOP-4 period available from the CDA are shaded dark green and those shaded light green have the complete EOP-3 and first half EOP-4 period available. Those shaded dark red have the complete EOP-3 period available and those shaded pink have the first half of EOP-3 available. Boxes shaded white represent data sets that are expected but are not yet available and the black boxes are data sets that are not collected at the site.

The WDC-Climate as CEOP Model Data Center

Frank Toussaint, **Michael Lautenschlager**, **Hans Luthardt**, Max-Planck-Institute for Meteorology, Hamburg, Germany

1. Introduction

Within CEOP, three main data types have to be handled: 1) satellite data, 2) in-situ products from different measuring stations, and 3) model output from different numerical weather prediction (NWP) centers. The model data is managed by the World Data Center for Climate (WDC-Climate) in cooperation with the Max-Planck-Institute for Meteorology (MPI-M) for the CEOP community. For more information on WDC-Climate see www.wdc-climate.de.

The model output data can be grouped into two types. The first is the globally gridded model output, which covers all four space-time dimensions and is stored every model's time step on a global basis. Two years of data to cover the two CEOP annual cycles (EOP-3, -4) require up to one Terabyte for an output set of about 60 to 100 parameters (4 time steps a day, 320x160 longitude/latitude grid, 50 altitude levels).

The second type of model data is used to compare against the measurements taken at the CEOP reference sites located around the globe. Accordingly, for each physical parameter a 1-D Model Output Location Time Series (MOLTS) is extracted from each of the model data grids. Together with the in-situ measurements these data correlate with the 35 CEOP "reference sites", which are listed at the CEOP Data Management Web Page:
http://www.joss.ucar.edu/ghp/ceopdm/ref_site.html

2. The Homogenization Task at WDC-Climate

The CEOP data arrive at the WDC-Climate from eleven different numerical weather prediction (NWP) centers. Grid data is disseminated in the standard Gridded Binary (GRIB) format, but different data struc-tures and code tables are used. The code tables specify the physical quantities, which themselves may be defined differently. Thus, map-ping the output of different models from different centers can be a difficult task. Furthermore, the data have different storage structures (vertical coordinate system, order of dimensions, etc.). Because of these issues, it is more difficult to deal with different data structures than with large data volumes. Structure homogenization requires a considerable amount of effort.

Since most users are mainly interested in downloading homogeneous data, it is important to quickly clarify their requirements and to include as many options as possible in the WDC-Climate storage structure and format. Decisions of this type have to be made separately for time series of global coverage, time series of vertical profiles, and so on. The current set of filing states can be seen at:
http://www.mad.zmaw.de/CEOP/Data_timeline.html (see figure 1).

3. Grid Point Data from Climate Models

Grid point data is uploaded to WDC-Climate in GRIB format, however, since the GRIB convention codes each physical parameter with a so-called "code number", the coding may differ between the different NWP centers.

About one half of the expected data has already been uploaded to the WDC-Climate archive. It covers mostly the time to the end of the CEOP Phase 1 period (end of 2004). The upload of data from all of the centers is expected to continue beyond that point in time and data from the National Center for Environmental Prediction (NCEP) in the USA data beyond the end of 2004 is already in the archive and continues to be uploaded. Most of this data was already transferred into the Climate and Environmental Data Retrieval and Archive System (CERA) database and is accessible through the Internet from the CEOP database at WDC-Climate in the data structure provided by the NWP centers.

4. MOLTS Data

For the local time series of the NWP centers' models it was decided to hold the data in three different forms. First the data blocks are stored as they are provided originally by the CEOP partners. This original data is disseminated in very different formats. Depending on their source the data formats vary from pure binary

over different forms of NetCDF to plain ASCII. Furthermore, the descriptions of the contents are inhomogeneous. In this raw form most data are presently accessible by the WDC-Climate web browser interface.

In a second step the data are homogenized to the network Common Data Form – Climate and Forecast (netCDF-CF) standard format. The WDC-Climate was assisted in this process by the broader CEOP Community, especially the Australian, Bureau of Meteorology Research Center (BMRC) and the German, Forschungszentrum Geesthacht GmbH (GKSS). Presently, the conversion of this data is in progress.

Finally, the data are directly filled into Database tables as standard real numbers, where they can be accessed number by number via the Internet. This form of access is optimized for the link to the WTF-CEOP system (WGISS Test Facility for CEOP, Distributed Data Integration System Prototype). The interface, necessary for the table data download from the database, is currently running and data retrieval from WTF-CEOP has started for a pilot data set in November 2005.

5. The CERA-2 Graphical User Interface

Since CEOP climate data is requested from all over the world, WDC-Climate offers an Internet access and download capability to all users. Presently, this is achieved by a Java browser applet, which can be found at ceop.wdc-climate.de. However, plans are in place to switch to an html database interface in early 2006 in an effort to avoid problems associated with system firewall protection schemes. Additionally, a Java programme for script based data access is available.

In the archive catalogue the data is grouped by projects that consist of various experiments. Every experiment is subdivided into data sets (see ceop.wdc-climate.de). The CEOP data can be obtained under the project name “CEOP: Coordinated Enhanced Observing Period”.

6. Direct Web Access to Metadata and Data

Recently, an Extensible Markup Language (xml) interface to the complete set of catalogue data (metadata) was installed. As the information can be mapped to different formats, the WDC-Climate metadata can be ingested into other catalogue systems. For the http access to the metadata see wini.wdc-climate.de.

For MOLTS table data the direct http-access is provided and prototypically used by WTF-CEOP. The servlet responds to the URL-queries by html or plain text.

7. CEOP as Prototype Element of the WDC-Climate Data System

Most of the data downloads that were requested from WDC-Climate during 2005 were related to CEOP (see figure 2). As a result of the regular interaction with the various elements of CEOP and feedback from users of this data it is gratifying to say that the integration of all model data from the CEOP NWP centers was without major problems and will be a promising and stable basis for future CEOP as well as broader climate model archiving activities.

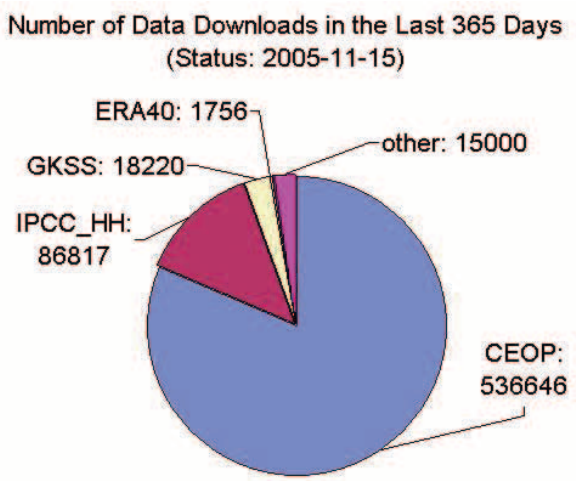

Figure 2: Data downloads requested from WDC-Climate during 2005

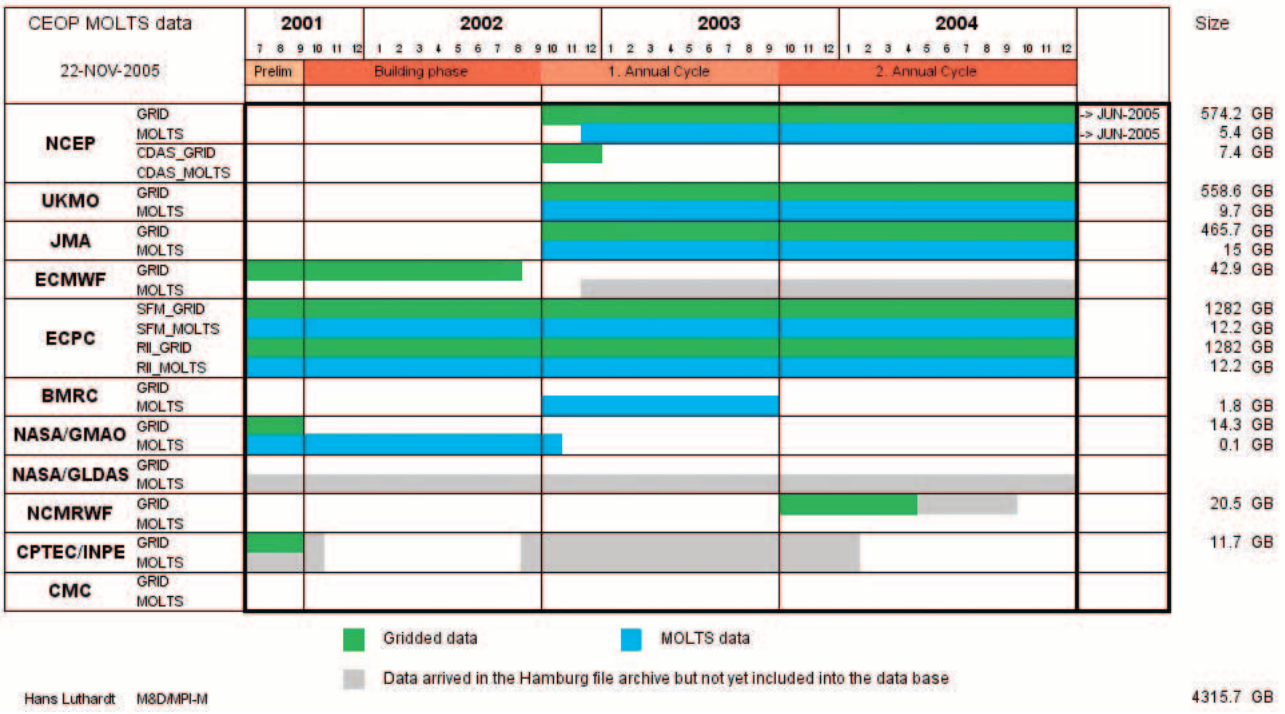

Figure 1: CEOP Model Database Status at WDC-Climate as of 22 November 2005

Centralized Data Archiving and Integration System: University of Tokyo Contribution

Masaru Kitsuregawa[1], **Toshihiro Nemoto**[1], **Masaki Yasukawa**[1], **Eiji Ikoma**[2], **Kenji Taniguchi**[3], **Toshio Koike**[3]
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The better understanding and improved predictability of the energy and water cycle cannot be achieved without data and information sharing capabilities, including data management and integration systems that comprise functions related to data access, archive, integration and visualization, and information fusion. The success of CEOP in linking to the GHP CSEs as the basis for the collection of in-situ data and to agencies and centers to contribute satellite and NWP model outputs respectively has included a parallel achievement in establishing an international framework for archiving these data and providing them to the science community. The data should be freely available to any and all users free of any costs. It is, therefore, essential to establish integration services for collecting, archiving and distributing coordinated and quality checked in-situ, satellite, and model output datasets.

The total amount of the CEOP Phase 1 data will be around 300 Terabytes. The data was originally produced by various sources and came in a wide variety of formats and structures. CEOP started by addressing possible solutions to this important heterogeneity issue. In response to this situation there was recognition of the need for data management systems for the collection, sharing, integration and supply of data from which users can extract subsets from wherever they need them and whenever they want them, and in formats familiar to the science community.

The development of a centralized data archiving and integration system is one of the major components achieved through CEOP.. he purpose of the CEOP centralized system are to provide researchers with an environment that is easy to manipulate and has an integrated interface with various formatted earth environmental datasets that can be retrieved by accessing basic processing and visualization functions associated with the archived data.

The architecture of the centralized data archiving and integration system is shown in Figure 1. The system manages all of the data and metadata together using a tape library system and disk arrays to store the data with location transparency. The details of the system and architecture are given in Nemoto and Kitsuregawa (2005).

Users can access all types of data through a single interface and can view the retrieved data as graphical charts or images, depending upon their dimensionality. Retrieved data is listed in the user's workspace and various processing and visualization operations can be applied to it. The client has various functions like changing temporal and spatial resolution, spatial and temporal averaging, unit conversion, and basic mathematical functions (logarithm, trigonometric functions, square root, power, etc) that are very useful in analyzing the data. The visualization functions include one-dimensional (line, scatter) and two-dimensional plots. Multiple data sets can be overlaid in a single plot (Figure 2). Users can customize specifications for plotting (color, contour interval, region, images size, etc). All these operations are available in the working space of each user on the server (Ikoma et al., 2005, Taniguchi et al., 2005).

The system architecture enables users to browse and analyze a large volume of data, even if their computer environments do not have enough capacity for the entire amount of data. This feature is another advantage of the CEOP centralized data integration system. At the same time, retrieved or processed data can be acquired by the users on their own computers. At present, NetCDF and several text formats are available that the users can choose from according to their needs.

The system has already been opened to the CEOP community. To use the CEOP centralized system, users do not need any commercial software; however, a CEOP data client application is required that is provided through the CEOP client web page listed in following references.

References:

Nemoto, T and M. Kitsuregawa, CEOP Data Server and Browse/Analysis Interface, CEOP/IGWCO Joint Metting Proceedings, pp.83-86, 2005.

Ikoma E. et al, Development of a Visual Data Mining Application for Earth Environmental Data, CEOP/IGWCO Joint Metting Proceedings, pp.87-90, 2005.

Taniguchi, K. et al., CEOP centralized data system and integrated analysis tools, Proc. of the 11th CEReS International Symposium on Remote Sensing, Dec. 13-14 2005, Chiba University, in press.

CEOP data client web page; http://monsoon.t.u-tokyo.ac.jp/ceop-dc/ceop-dc_top.htm

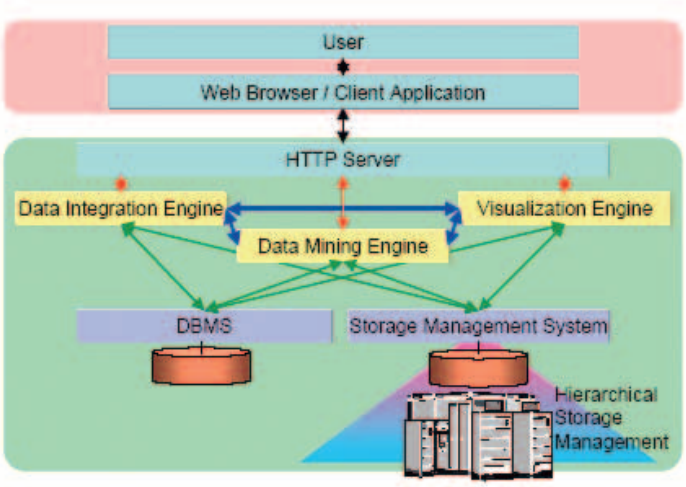

Figure 1: The Architecture of the CEOP Centralized Data Archiving and Integration System

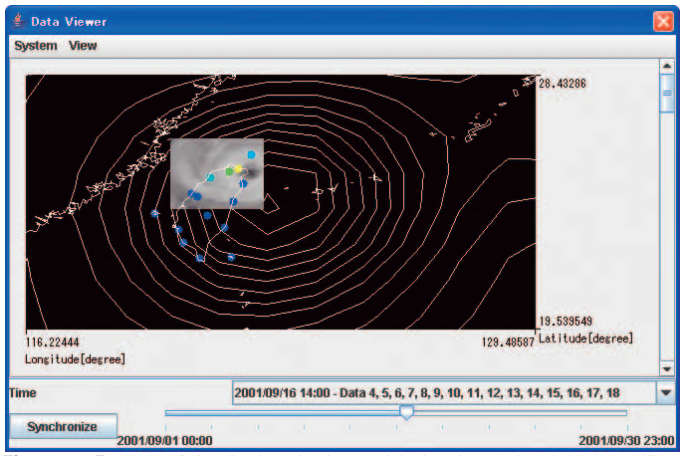

Figure 2: Example of visualization. In-situ precipitation data (colored dots), satellite data (GMS IR1) and model output (Geopotential Height) is overlaid.

The WGISS Test Facility for CEOP

Osamu Ochiai[1], **Ben Burford**[1], **Ken McDonald**[2], **and Yonsook Enloe**[2], [1]JAXA, Tokyo, Japan; [2]NASA, USA

The CEOP science community utilizes a wide variety of data sets, obtained from many different sources ranging from field observations and satellites to modeling software. The CEOP Program initiated a discussion with the Committee on Earth Observation Satellites (CEOS) Working Group on Information Systems and Services (WGISS) for assistance in the development of advanced tools for integrated access, visualization and comparison of these multiple types of data. CEOS WGISS initiated a project, the WGISS Test Facility for CEOP (WTF-CEOP), to collaboratively prototype a set of tools and services needed to provide data integration to support CEOP science. JAXA (the lead agency) and NASA participated in the first phase of WTF-CEOP by initiating independent prototypes, both of which were successfully demonstrated at the Spring 2005 CEOP meeting. A second phase is currently being planned where existing tools and software (e.g. OPeNDAP suite of complementary clients and servers such as the Grads client, Ferret, and Live Access Server; the Open Geospatial Web Coverage Server, NASA's ECHO catalog system, and the THREDDS catalog server) are expected to be tailored in order to provide a wider set of the data services needed for data integration.

I. The JAXA Prototype for WTF-CEOP

The purpose of JAXA's Prototype for the WTF-CEOP is to provide user-friendly access to the CEOP (in-situ, satellite and model output) data. The system is distributed in the sense that, while the system is located in Tokyo, the data is located in archive centers, which are globally distributed (see Figure 1). The in-situ data is archived at NCAR/EOL (former UCAR/JOSS) in Boulder, Colorado, USA. The model output data (MOLTS and gridded global fields) is archived at the WDC-Climate in cooperation with MPI-M in Hamburg, Germany. The satellite data is archived at the Institute of Industrial Science (IIS) at the University of Tokyo, in Tokyo, Japan. Other (non-CEOP) globally distributed data that is on DODS servers can be added in the future according to scientists' requests.

The system is integrated in the sense that all of the data is temporally and geospatially coordinated and can be selected and viewed within the same system. The in-situ and MOLTS data are time series data and the gridded global model output and satellite data are 4D (time series of 2D scenes at levels or in multiple frequency bands). The system knows the geolocation and time of all data sets and supports selection of the data through a uniform set of menus (see Figure 2), by data type, agency, reference site and station, and supports sub setting according to time, area and height/depth (see Figure 3).

Users can access the system at http://jaxa.ceos.org/wtf_ceop . This site requires a brief registration to satisfy the CEOP data policy of keeping a record of users who receive CEOP data. The system has been online since June 1, 2005. All in-situ data is available on WTF-CEOP while MOLTS, satellite and global model output is being added steadily. Future plans call for investigation and prototyping into advanced data search and discovery functions, access of data from other server technologies such as OGC (Open Geospatial Consortium) WCS (Web Coverage Servers) and integration of data catalog and data search capabilities such as the GCMD (Global Change Master Directory). In addition, developments in the Global Earth Observation System of Systems (GEOSS) will be closely followed and will influence development of the system.

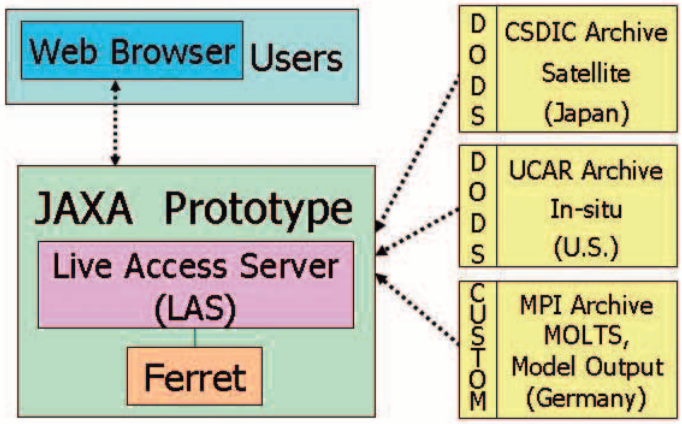

Figure 1: JAXA's Prototype for WTF-CEOP

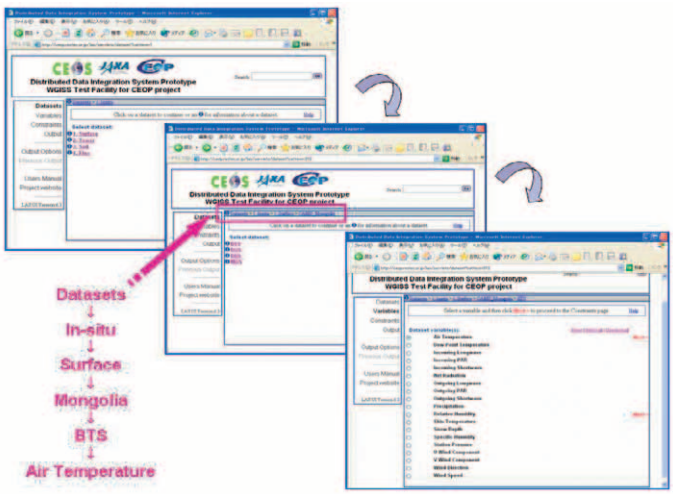

Figure 2: Flow of data selection using menus

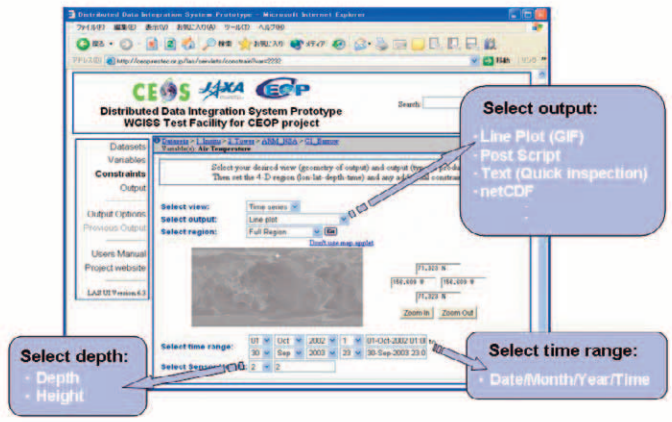

Figure 3: Select time, subsetting and output style

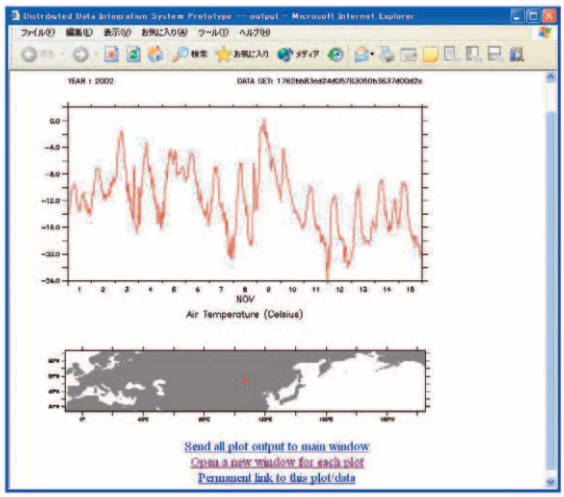

Figure 4: Example of output image

II. NASA's Prototype for WTF-CEOP

NASA's 1st phase Prototype for WTF-CEOP takes two existing technologies, the OGC Web Coverage Server and the OPeNDAP and interconnect them, leveraging the geospatial processing capabilities of the OGC Web Coverage Server with transparent data access to OPeNDAP-enabled science data applications and analysis clients used by many CEOP scientists. Figure 5 shows the architecture diagram of this prototype. This prototype will enable greater interoperability and data flow and access to distributed data sources of EOS Level 1B and Level 2 and higher-level processed products by existing science communities. By using an OPeNDAP enabled client such as the Grads client and access to satellite data through NASA's prototype, CEOP scientists will be able to access global model output data and then overlay the satellite data over it and compare data values (see Figure 6). NASA's prototype will provide an intelligent data geo-rectification and regridding service, allowing remote processing and intelligent subsetting on the data and reducing the amount of data transferred over the network. NASA's 1st phase prototype was a proof of concept prototype. In Phase 2, this prototype is expected to be enhanced with additional capabilities and made operational. The software will be made available to other interested CEOS agencies (e.g. JAXA, ESA) willing to host the software and provide Web Coverage Server access to their satellite data.

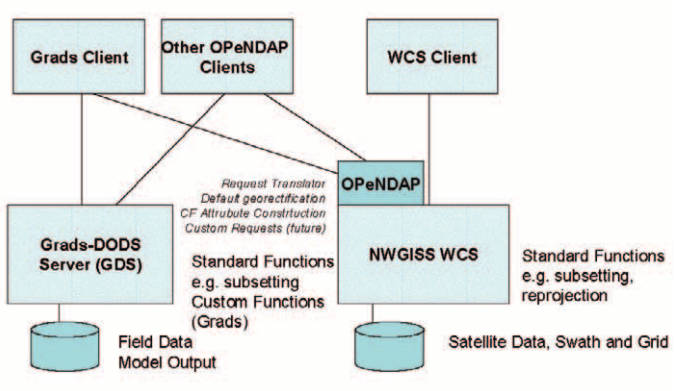

Figure 5: NASA's Prototype for WTF-CEOP

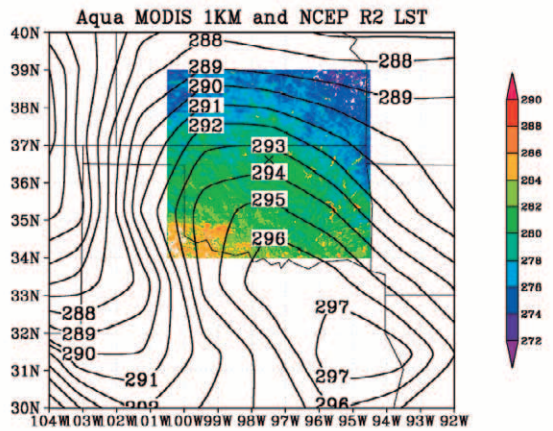

Figure 6: NASA's Prototype showing satellite data with model output data

CEOP presentations and issues at the Chinese Academy of Sciences (CAS), Third World Academy of Sciences (TWAS), World Meteorological Organization (WMO) Forum (CTWF) Workshop (15-18 November 2005, Zhuhai, China)

Michael G. Bosilovich[1], **Xubin Zeng**[2], and **Zhaohui Lin**[3]

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The Chinese Academy of Science (CAS), Third World Academy of Sciences (TWAS) and the World Meteorological Organization (WMO) have since 2000 sponsored an annual forum (CTWF) on the Physico-Mathematical Problems Related to Climate Modeling and Prediction. This year, the theme of the workshop was Land Surface Models and Their Applications (15-18 November 2005, Zhuhai, China). Over three days, topics of invited presentations included directions for improving land parameterizations, increasingly fine scale representations (and interactions with the atmosphere), hydrological processes, ecosystems modeling, data assimilation and field experiments. In addition, there were poster sessions for local students to discuss their work covering many of these same topics.

While many of the presentations touched on issues that concern CEOP (such as the surface energy balance and monsoon lifecycles), there were three presentations directly related to CEOP activities. Dr. Kun Yang (University of Tokyo) presented his study of land processes and model evaluation in Tibet, focusing on the processes (model and observed) during the onset of the monsoon. Dr. Huizhi Liu (Institute of Atmospheric Physics, Beijing) presented a study of the observed seasonal and diurnal variations of moist processes at the land surface in semi-arid Northeastern China with some considerations for climate change. Dr. Michael Bosilovich presented a coupled land-atmosphere data assimilation experiment, using many CEOP reference sites to understand the impact of the assimilation of surface

temperature on the surface energy budget.

There was general interest in CEOP and its progress, as well as recognition of the need for long-term climate data sets along the lines that CEOP proposes. More information on the 2005 CTWF Workshop and the invited and poster presentations can be found at: http://www.icces.net/ctwf2005/home.htm. The theme for the CTWF Workshop in 2006 will most probably be related to data assimilation, and CEOP readers are welcome to contact (ctwf@mail.iap.ac.cn) for participation in future CTWF activities.

Summary of the Asian Water Cycle Symposium 2-4 November 2005, Tokyo, Japan

S. Benedict and **P. Koudelova**, CEOP International Coordination Function

The Asian Water Cycle Symposium was held in Tokyo, 2-4 November 2005 as the first step toward establishment of a regional Water Initiative in Asia contributing to Global Earth Observation System of Systems (GEOSS). It was emphasized at the meeting that the key elements of a Water Initiative in Asia needed to include the development of a sustainable scheme for water cycle data collection, sharing, exchange, and management in compliance with the main objectives of the Group on Earth Observations (GEO) Committee on Architecture and Data, which are Convergence of Observation, Interoperability, and Data Management. The meeting was co-hosted by GEO, the Japan Aerospace Exploration Agency (JAXA), Japan Agency for Marine Earth Science and Technology (JAMSTEC), and the University of Tokyo (UT) and involved more than 140 participants from 19 countries including scientists, water management experts, governmental and Non-governmental Organization (NGO) representatives. Through the reports and discussions at the symposium, the participants recognized the common water-related issues and socioeconomic needs related to disasters including floods, droughts, landslides, water scarcity, river and water management, and effects of climate change in Asia. There was a great deal of information and ideas exchanged that dealt with the extensive impacts of human activities as well as the large natural variation of water resources in the region. To address these issues, the participants agreed that it would be helpful to have a well coordinated effort that could combine global earth observations and physical, chemical, biological and socio-economic measurements and information to address the scientific challenges toward understanding local and regional variations in water assets. By considering the successes and weaknesses of previous and current on-going national, regional and international water themed initiatives the participants were able to begin to formulate improved methods for convergence and harmonization of observation activities, interoperability arrangements and effective and comprehensive data management as the main functional elements of an Asian Water Cycle Project.

An important outcome of the meeting was the establishment of the International Task Team that will follow up with the actions identified as the “next steps” and agreed to at the time of the summary session of the meeting. CEOP was accepted as a prototype of an integrated data system that could be applied at the regional level in Asia and it was agreed that close collaboration with CEOP, during its second phase, would be started at new reference sites that will be part of the Asian Water Initiative.

CEOP/IGWCO Joint Meeting , 26February - 4March 2006, Paris, France

http://copes.ipsl.jussieu.fr/Workshops/CEOP_IGWCO/Programme.html

5th International Implementation Planning Meeting for the Coordinated Enhanced Observing Period (CEOP) and 2nd Integrated Global Observing Strategy Partners (IGOS-P) Integrated Global Water Cycle Observation Theme (IGWCO) Workshop will be held in UNESCO Headquarters

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