

EXECUTIVE SUMMARY of the Third Annual Meeting for the Coordinated Energy and water-cycle Observations Project (CEOP) (19-21 September 2009 at the Head Office of the Bureau of Meteorology (BoM) of Australia, Melbourne, Australia

(see: <http://www.ceop.net>)

First Draft: 25 September 2009

1. BACKGROUND

The Third Annual meeting of the Coordinated Energy and water cycle Observations Project (CEOP), held from 19-21 August 2009 at Melbourne, Australia, was designed to focus on how the project is being organized and implemented. The more detailed science findings and progress toward its main scientific goal to: “understand and predict continental to local-scale hydroclimates for hydrologic applications”, were left for detailed presentation, review and discussion at the Sixth International Scientific Conference on the Global Energy and Water Cycle that took place from 24-28 August 2009, at Melbourne, Australia.

1.1 Introductory Comments: BoM, GEWEX, WCRP

The introductory comments by Dr Sue Barrow, Deputy Director of the host organization at the Bureau of Meteorology of Australia (BoM), Melbourne Head Office, and Dr Helen Cleugh, Theme Leader Climate and Atmosphere at Australia's Commonwealth Scientific and Industrial Research Organization (CSIRO) emphasized the importance of the GEWEX/CEOP focus on Water and Energy budgets. They commended the efforts by CEOP to understand variations in conditions during the entire CEOP period. They also acknowledged the importance of the integrated approach being undertaken by CEOP, which combines the CEOP Regional Hydroclimate Projects, such as the one underway in the Murray Darling Basin (MDB), in Australia, with the use of data and model prediction schemes to study global scale phenomenon and to apply new tools and improved knowledge to regional scientific climate issues in areas that are especially sensitive to climate change and weather and extend this knowledge to global scale such as in semi-arid, cold and high latitude regions. CEOP extremes studies were also mentioned as an area in need of further study especially work that encompasses drought, heavy precipitation, floods, low flows and related features.

Dr Tom Ackerman, newly appointed Chairman of the GEWEX Scientific Steering Group (SSG) and Dr Peter van Oevelen, the Director of the International GEWEX Project Office (IGPO), each reiterated that CEOP had made an exceptional and appropriate adjustment of its strategic vision following the decision of the GEWEX SSG in 2007 to merge all regional hydrology projects under CEOP. The latest version of the CEOP Strategic Implementation Plan (SIP), on the Internet at: <http://www.ceop.net>, reflects the approach CEOP has successfully undertaken to fit this expanded role. The CEOP science team was commended for having worked diligently to implement this larger vision encompassing data acquisition and storage, data quality control, data analysis, regional modelling and scientific discovery.

Comments made earlier by the Director of the World Climate Research Programme (WCRP) Secretariat at the World Meteorological Organization (WMO) at Geneva, Switzerland had noted that one of the WCRP mission objectives, described in the WCRP Strategic Framework 2005–2015, is to “support climate-related decision making and planning adaptation to climate change by developing science required to improve climate predictions, the understanding of human influence on climate, and use this scientific knowledge in an increasing range of practical applications of direct relevance, benefit and value to society.” It was acknowledged at that time, that CEOP had developed a research framework and integrated datasets required to address these issues. The strength in the CEOP approach was identified to be that its focus on regional basins and climatically sensitive regions of the world encourages researchers to study these areas, understand their regional hydrological and radiation budgets, and ensure that these are well represented in global climate system models. The conclusion was that WCRP and the

GEWEX SSG continues to support the efforts of CEOP and seeks to ensure its continued vitality and encourage its research contributions to GEWEX and the WCRP.

1.2 CEOP Compliance with WCRP/GEWEX Requests for Action: SSG and WCRP

In keeping with the emphasis on organizational and business matters for this meeting, the CEOP Co-Chairs, Drs Ron Stewart and Toshio Koike, covered a number of important issues related to the responsiveness of CEOP to comments, observations and specific actions coming from the GEWEX SSG and WCRP. These included redrafting of the CEOP Strategic Implementation Plan (SIP) and tactical adjustments to CEOP work in response to comments and actions emanating from review, by the GEWEX SSG of CEOP material presented at SSG annual meetings, as well as advice and observations contained in a Rapporteurs Report, by SSG members, Drs. Anton Beljaars, Jan Polcher, Howard Wheeler, and Olga Zolina, dated 20 January 2009, that was commissioned by the SSG Chairman.

One immediate result of the merger of the GEWEX Hydrometeorology Panel (GHP) with the Coordinated Enhanced Observing Period was a refocusing of some activities toward the broader goal and objectives of the CEOP. With this in mind and with the need to be responsive to the guidance of the SSG, a new Strategic Implementation Plan (SIP) was developed as a way of documenting the guiding principals of CEOP. The CEOP Co-Chairs reiterated that the latest version of the SIP incorporates comments provided through a thorough review of the first draft of the document undertaken by the GEWEX SSG following their February 2008 meeting at Buenos Aires, Argentina.

The specific responses contained in the initial presentations by the CEOP Co-Chairs, to actions from the February 2009 SSG meeting held at Irvine California, USA, and to the Rapporteurs Report that was submitted at that meeting can be found in the full report of the CEOP Third Annual Meeting that is still in work. Alternately that information is immediately available for review and comment along with all of the presentation material provided by the participants at the meeting, on the Internet through the CEOP Home Page at: <http://www.ceop.net>. The placement of this large amount of information from the meeting on to the internet at the CEOP Home Page was accomplished through the efficient efforts of Ms Akiko Goda and Mr Katsunori Tamagawa in the CEOP Office at Tokyo, Japan.

2. EXECUTIVE SUMMARY OF MAIN ISSUES/CONCLUSIONS AND ACTIONS

The presentations and breakout periods organized at the meeting emphasized the expansion of the scope of CEOP science activities. A summary of the main actions associated with the discussions are summarized below:

2.1 CEOP 10 Year Data Set

Action was assigned to the Data Management Working Group to submit a proposal with an implementation scheme and schedule for defining and organizing a CEOP 10 year dataset. This action is to take the data periods associated with the Coordinated Enhanced Observing Period and to meld them with the expanded data requirements of the "new" CEOP as a means of integrating the overall CEOP data requirements with the available CEOP data resources. The concept is illustrated in Figure 1.



Toward Integration of CEOP Components¹

Data

- Data Periods
- Data Submission Schedule: 6 months. 15 months after observations.

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
EOP										
CEOP		EOP2	EOP3	EOP4	2005	2006	2007	New CEOP		

Figure 1: CEOP 10 Year Dataset

2.2 CEOP Synthesis Document(s)

It was agreed that a clear and somewhat concise summary of CEOP activities especially covering the work that has taken place since the successful integration of the RHPs. Such a document is necessary to be responsive to SSG comments related to a clarification of the strategy CEOP is using to bridge the connection between the CEOP regional/basin scale (RHP) needs/applications and the CEOP global observation/prediction activities.

The CEOP Co-Chairs agreed to take action to use existing material contained in the CEOP submittal to the WCRP/GEWEX Legacy document to develop a draft of the initial CEOP Synthesis Document by the end of October 2009, with submission set for early 2010. However, this action will involve many members of the CEOP community before it is submitted for publication.

A simplified outline for the document, which is expected to be submitted to the Bulletin of the American Meteorological Society (BAMS) was suggested at the meeting to be as follows:

1. Introduction (background, objectives, strategy)
2. Datasets and data integration (model, observations)
3. Science Progress (regions, issues, global perspective)
4. Implications (models, remote sensing, monitoring, climate change)
5. Concluding Remarks (the problem, progress, to be done, plans)

Another aspect of this action is to consider the possibility of other documents beyond the initial General/Comprehensive version. Follow-on documents/articles would possibly clarify the CEOP strategy for work being accomplished specifically under the headings of Regional Science Foci, Science Crosscutting Initiatives and Model Integration. As part of the current action the CEOP Co-Chairs will investigate the need for such a follow-on effort.

2.3 Activation of a CEOP HAP Task Team

The need, was addressed at the meeting, for a Task Team to ensure further integration of the CEOP Hydrological Applications Project (HAP) with other synergistic parts of the CEOP science community. The action was taken by the CEOP International Coordination Function to work with the CEOP Co-Chair (Koike) and the CEOP HAP Working Group Leader (Wood), to activate a CEOP HAP Task Team that would focus on:

- (i) Seasonal forecasting, mainly drought, in cooperation with HAPEX and
- (ii) Flood prediction and Climate change impact analyses in cooperation with GEOSS/AWCI

A member list, task assignment table, and implementation schedule with near term milestones are to be completed by the end of November 2009.

2.4 Activation of a CEOP Land Modeling Task Group

In order to better utilize available CEOP data and model parameter sets and to improve coordination among global land modeling activities, it was agreed that a CEOP Land Modeling Task Group will be activated. This Group will work in concert with the HAP Task Team to advance the common goal of generating physically coherent fields of land surface states and fluxes through the integration of disparate data products.

The Group will avail itself of available datasets such as those at NASA/GSFC: <http://disc.gsfc.nasa.gov/hydrology/> and Princeton: <http://hydrology.princeton.edu/data.pgf.php> that were identified at the meeting and will seek opportunities to integrate its work with that being undertaken as part of the planning for the third Global Soil Wetness Project (GSWP-3) and with work underway as part of the GEWEX Global Land Atmosphere System Study (GLASS) and the LandFlux activity that has been launched recently by the GEWEX Radiation Panel (GRP), in collaboration with the GLASS. LandFlux wants to develop the needed capabilities and to produce a global, multi-decadal surface turbulent flux data product, which is consistent with the goals proposed for the CEOP Land Modeling Task Group.

The action was taken by the CEOP International Coordination Function to work with the CEOP Co-Chair (Koike), the CEOP Land Modeling Working Group Leader (Rodell) and the CEOP HAP Working Group Leader (Wood), to define a member list, task assignment table, and implementation schedule for the CEOP Land Modeling Task Group by the end of November 2009.

2.5 Advance Existing Collaboration Between CEOP Cold Regions and High Elevation Studies

It was agreed at the meeting that the existing collaboration between the CEOP Cold Regions Study (CRS) and the CEOP High Elevations Study (HE) needs to be better organized and more formally established. The CEOP International Coordination function has the action to work with the CRS and HE Lead persons (O'Hata and Tartari) to initiate more regular interactions and communications between these existing groups to improve their collaboration and show additional results in a number of areas where there is already existing interactions including:

- (i) the convergence of observations and data integration from CEOP Cold Regions and HE reference sites,
- (ii) long-term variation of snow distribution in northern regions and its impact on atmospheric circulation,
- (iii) Water and energy budgets (WEBs) in cold regions, and
- (iv) High mountain hydrology including glaciers.

International conference calls designed to further the existing dialog between these groups related to work on these specific topics will begin by the end of October 2009.

2.6 Activation of a CEOP Global to Regional Scale Task Team

In order to better utilize available CEOP datasets for the purpose of addressing the matter of bridging the gap between the global and regional aspects of CEOP research it was agreed that a CEOP Global To Regional Task Teams should be activated.

The Team will be made up of key individuals from the CEOP Cross Cutting Study area and the CEOP Model Output Working Group that are doing work at both the Global and Regional scales and will make use of datasets that have already been produced under CEOP initiated studies in each case. These would include:

Model Analyses for CEOP (MAC) subset products for CEOP RHPs,

CEOP Inter-Continental Transferability Study (ICTS) co-analysis products
CEOP Stable Water Isotope Intercomparison Group (SWING) subset products for RHPs

There will also be experts from the CEOP RHP's that will be involved in the work to be undertaken by this Task Team. The BALTEX RHP, the Tibet region of MAHASRI, and parts of the AMMA RHP are the initial candidate regions to be included in the work of this strategic task team effort. The main contribution from the CEOP RHP's will be high quality regional datasets for validation purposes.

The Team is expected to seek opportunities to integrate their efforts with other planned or on-going initiatives in the broader climate research community one in particular that was mentioned is the WCRP initiated COordinated Regional climate Downscaling EXperiment (CORDEX) effort that plans to provide a set of regional climate scenarios covering the period 1950-2100, for the majority of the populated land-regions of the globe.

CEOP International Coordination Function agreed to take the action to activate this Team, in cooperation with the CEOP Co-Chairs (Koike and Stewart), and a number of key persons in each CEOP study area involved in this activity. These would include but not be limited to: Isemer, Stewart, Kun, Bosilovich, Rockel, and Yoshimura.

It was agreed that a series of International conference calls would be started that would take this activity through a series of steps including an initial brainstorming session, a parameter prioritization exercise, strategic plan development process and a milestone definition and scheduling procedure. Activation of this Team and initiation of these calls should begin by November 2009.

2.7 CEOP Contribution to the Adaptation to Climate Change (ACC) Theme

There was a general concern expressed at the meeting in relation to CEOP taking on the formulation of "adaptation" as a main theme. Although it was agreed that the broadest aspects of ACC were not consistent with the current CEOP Strategic Implementation Plan they were not wholly outside the scope of the work CEOP was involved in on a day to day basis. It was, therefore, agreed that CEOP would embrace some of the main tenets of ACC and would look into ways of contributing to those in direct fashion. Some ideas related to this consensus were:

- (i) Identifying Regional to local Impacts of ACC on the hydroclimate in RHP basins,
- (ii) Quantifying uncertainty by using CEOP data infrastructure,
- (iii) Testing models and ACC scenarios by apply WEBS analysis techniques and
- (iv) Exploiting CEOP/RHP connections to local/basin scale model Centers to assist in ACC work

3. SUMMARY OF MAIN SCIENCE and DATA TOPICS and NEAR TERM MILESTONES

The presentations and breakout periods organized at the meeting emphasized the expansion of the scope of CEOP science activities. In addition to the Regional Hydroclimate Projectes (RHPs), CEOP includes groups focused on studies in high elevations, monsoon, extremes, cold regions, and semi-arid regions.

The summary by the Co-Chairs emphasized that the CEOP science team has worked diligently to implement a larger vision encompassing data acquisition and storage, data quality control, data analysis, regional modelling and scientific discovery that would be consistent with it becoming a prototype element of any International Climate Research Framework that may emerge in the future, including WCRP with restructured core projects and science foci or a Global Earth Observation System of Systems (GEOSS).

3.1 Science Foci Summary

Presentations at the meeting highlighted a number of points and milestones reached by various elements of CEOP within its current organizational framework (see Table 1).

- The CEOP Monsoons Study has been shown to be synergistic with the overall WCRP Monsoon crosscut initiative.
- The CEOP High Elevation study presented plans to organize a global high elevation watch period.
- CEOP Extremes studies has begun focusing on drought, heavy precipitation, floods and low flows including the inter-meshing of these.
- The links between the CEOP Cold Regions Study and several RHPs have now been clearly identified. This work is also being coordinated with the WCRP CliC Project.
- The CEOP Semi-arid regions study has recently shown progress on meeting the goals established for it as an element of CEOP, especially by establishment of a joint US and China semi-arid region study.
- CEOP science continues to provide a traditional focus on Water and Energy Budget Studies (WEBS), which will now extend the efforts to understand average conditions to conditions during the entire CEOP period.
- The other CEOP science efforts related to the water and energy budget studies have been expanded including a study of the influence of aerosols and a study of water isotopes.
- CEOP modeling efforts now include explicit global, regional, land surface, and Hydrologic Applications Project (HAP) efforts. All of these modeling groups have now begun looking at an ensemble of international models in many different regions focused on the CEOP reference sites.
- A CEOP satellite dataset has been populated with data from instruments flown on JAXA, ESA and NASA spacecraft and tools for handling historical data have been provided by NOAA. All of this work is being carried out as part of the CEOP Data Management component.

3.2 Integrated Datasets Summary

CEOP has fulfilled its most ambitious goals to address a number of key scientific issues through a comprehensive improvement in access to integrated observational (in-situ and satellite) and model data. Data Management, which was a focal point of the Coordinated Enhanced Observing Period, has now successfully implemented a data policy allowing the sharing of in situ reference site data, model output data, and satellite data and set up archival centers of this data at the National Center for Atmospheric Research (NCAR) and the Max Planck Institute (MPI). Satellite data has come on line at the University of Tokyo (UT) and then along with the other data has been moved to a central data archive where it can be accessed and distributed to interested users. Key points on this topic that were presented at the meeting included:

- The CEOP Data Management web page was revised (August 2008) and is available directly at: <http://www.eol.ucar.edu/projects/ceop/dm/> with improved links to all CEOP RHP (and related data provider) data archives.
- Completed in-situ data are now available from 30 of 32 Reference Sites (including data from 14 sites which contain full annual cycles for both EOP 3 and 4).
- The CEOP Model Output Center (located at the World Climate Data Center, Max Planck Institute for Meteorology, Germany) has continued to maintain the archives and Model Output Gateway at <http://www.mad.zmaw.de/projects-at-md/ceop/>. To date, more than 6 TB of data have been submitted and are available via internet. Metadata from the 11 Numerical Weather Prediction (NWP) Centers participating in CEOP continues to be updated at: http://www.eol.ucar.edu/projects/ceop/dm/model/model_table.html. Periodic conference calls are conducted between these various NWP Centers to coordinate data submission and data formatting issues.

- The CEOP Satellite Data Center (located at the University of Tokyo, Japan) continues to add EOP3/4 satellite data to its archives. A new Satellite Data Gateway web page was developed and is available at: <http://monsoon.t.u-tokyo.ac.jp/ceop2/satellite/> . This web page provides current data policy, format, inventory, and access information. Data access is also available through the CEOP Centralized Data Integration System at: http://monsoon.t.u-tokyo.ac.jp/ceop-dc/ceop-dc_top.htm.
- An unprecedented international effort has resulted in the specialized data integration function developed by CEOP, which has in turn begun to add value to work in both the meteorological and climate science and operational communities especially the numerical weather prediction centers involved in CEOP.
- An improvement of models has been achieved based on insights developed through CEOP validation studies and intercomparisons as well as the provision of new capabilities and tools for integrating the model products with satellite and in-situ data.

3.3 Near Term Milestone Summary

The Co-Chairs and leaders of key CEOP working groups presented material which showed that CEOP has focused a great deal of effort on a number of main science foci and crosscutting regional study areas where milestones have been developed for the period up to 2011. Milestones related to these topics were highlighted at the meeting to be examples of work being undertaken in CEOP that will contribute to GEWEX and WCRP goals and objectives over the next 2 to 3 years. They include:

CEOP Extremes is working to better document, understand and simulate the occurrence, evolution, structure and role of hydrometeorological extremes within the climate system and to contribute to their better prediction at various time scales and to addressing societal concerns. A number of specific steps are currently underway with items to be accomplished between now and 2011. These include:

- Assess current definitions of extremes and determine if further ones are needed
- Assess existing extreme event catalogues (heat waves, floods, droughts on a global basis from 1948 to present) and as appropriate incorporate this into the Extremes information base.
- Produce a high resolution dataset on global precipitation
- Pull together at least one comprehensive, continental-scale dataset on multi-year drought
- Assess whether re-analyses are capable of detecting and determining the trend of extremes events over the last 30 years
- Provide a recipe book for others to follow in terms of conducting comprehensive drought studies

The High Elevations (HE) Project is a concerted, international and interdisciplinary effort to further knowledge of the physical and dynamical processes in high altitude areas. High elevation areas provide interesting locations for the early detection and study of the signals of climate change and the assessment of climate related impacts on hydrogeological, ecological and societal systems at a global level. A key objective is improve the forecast capabilities of extreme weather events in high altitudes that influence not only mountain regions but also a much wider environment and an elevated number of people, with important social consequences depending on the interaction between the three major components: environment, economics and society.

A number of specific steps are currently underway with items to be accomplished between now and 2011. These include:

- Develop a catalog of key high elevation monitoring sites where physical and dynamic processes are being studied and to invite site managers as a way of building-up a CEOP-HE network,

- Develop CEOP-approved installation procedures and long-term maintenance guidelines for HE sites and QA/QC policies for data acquisition at those sites,
- Produce high-quality datasets in line with the CEOP data policy.

The CEOP Monsoon Study (MONS) effort includes multiple observation and science activities within the fields of hydrometeorology and hydroclimatology. CEOP has evolved components to integrate observations based on coordination among field science groups, space agencies, and NWP centers in the local, regional and global scales. Other synergistic elements of CEOP that are also multidisciplinary include: 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.

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A number of specific steps are currently underway with items to be accomplished between now and 2011. These include:

- Collect and analyze data concerning continental forcing including trends, and inter-decadal and inter-annual variability.
- Identify Large-scale Orographic forcing particularly over the Tibetan Plateau on time scales including inter-decadal, inter-annual and LFV variability.
- Detect the land/sea breeze-- inter-decadal, inter-annual, LFV and diurnal variability.
- Contribute to a synthesis paper (s) providing input to next IPCC assessment.
- Produce high-quality datasets consistent with the CEOP data policy.
- Specify the important and urgent cross-cutting issues on regional as well as global monsoon systems in the world. Particularly, understanding the role of the monsoons in the changing global climate system, in relation to phenomena such as energy and water cycles and floods and desertification, using various data and coupled ocean-atmosphere GCMs and RCMs.

Table 1. CEOP Organization Matrix

FUNCTION	WWW sites	Representative	Email address
CEOP co-chair	http://monsoon.t.u-tokyo.ac.jp/ceop/	Toshio Koike*	tkoike@hydra.t.u-tokyo.ac.jp
CEOP co-chair	http://www.drinetwork.ca/extremes/	Ron Stewart*	ronald.e.stewart@gmail.com
International Coordinator	http://www.gewex.org/	Sam Benedict*	sam.benedict@gewex.org, gewex@gewex.org
RHPs			
CPPA	http://www.climate.noaa.gov/cpo_pa/cppa/	Jin Huang	jin.huang@noaa.gov
LBA	http://lba.cptec.inpe.br/lba/site/	A.C. De Araujo	alessandro.araujo@falw.vu.nl
LPB	http://www.eol.ucar.edu/projects/lpb/	Hugo Berbery	Berbery@atmos.umd.edu
BALTEX	http://www.baltex-research.eu/	Hans-Joerg Isemer*	Hans-Joerg.Isemer@gkss.de
AMMA	http://www.amma-international.org/rubrique.php3?id_rubrique=1	Amadou Gaye	atgaye@ucad.sn
MAHASRI	http://mahasri.cr.chiba-u.ac.jp/index_e.html	Jun Matsumoto	jun@eps.s.u-tokyo.ac.jp

MDB	http://www.gewex.org/mdb.html	Jason Evans	jason.evans@unsw.edu.au
NEESPI	http://neespi.org/	Pasha Groisman	Pasha.Groisman@noaa.gov
Regional Studies			
CRS		Tetsuo Ohata	ohatat@jamstec.go.jp
High Elevation	http://www.ceop-he.org	Gianni Tartari	tartari@irsa.cnr.it
Monsoon co-chair		Jun Matsumoto	jun@eps.s.u-tokyo.ac.jp
Monsoon co-chair		Hugo Berbery	Berbery@atmos.umd.edu
Monsoon co-chair		William Lau	lau@climate.gsfc.nasa.gov
SAS		Congbin Fu*	fcf@mail.tea.ac.cn
Cross Cutting Studies			
WEBS	http://www.itpcas.ac.cn/users/webs/	Kun Yang	yangk@itpcas.ac.cn
Extremes	http://www.drinetwork.ca/extremes/	Ron Stewart*	ronald.e.stewart@gmail.com
Aerosols		Bill Lau	
Isotope co-chair		David Noone	dcn@Colorado.EDU
Isotope co-chair		Kei Yoshimura	k1yoshimura@ucsd.edu
Models			
Global (MAC)		Mike Bosilovich*	Michael.Bosilovich@nasa.gov
Regional			
ICTS	http://icts.gkss.de	Burkhardt Rockel*	Burkhardt.Rockel@gkss.de
SIEVE		Ray Arritt	rwarritt@bruce.agron.iastate.edu
LSM		Matt Rodell	Matthew.Rodell@nasa.gov
HAP		Eric Wood*	efwood@princeton.edu
Data Management	http://www.eol.ucar.edu/projects/ceop/dm/		
Reference Sites/Basins	http://www.eol.ucar.edu/projects/ceop/dm/	Steve Williams*	sfw@ucar.edu
Model Output	http://www.eol.ucar.edu/projects/ceop/dm/model/	Michael Lautenschlager	Michael.Lautenschlager@zmaw.de
Satellite Data	http://monsoon.t.u-tokyo.ac.jp/camp-i/doc/sat_info/index.htm	Toshio Koike	tkoike@hydra.t.u-tokyo.ac.jp
Data Integration & Dissemination	http://jaxa.ceos.org/wtf_ceop/	TBD	
Central Data Integration	http://monsoon.t.u-tokyo.ac.jp/ceop-dc/ceop-dc_top.htm	Kenji Taniguchi	taniguti@hydra.t.u-tokyo.ac.jp
Associated Global Data Centres	http://www.ngdc.noaa.gov/wdc/		
GRDC	http://grdc.bafg.de/	Ulrich Looser	Looser@bafg.de