

Coordinated Enhanced Observing Period (CEOP) Rev.1

Reporting Period: 2006

Starting date: 2001

End date: 2010

URL: <http://www.ceop.net>

Chair(s) and term dates:

DATA MANAGEMENT WORKING GROUP: Steve Williams, Hans-Joerg Isemer

MODEL OUTPUT DATA DEVELOPMENT AND APPLICATION: Michael Bosilovich, Michael Lautenschlager

SATELLITE DATA INTEGRATION: Toshio Koike, Paul Houser

MONSOON SYSTEMS STUDIES: William Lau, Jun Matsumoto, Jose Marengo

WATER AND ENERGY SIMULATION AND PREDICTION (WESP): John Roads, Tetsuo Ohata, Congbin Fu

WATERSHED HYDROLOGY STUDY: Eric Wood, Dennis Lettenmaier

(Terms are for three years and are renewable for an additional three years.)

Overview:

Objectives:

CEOP's guiding goal is:

"To understand and model the influence of continental hydroclimate processes on the predictability of global atmospheric circulation and changes in water resources, with a particular focus on the heat source and sink regions that drive and modify the climate system and anomalies."

The key science objectives of CEOP are associated with its WESP and Monsoon Systems Studies activities. These include respectively:

- To use enhanced observations to diagnose, simulate and predict water and energy fluxes and reservoirs over land on diurnal to annual temporal scales as well as apply these predictions for water resource applications; and
- To document the seasonal march of the monsoon systems, assess their driving mechanisms, and investigate their possible physical connections.

Status:

Past year activities:

During this reporting period, CEOP has made progress in further development of the two sets of unique functional components that have been established during CEOP Phase 1 (2001–2004):

- components to integrate observations based on coordination among field science groups, space agencies, and numerical weather prediction centers in the local, regional and global scales;
- components required to exchange and disseminate observational data and information including data management that encompasses functions such as Quality Assessment/Quality Control, access to data, and archiving of data, data integration and visualization, and information fusion.

The key achievements include a substantial increase of the volume of data stored in the respective CEOP archives for the Phase 1 Enhanced Observing Periods EOP-1, EOP-3, EOP-4, i.e. in-situ archive at the National Center for Atmospheric Research (Colorado, USA; <http://www.eol.ucar.edu/projects/ceop/dm/>); model output archive at the Max-Planck Institute (Hamburg, Germany; http://cera-www.dkrz.de/CERA/cera2browser_CEOP/index.html); and satellite data archive at University of Tokyo, Japan (the direct access will be available by the end of 2006, currently the data can be accessed using the CEOP Centralized Data Integration System at: http://monsoon.t.u-tokyo.ac.jp/ceop-dc/ceop-dc_top.htm). A major portion of the expected data for CEOP Phase 1 has already been uploaded and is available through the on-line data archives and data integration systems.

Significant progress has been made in development of the CEOP Data Integration Services, namely the Distributed Data Integration System (http://jaxa.ceos.org/wf_ceop/) and the Centralized Data Integration System (http://monsoon.t.u-tokyo.ac.jp/ceop-dc/ceop-dc_top.htm). Both systems are being

regularly updated to reflect progress in data submission to CEOP. Moreover, new capabilities have been and are being developed and included on the systems to provide users with wide range of functions of data retrieval, visualization and analysis and also to allow for compatibility with other relevant data portals.

Significant advances within CEOP of satellite, and ground-based remote sensing and in-situ observations data management and coordination with strong connections to the climate modeling community provided an excellent opportunity for the development of national and a growing number of international programs to assess the impact of aerosols on radiation, clouds and their interaction with the Asian summer monsoon at a CEOP Co-sponsored Workshop on that topic held in Xining Qinghai Province, China from 31 July to 4 August 2006.

During this reporting period, besides following its normal schedule of regular international conference calls and Newsletter publications, CEOP has also begun a funded CEOP Analyses Intercomparison Project and had a CEOP IPY proposal accepted in cooperation with CliC.

New directions:

The main recommendations that the CEOP AOC/SSC members made at the CEOP International Implementation Planning Meeting held in March 2006 set the tone for CEOP new directions:

- (i) CEOP will take extra efforts to underwrite its current level of success in development of its in situ model and satellite datasets. In particular it will articulate and implement a clear strategy for finalizing collection of its Phase 1 in-situ and satellite datasets, each of which continues to show numerous gaps. This strategy will also be made functional in Phase 2, whereby CEOP will continue timely data collection at all reference sites; production of model products at all contributing NWP centers; and exploitation of all relevant operational and experimental satellite instrument data in a coordinated manner.
- (ii) In the context of its data collection process CEOP will continue its relationship with data archive Centers at UCAR, MPI and JAXA/UT. CEOP will work to ensure that Funding for these efforts will be maintained and that the centers will work together to ensure the synergy of the three data types is maintained into the future.
- (iii) CEOP will remove any confusion about its unique contribution to climate research. The questions and dialog about its unique nature has lead to a clearer expression of it being science driven versus science enabling. It is important for scientists to be involved in data related activities to ensure the value of the resultant products to the broader community. CEOP does not, therefore, necessarily have to be about establishing an integrated data system, even though that might be an outcome of the implementation of the unique coordinated data management scheme it has fostered.
- (iv) CEOP will work to further clarify it function/status in WCRP. Connections with other core projects such as CliC and GEWEX and oversight by groups such as the JSC/WOAP will result in conclusions about its unique structure and range of interactions among and between multi-disciplinary scientists/groups and various technical and data management experts/centers. Such a new unifying configuration should result in special autonomous status for CEOP as a collaborating Project within WCRP. As an example of this future vision CEOP has begun discussions with GEWEX to merge the GEWEX Hydrometeorology Panel (GHP) into CEOP, while CEOP retains it special status in WCRP.
- (v) In the context of a clarification of its unique contribution to climate research CEOP will want to revisit its role and position in WCRP to the point of it being established as a special coordinating Project in WCRP.
- (vi) The CEOP relevance to GEO/GEOSS will be clarified. It appears that CEOP is related to GEO in a positive manner but this needs to be fully explored and explicitly explained in the future.
- (vii) It is valid and appropriate for CEOP to expand its science scope and from material incorporated into its Phase 2 Implementation/Science Plan the incorporation of work on extremes/teleconnections; aerosols and water cycle; watershed hydrology as science issues

and the extension/enhancement of data collection and analyses into cold and semi-arid regions as part of Phase 2 is to be part of CEOP's future vision.

- (viii) CEOP will take steps to obtain relevant ocean data particularly in ocean areas near existing reference sites where data may be more easily obtained through agreements, which are already in place.

Future:

- (i) The work being undertaken as a precursor to CEOP Phase 2, as presented at the CEOP 2006 International Implementation Planning meeting, and the plan and schedule for the kick-off and implementation of Phase 2 that will begin in 2007 emphasized the extension of existing data and observation processes and greater stress on the research and analysis components of CEOP, providing for CEOP to meet its commitments to CEOS/IGOS-P Water Theme, WCRP/COPES and GEOSS.
- (ii) Each of the Phase 2 initiatives will be advanced in 2006-2007 including: the emphasis on the diurnal cycle as a unifying scientific theme; Phase 2 plans to continue with a watershed hydrology component; for CEOP to contribute towards, examination of some inter-connectivity between land areas; to embark on a Worldwide Integrated Study of Extremes (WISE); to undertake a joint initiative with the WCRP Climate and Cryosphere CEOP/CliC project and the International Polar Year (IPY); to exploit CEOP reference sites located in semi-arid; to augment and formalize the CEOP international coordination function

Key results:

- (iii) By providing an appropriately formatted summary Table of tasks in Phase 1 (see figure below), CEOP has respond to recommendations for provision of a list of accomplishments showing the level of progress attained during the last reporting period

Criteria for measuring CEOP Progress

Technical Requirements: P, I, F (Planned, Initiating, Functioning)

Scientific Requirements: B, Pr, C (Beginning, Progressing, Completed)

Data Management	Reference Site Composite Data Archive	F	35 Reference Sites; EOP-1 Completed, EOP-3/4: on-going 1 article on the CEOP Newsletter
	Model Output Archive	F	9 NWP Centers and 2 Data Assimilation Centers: on-going 1 article on the CEOP Newsletter 1 paper submitted to the CEOP special issue of JMSJ
	Satellite Products Archive	F	TM1, PR, SSM/I, AMSR-E: Completed Phase 1, AIRS, AVHRR, MODIS, GVS: on-going
	Interoperability Arrangement	F	Metadata Design, GOVD portal CF compliant NetCDF format for MCOLTS data: on-going 1 paper submitted to the CEOP special issue of JMSJ
	Distributed Data Integration System	F	Opened in June 2005, Demo at CEOP, Asia Water Cycle Symposium 1 article on the CEOP Newsletter 1 paper submitted to the CEOP special issue of JMSJ
	Centralized Data Integration System	F	Opened in June 2005, Demo at CEOP, Asia Water Cycle Symposium 1 article on the CEOP Newsletter 4 papers submitted to the CEOP special issue of JMSJ
WESP	Water and Energy Budget Studies (WEBS)	Pr	4 articles on the CEOP Newsletter
	Model Output Validation by NWP Centers	Pr	14 papers submitted to the CEOP special issue of JMSJ Papers in other journals
	GLDAS	Pr	Presentations at the 5th GEWEX Science Conference, Costa Mesa, CA, USA, June 2005
	GHP/CEOP Model Transferability Study	Pr	3 presentations at the 2005 CTWF, Zhuhai, China
	Model Intercomparison Study	Pr	GLDAS product generation: on-going
CIMS	Monsoon Intercomparison Study	Pr	3 articles on the CEOP Newsletter
	Diurnal, Intraseasonal and Seasonal Variability	Pr	4 Workshops (Milan, Montevideo, Costa Mesa, Rome)
	Monsoon Process Study by Using Models	B	Presentations at the 5th GEWEX Science Conference, Costa Mesa, CA, USA, June 2005
	Impacts of Local & Remote Forcings on Monsoon	B	8 papers submitted to the CEOP special issue of JMSJ Papers in other journals
Satellite	Algorithm Development and Validation	Pr	Soil moisture, Snow, 2 articles on the CEOP Newsletter 4 papers submitted to the CEOP special issue of JMSJ
	Satellite Data Assimilation for Land Hydrology	Pr	Soil moisture, surface fluxes Several journal papers 4 papers submitted to the CEOP special issue of JMSJ
Project management	Establishment of Direct Links and Connections	F	Reference sites, NWP/Cs, Space Agencies
	CEOP Meetings	F	Implementation Migs, Conference Calls, Thematic Workshops Townhall meeting at the 5th GEWEX Science Conference, June 2005
	Scientific Conferences	F	AGU: 2; ACGS: 1; AMS: 1;
	Key Actions/Milestone Documentation and Tracking	F	Working Groups Phase 2 Planning – CEOP Phase 2 Implementation/Science Plan – draft in July 2005; Implementation Meeting Reports Conference Call Reports CEOP special issue of the Journal of Meteorological Society of Japan (JMSJ) – to be published in February 2007
	Newsletter	F	Twice a year (1–9)

Issues and Recommendations:

It is recommended that CEOP:

- (i) Continue the development of the CEOP datasets as an important accomplishment and useful tool for further improvements in prediction of variations in water and energy cycle characteristics in climate.
- (ii) Continue its success in the in-situ dataset implementation process and the build-up of CEOP model data output and analyses and the ability of CEOP to engage agencies to provide satellite data for use with the new data integration tools being developed in the CEOP framework.
- (iii) Continue the expansion of the scientific scope of CEOP. Such expansion may require additional data types as reflected in the CEOP Phase 2 Implementation/Science Plan.

- (iv) Continue the evolution of CEOP Phase 2 by seeking advice from within WCRP by continuing the review process within CEOP itself and among the other review and advisory elements of WCRP such as the GEWEX SSG and the WOAP. This process should provide a reasonable arrangement for the natural and orderly progression of CEOP.
- (v) In each case where CEOP is undertaking synergistic research, the basis and scope of the studies and results should continue be associated with the unique observations, datasets and tools established within the CEOP framework up to now and as planned to be extended in the future.

Issues that need consideration include:

- (i) That where CEOP is undertaking research in fields where other international efforts are also working there must be an awareness that even though work in these new arenas has been on-going or is being initiated under the auspices of other International groups and projects, that work is being extended/included in CEOP in a specialized manner only within the scope of the CEOP period, including up to the end of Phase 2, and through the application of the unique CEOP capabilities.
- (ii) A CEOP Phase 2 has been endorsed by the CEOP AOC/SSC the GEWEX Scientific Steering Group (SSG) and the Joint Scientific Committee (JSC) for WCRP in 2004 and should not be considered as a disruptive activity in the context of the overall WCRP structure.

Contributions to WCRP strategic framework

CEOP has already been identified as a potential major contributor to WCRP COPES, and we are working with CliC on a special cold regions study in the framework of IPY. We have had close ties with CLIVAR and GEWEX on monsoon studies that have given impetus to that research. In addition we have a number of cross-cutting activities underway that are closely tied in with work in various Panels within GEWEX not the least of which includes the on-going merger process of CEOP and GHP. Specific developments within CEOP that can be considered as contributions to WCRP COPES or more generally to the WCRP strategic framework include:

- (i) Cooperation, Coordination and exploitation of data from GEWEX Continental Scale Experiments on a broad global scale;
- (ii) International participation by a number of weather prediction and modeling centers interested in seasonal to interannual time periods;
- (iii) Involvement of space agencies through broad international groups e.g. CEOS & IGOS-P;
- (iv) Advancement of an active data integration process with real and valuable tools for visualization of satellite, *in-situ* and model data and products;
- (v) A timely emphasis on water cycle research;
- (vi) An evolving notion of the characterization and implementation of an international climate observations reference network with prototypical land and water observations available to a broad set of users; and
- (vii) Initial Implementation of actual Long-term archive quality datasets.

Contributions to society and to WCRP/GEWEX visibility

In so far as CEOP will be contributing to GEOSS, then the targets for implementation of GEOSS that CEOP will assist with can be viewed as means by which WCRP/GEWEX get visibility within GEOSS as it develops. CEOP Phase 2 planning is, therefore, remaining consistent with the GEOSS framework as one way for WCRP/GEWEX interests to be injected into the longer term global earth observation initiatives.

The infrastructure that has evolved in CEOP over its initial observation period is also very positive means by which CEOP is drawing attention and providing visibility to the overall issue of water and energy cycle research in climate studies. Because CEOP is currently playing a valuable role by increasing the focus on the important topic of water resources applications on behalf of WCRP/GEWEX, we feel we are contributing to the overall visibility of both of those communities.

We are also trying to raise the visibility of WCRP/GEWEX interests in various cross-cutting activities by becoming involved in those activities in concert with the appropriate elements of WCRP/GEWEX and introducing those topics to new international research groups. These include more work that intersects with GMPP, through our model comparison/intercomparison studies; with GRP through our

cloud/radiation dataset initiative; with GHP in the use of CSE data for more global applications. More specific topics which CEOP is drawing attention to that have up to now not been “pushed” in other parts of WCRP/GEWEX might include a semi-arid regions study and a monsoon/aerosol study.

Summary:

CEOP is making important progress towards the realization of its long-term guiding scientific goal: *“To understand and model the influence of continental hydroclimate processes on the predictability of global atmospheric circulation and changes in water resources, with a particular focus on the heat source and sink regions that drive and modify the climate system and anomalies.”* By making progress toward this goal CEOP is responding to the challenges and priorities that relate to variations in the earth’s water and energy budgets and the cycling rate of the hydrological cycle as posed by the International Panel on Climate Change (IPCC) and will contribute to the development of WCRP COPEs and the GEO, GEOSS.

List of key publications:

- CEOP Newsletter No.9 (February 2006), No.10 (August 2006)
- CEOP Special Issue of Journal of Meteorological Society of Japan (JMSJ) – revision of articles will finish in October 2006, publication in February 2007 (41 manuscripts submitted)
- CEOP data overview article in the GEWEX Newsletter August 2006
- Several publications of CEOP science achievements in refereed journals

List of meetings, workshops:

- GEWEX SSG (Dakar, Senegal, January 2006)
- 5th CEOP International Implementation Planning Meeting/IGWCO 2nd Workshop (Paris, France, 26 February – 4 March 2006)
- WCRP JSC (Pune, India, March 2006)
- CEOS WGISS 21 Meeting (Budapest, Hungary, 8 – 12 May 2006)
- IGOS-P Meeting (Geneva, Switzerland, 23 May 2006)
- International Workshop on Impact of Elevated Aerosols on Radiation-Monsoon-Water Cycle Interactions (Xining/Tibet, China, 31 July – 4 August 2006) – sponsored by CEOP

Planned meetings, workshops:

- WOAP Meeting (Ispra, Italy, August 2006)
- CEOS WGISS Meeting (11 – 15 September 2006)
- Pan-GEWEX Meeting (Frascati, Italy, October 2006)
- ESSP Open Science Conference (Beijing, China, 9-12 November 2006)
- 2006 AGU Fall Meeting – CEOP session (11 – 15 December 2006)
- 6th CEOP International Implementation Planning Meeting/IGWCO 3rd Workshop (Washington DC, USA, 12 – 16 March 2007)

The following list reflects current CEOP organizational thinking and key persons in CEOP, including recent updates. Most are committed through CEOP Phase 2 (2010)

DATA MANAGEMENT WORKING GROUP: Steve Williams, Hans-Joerg Isemer

MODEL OUTPUT DATA DEVELOPMENT AND APPLICATION: Michael Bosilovich, Michael Lautenschlager

SATELLITE DATA: Toshio Koike, Paul Houser

GEWEX RADIATION PANEL (GRP) DATA IN CEOP: Toshio Koike

WTF-CEOP DISTRIBUTED DATA INTEGRATION SYSTEM STATUS: Satoko Miura (NEW), Ken McDonald

MONSOON SYSTEMS STUDIES: William Lau, Jun Matsumoto

WATER AND ENERGY SIMULATION AND PREDICTION (WESP): John Roads, Congbin Fu (NEW), Tetsuo Ohata (NEW)

CEOP ANALYSES INTERCOMPARISON PROJECT: Michael Bosilovich, Kun Yang (NEW)

WATERSHED HYDROLOGY STUDY: Eric Wood, Dennis Lettenmaier

EXTREME EVENTS IMPACT ANALYSIS PROJECT: Ron Stewart (NEW)

SEMI-ARID REGION STUDY: Congbin Fu (NEW)

CEOP COLD REGION STUDY AND CliC JOINT SESSION: Barry Goodison, Steve Williams, Toshio Koike, Tetsuo Ohata, and Jim Moore (NEW)