WCRP REPORT
World Climate Research Programme

SUMMARY REPORT
FROM THE

19th SESSION OF THE GEWEX SCIENTIFIC STEERING GR0UP (SSG-19)

(Honolulu, Hawaii, 22–26 January 2007)

WCRP
Informal/Series Report No. 20/2007

TABLE OF CONTENTS

DECISIONS AND ACTION ITEMS FROM THE 19th SESSION OF THE GEWEX SCIENTIFIC STEERING Honolulu, Hawaii, 22-26 January 2007

DECISIONS:

1. As part of the next international GEWEX science conference in 2009, GEWEX recommends a 1-day joint GEWEX/iLEAPS conference, provided iLEAPS is having a full conference at the same venue. The topic that is viewed as being most useful for GEWEX is "land surface fluxes and land cover characterization".

2. The SSG recognized the efforts being made to build links with The Observing System Research and Predictability Experiment (THORPEX) and looks forward to a more comprehensive report next year.

3. The GEWEX SSG accepted the Monsoon Asian Hydro-Atmospheric Science Research and prediction Initiative plan (MAHASRI) but asked them to consult with the director of the International CLIVAR Project Office (ICPO) to ensure the Climate Variability and Predictability Project (CLIVAR) concerns are met (*ACTION: Jun Matsumoto*).

4. The SSG approved the proposed Northern Eurasian Earth Science Partnership Initiative (NEESPI) as a Regional Hydroclimate Project (formerly Continental Scale Experiment).

5. The SSG approved the plan for a Coordinated Enhanced Observing Period / GEWEX Hydrometeorology Panel (CEOP/GHP) merger, including the adoption of the CEOP designation ("Coordinated Energy and Water cycle Observations Project", subject to the development of suitable milestones for the GEWEX Roadmap).

6. The SSG approved Eric Wood as the GEWEX representative to CLIVAR's Working Group on Seasonal-Interannual Prediction (WGSIP).

7. The SSG will inform Dr. Duane Waliser that it supports the Year of Tropical Convection (YOTC) proposal. Through its monsoon and GEWEX Modeling and Prediction Panel (GMPP) activities, GEWEX will assist in YOTC's further development.

8. The SSG recognized the work that had been done in clarifying the GMPP role and encouraged Christian Jakob to formulate a greater role for GMPP.

9. The SSG accepts the GEWEX Radiation Panel (GRP) recommendation that Chris Kummerow become the Chair of the SSG after the 2008 GEWEX SSG meeting.

10. The SSG encourages additional CLIVAR/GEWEX collaboration in the areas of North American droughts and floods, as well as variability in global water and energy budgets.

ACTION ITEMS:

A. SSG General:

A.1. SSG Members and Panel Chairs are to provide a few bullets (ideas) by February 2, 2007 to the International GEWEX Project Office (IGPO) on the importance of GEWEX and its activities and why GEWEX should continue to exist. (ACTION: *All members*)

A.2. The SSG should prepare a letter for signature by the Chair of the Joint Scientific Committee (JSC) or the chair of GEWEX to the European Space Agency (ESA) requesting the extensions of the European GEWEX Coordinator's position for 5 years (2008–2013).

A.3. iLEAPS will be advised that GEWEX would be happy to have a 1-day meeting on the characterization of surface fluxes (including water and carbon fluxes) and land cover as part of its next Science Conference. (IGPO will discuss terms of the conference with iLEAPS).

A.4. The SSG will send a letter (to be drafted by GRP) to national World Meteorological Organization (WMO) PRs (including the U.S. PR) proposing that the U.S. switch the data set production of the International Satellite Cloud Climatology Project (ISCCP), Global Aerosol Climatology Project (GACP), and Surface Radiation Budget (SRB) Global Precipitation Climatology Project to B1U.

A.5. GEWEX will name a liaison for the Global Water System Project (GWSP).

A.6. A letter will be written to JSC encouraging the continuation of the WCRP Observation and Assimilation Panel (WOAP) as a principal means of coordinating World Climate Research Programme (WCRP) data activities. (ACTION: *IGPO*)

B. CEOP:

B.1. CEOP will develop a set of milestones with dates at its upcoming meeting in March 2007 for the next version of the GEWEX Roadmap (*ACTION: Toshio Koike, John Roads*).

B.2. The GEWEX SSG was pleased to see the progress in the Hydrologic Applications Project (HAP) but requested that the strategy be revised slightly to elaborate links and collaborative projects with GWSP and to broaden it so more scientists can participate (*ACTION: Eric Wood*).

B.3. CEOP will revise its Science and Implementation plans and develop milestones for the 2007–20102 period. The new milestones will be submitted to IGPO before the end of March 2007(*ACTION: Toshio Koike, John Roads*).

B.4. CEOP should plan to make a presentation at the next THORPEX meeting (*ACTION: Toshio Koike, John Roads*).

C. GMPP:

C.1. The GEWEX SSG encourages GMPP to develop a joint project with the Cloud Feedback Model Intercomparison Project (CFMIP) (*ACTION: Christian Jakob, Pier Siebesma*).

C.2. GMPP will lead the coordination of the Aerosols-Cloud-Precipitation-Climate (ACPC) issue with iLEAPS and will provide feedback to GRP, CEOP and IGPO (*ACTION: Christian Jakob*).

D. GRP:

D.1. GRP is requested to develop a strategy for moving the production of GRP global data sets to operations (*ACTION: Bill Rossow*).

E. IGPO:

E.1. IGPO will send a request asking that the GMPP meet with the Working Group on Numerical Experimentation (WGNE) on an annual basis. This may involve holding some WGNE meetings simultaneously with future Pan-GEWEX events.

E.2. Next year, a discussion item will be added to the SSG agenda about moving the production of global data products from research to operations.

E.3. IGPO will explore options for holding the next GEWEX SSG meeting in Buenos Aires, Argentina in January or February 2008.

E.4. GEWEX will coordinate the preparation of a write-up for a GWSP Newsletter describing data sets that are available for research.

1. INTRODUCTION AND OVERVIEW

This report summarizes the main developments in GEWEX during the year 2006 and includes the main items and recommendations from the 19th Session of the GEWEX Scientific Steering Group (SSG), which was held in at the East-West Center at the University of Hawaii in Honolulu, 22–26 January 2007. The meeting was hosted by Dr. Julian P. McCreary, Jr. of the International Pacific Research. Approximately 45 experts from 10 countries attended the meeting. The meeting focused on GEWEX activities and on how GEWEX could organize itself to most effectively meet the requirements of the GEWEX Phase II Roadmap, the World Climate Research Programme (WCRP) strategic plan and, more generally, the goals of climate research. As a result of this approach the discussions focused on GEWEX projects and their links with some central projects including the Climate Variability and Predictability (CLIVAR) Project, the Global Water System Project (GWSP), THe Observing System Research and Predictability Experiment (THORPEX), and Global Climate Observing System (GCOS).

In addition a number of scientific talks were given on the following topics: (1) Tropical Rainfall Measuring Mission (TRMM) data and latent heating estimates; (2) Cloudsat and its implications for global data sets; (3) monsoon research needs; and (4) EUMETSAT's Satellite Applications Facility.

The most significant and far reaching decision at this meeting was the SSG's approval of a proposal to merge the Coordinated Enhanced Observing Period (CEOP) and the GEWEX Hydrometeorology Panel (GHP) into a single entity known as the Coordinated Energy and Water Cycle Observations Project (CEOP). A background paper describing the rationale for this decision is given at *http://www.gewex.org.ceop.htm*. In addition it was agreed that the GEWEX Continental-Scale Experiments (CSEs) will be known as GEWEX Regional Hydroclimate Projects (RHPs) within this new structure. The GEWEX SSG believes that the new panel will provide a global framework for the RHP activities and that the CEOP data services will benefit the full range of science being undertaken in the RHPs. The technical and scientific criteria used as terms of reference for CSEs will be updated for the RHPs to better reflect current WCRP and GEWEX objectives. The restructured CEOP will be meeting in Washington, DC in March to address some of the issues related to the merger and to discuss ways to clarify and strengthen CEOP's contributions to the GEWEX Roadmap.

Assessments of global data products have been carried out under the leadership of GEWEX Radiation Panel (GRP). All four principal sets of data products [International Satellite Cloud Climatology Project (ISCCP), Global Aerosol Climatology Project (GACP), Global Precipitation Climatology Project (GPCP), and the Surface Radiation Budget (SRB) Project] now cover periods longer than 20 years and are increasingly being used in climate studies. The projects continue working towards a coordinated reprocessing activity so that these products can have even broader application. GRP is proposing to make ISCCP an operational product. The precipitation assessment is complete and the report is in review. Other assessment reports are also nearing completion. GPCP is now collaborating with the International Precipitation Working Group concerning improved measurements of snowfall and with a consortium for quantitative precipitation estimation under the WCRP/THORPEX activity.

The GEWEX Modelling and Prediction Panel (GMPP) outlined its new approach to model evaluation and parameterization development. The SSG welcomed this structured approach and supports the ambitious GMPP agenda. GMPP will lead the GEWEX coordination of the Aerosol Cloud Precipitation Climate Initiative with the international Land Ecosystem-Atmospheric Processes Study (iLEAPS) and with the international Global Atmospheric Chemistry Program. GMPP will also investigate collaboration with the Task Force on Seasonal Prediction through the Global Land Atmospheric Coupling Experiment-2 (GLACE-2) and how the effects of snow and vegetation initialization on predictive skill at intraseasonal to seasonal time scales can be assessed. The GEWEX SSG encouraged GMPP to advance a proposal for a joint GEWEX Cloud System Study (GCSS)/WCRP Working Group on a Coupled Modelling collaboration on the Cloud Feedback Model Intercomparison Project (CFMIP) to assess climate change cloud feedbacks and to potentially use the Data Integration for the Model Evaluation (DIME) web site to host model and observational data to facilitate this enterprise. CFMIP will encourage the systematic comparisons of cloud feedbacks among GCMs and comparisons of model clouds with observations.

The SSG approved the Northern Eurasia Earth Science Partnership Initiative (NEESPI) as a Regional Hydroclimate Project. NEESPI seeks to understand how the land ecosystems and continental water dynamics

in northern Eurasia interact with and alter the climatic system, biosphere, atmosphere, and hydrosphere of the Earth. In addition, the draft strategic plan of the Hydrology Applications Project (HAP) was reviewed. This project, which succeeds the Water Resources Application Project (WRAP), will be the primary GEWEX link with the Global Water System Project (GWSP). After some modifications to the plan and some broadening of the level of participation GEWEX should be ready to launch this new initiative in the summer of 2007.

Given the WCRP crosscuts and the responsibility that GEWEX has for leading the monsoon crosscut, the research priorities for this topic received significant attention at the meeting. A key overarching issue for monsoon prediction is the fundamental need for improved representation of tropical convection. The SSG endorsed the concept for the THORPEX/WCRP Year of Tropical Convection (YOTC), a coordinated observing, modelling and forecasting tropical convection activity. YOTC will exploit the vast amounts of existing and emerging observational and computational resources now available in conjunction with the development of new high resolution modelling frameworks to advance the characterization, diagnosis, modelling and prediction of multiscale convective/dynamic interactions and processes, including the two-way interaction between tropical and extra-tropical weather/climate.

The Asian Monsoon Year (AMY) also gained GEWEX support as a joint GEWEX/CLIVAR [plus the Climate and Cryosphere (CliC) Project and Stratospheric Processes And their Role in Climate (SPARC)] activity designed to provide improved observations, analyses, and modelling in the Asian monsoon regions. AMY would focus on the 2008 time period and cover the full annual cycle of boreal summer monsoon thus contributing to the YOTC initiative. AMY would bring together the GEWEX and CLIVAR monsoon efforts in the Asian-Australian region, and in particular, the Monsoon Asian Hydro-Atmosphere Scientific Research and prediction Initiative (MAHASRI). The idea of extending this effort to the global perspective for an International Monsoon Year was discussed.

Concern was expressed about the status of the European GEWEX Coordinator function beyond 2007. The SSG recognized the valuable contribution of the European GEWEX Coordinator (Dr. Peter van Oevelen) in supporting GEWEX activities over the past 2½ years and asked the SSG Chair to request that the European Space Agency (ESA) continue to support this function.

2. COORDINATED ENHANCED OBSERVING PERIOD (CEOP)

CEOP entered its Phase II in January 2005 and it is expected to run through 31 December 2010. CEOP has made progress in further development of the two sets of unique functional components that were established during CEOP Phase 1 (2001–2004). These include: 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; and 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.

Key achievements in CEOP 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/wtf_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.

The SSG approved the plan for a CEOP-GHP merger including the adoption of the name Coordinated Energy and Water Observations Project (CEOP). In order to implement CEOP in a timely way Drs. Toshio Koike and John Roads have been asked to co-chair the project for 3 years for Dr. Koike and one year with a review for Dr. Roads. CEOP will function as a GEWEX panel, will form a new science steering group, will revise its science and implementation plans and will no longer use the nomenclature "an element of WCRP initiated by GEWEX".

3. HYDROMETEOROLOGY

3.1 Overview

The GEWEX Hydrometeorology Panel (GHP) coordinates the regional CSEs, which include: the GEWEX Americas Prediction Project (GAPP), which is transitioning to the Climate Prediction Program for the Americas (CPPA); the Large-Scale Biosphere-Atmosphere Study in Amazonia (LBA); the La Plata Basin (LPB); the Baltic Sea Experiment (BALTEX); the Monsoon Asian Hydro-Atmospheric Science Research and prediction Initiative (MAHASRI); the Murray Darling Basin (MDB) and the African Monsoon Multidisciplinary Analysis (AMMA). There are also a few global hydrometeorologically relevant projects making contributions to GHP activities and these include the Global Runoff Data Centre (GRDC), the International Satellite Land Surface Climatology Project (ISLSCP), Global Precipitation Climatology Project (GPCC) and the Coordinated Enhanced Observing Period (CEOP). The International Association of Hydrologic Sciences (IAHS) is an organization that provides a forum for publicizing GHP activities. The International Atomic Energy's Water Resources Department was a relatively new global contributor that helped with the SWING working group activities described below. The Hydrologic Ensemble Prediction EXperiment (HEPEX) is planning to become a global contributor to a new Hydrologic Applications Project.

Some of the GHP highlights for 2006 include the following:

- A final MAGS report was presented at the 2006 pan-GEWEX meeting. No direct follow-on projects are being planned. However many of the MAGS scientists are involved in a network proposal for the IGPY and other scientists are involved in a drought study.
- MAHASRI is being planned for 2006-2012 with the objective to improve the prediction of the Asian monsoon and its hydrological cycle.
- Both the Baltic Sea Experiment (BALTEX) and the Large-scale Biosphere Atmosphere Experiment in Amazonia (LBA) have now completed their Phase I activities.
- The BALTEX Phase II science plan has been published and the implementation plan will be completed this year.
- One of the major activities of LBA Phase II will be the Regional Atmospheric Carbon Budget in Amazonia (BARCA), which will address the basin-wide budgets of CO_2, CH_4 and water.
- The La Plata Basin (LPB) and the Murray Darling Basin are continuing to develop their implementation plans
- GAPP plans to end by 2007 and then continue to contribute as a CSE as part of the Coupled Prediction Project for the Americas (CPPA). Through GAPP, numerous operational model upgrades have improved the Environmental Modelling Center global forecast system. A new CPPA science and implementation plan is being prepared for submission to GEWEX SSG.
- An operational center has been established for the African Monsoon Multidisciplinary Analysis (AMMA) Project.
- The Water and Energy Budget Study (WEBS), chaired by John Roads is assessing the uncertainties in observing and simulating water and energy budgets over the CSEs in particular, and global land in general, using model output and GEWEX global data sets.

- The Worldwide Integrated Study of Extremes (WISE) working group, chaired by Ron Stewart is determining the extent to which processes responsible for extremes are similar in different regions, to understand the processes that link extremes in different regions, and to assess how they may be changing. One of the first tasks for WISE is to develop a database of extreme events starting with the CEOP time period and extending back in time.
- The Stable Water Isotope Intercomparison Group (SWING) has almost completed its analysis of the first common SWING simulations under present-day boundary conditions using three different state-of-the-art isotope global circulation models. A change in chairmanship was made from Martin Werner to David Noone this past year.
- The Transferability Working Group (TWG), chaired by E. Takle, is facilitating the development of regional models and climate simulations. Of particular note, is the Inter-CSE Transferability Study (ICTS), a joint project under TWG and CEOP/WESP chaired by Burkhardt Rockel, to study the performance of regional climate models over all of the CSEs. The TWG agreed at the GHP meeting to also participate in the ongoing GEWEX Cloud System Study (GCSS) Pacific Cloud Transect Study. Colin Jones represents the TWG at the GMPP meetings.
- The Water Resources Application Project (WRAP), previously chaired by Lawrence Martz has now changed to a Hydrologic Applications Project (HAP), chaired by Eric Wood. Examples of initiatives with promising links to HAP include HEPEX and the Project for Ungauged Basins (PUBs).

As discussed by Roads et al. (2006) CEOP, which began as a discussion item at the 2nd GHP meeting in 1995, eventually became such a successful working group that it was moved from GHP to become a program that was recognized by WCRP as an element of WCRP initiated by GEWEX. CEOP has been strongly supported by GHP and many GHP activities have now become actively entrained within CEOP, in part through the CEOP data management and modelling activities, and in part through cross linkages of some of the CSEs and GHP science working groups within the CEOP Monsoon Panel (MP) and the Water and Energy Simulation and Prediction panel (WESP). Examples of current WESP activities include a WEBS and an Inter-CSE Transferability Study (ICTS) working group. Examples of cross linkages include the GHP/WISE – CEOP/Extremes working group, which focuses on both midlatitude (WESP) and tropical (MP) hydrometeorological extremes especially during the CEOP time period, which is now being extended past the original 12/31/2004 pilot phase.

Initially, CEOP was looked on as only a pilot experiment, designed to intensively study a limited time period, 7/1/2001-12/31/2004, a period when many CSEs would likely have corresponding intensive observation periods to complement CEOP and a time when many of the new Earth Observing Satellites would be providing a wealth of new information about the earth. This pilot experiment was formulated and guided by a formal Science and Implementation Plan and involved a number of technical and science driven working groups that were reviewed and received direction and oversight from a Science Steering Committee and an Advisory and Oversight Committee. However, with the demonstrated success of CEOP phase I and advent of CEOP phase II, it is clear that CEOP will transition beyond a pilot period and will be extended for a number of years meaning that researcher time and available grant funds will become increasingly focused on CEOP efforts.

As a result, the GEWEX SSG, in full agreement with the GHP and with CEOP, has decided to merge GHP within CEOP. This formal merger is meant to enhance the efforts of both GHP and CEOP and will not lose sight of any of the GHP goals or any of the ongoing GHP work since the same scientists and more are already working on closely related projects and goals in CEOP. It does mean, however, a refocusing of the CSE and GHP agendas toward the CEOP program. The CSEs will become a separate panel within CEOP and the former GHP working groups will be absorbed within their parallel activities within CEOP. WEBS will continue to function within the CEOP/WESP framework, as will the Transferability Working Group through ICTS. SWING activities will become a new WESP activity. HAP will become part of the CEOP cross-cutting watershed hydrology working group and WISE will consolidate its activities under the CEOP/Extremes working group.

3.2 Continental Scale Experiments

African Monsoon Multi-disciplinary Analysis (AMMA)

The goal of AMMA is to improve our understanding of the West African Monsoon (WAM) and its influence on the physical, chemical and biological environment, regionally and globally.

The AMMA field campaign is the largest and most extensive of its kind ever undertaken in Africa. The first component of the AMMA field campaign is the long-term observation period (LOP) based on operational networks and specific field projects, covering the period 2001–2010. In 2005, AMMA began its Enhanced Observing Period (EOP) which will last 3 years and is characterized by a widespread intensification and coordination of existing networks. The peak of activity occurred in 2006 with four Special Observing Periods (SOPs) based on the deployment of extensive observation platforms, including research aircraft and vessels, balloons, and an array of ground instruments.

The Baltic Sea Experiment (BALTEX)

BALTEX has completed its Phase I and the BALTEX Phase II implementation document was published in 2006.

The BALTEX Assessment of Climate Change for the Baltic Sea Basin (BACC) Project organized its First International Conference on 22-23 May 2006 in Göteborg Sweden. The BACC Project is a joint venture of BALTEX and HELCOM (Baltic Marine Environment Protection Commission) and is an example of a dialogue between the scientific community and environmental policy makers. The unique feature of BACC is the combination of evidence on past, current and future climate change and related impacts on marine, freshwater and terrestrial ecosystems in the Baltic Sea Basin. The BACC project is the first systematic scientific effort for assessing climate change in a European region, and for a GEWEX CSE as well.

A BALTIC GRID Pilot Study is being set up to share resources (model data, observations and expertise) within the existing BALTEX communication and cooperation network. A free-as-possible information and data exchange with respect to the BALTEX data policy is expected. Additionally to the planned simulations, re-initializations (nudging) and data assimilation will be performed. Thus, data from the BALTEX Data Centres as well as additional observations (hydrographical and satellite data) will be needed. Furthermore, these data are important for process studies and model validation.

Climate Prediction Program for the Americas (CPPA) Project

Within NOAA, the GEWEX Americas Prediction Project (GAPP) project has been integrated with the CLIVAR/PACS program into the CPPA program. The overall CPPA goal is to improve operational intraseasonal to interannual climate prediction and the water resource applications. CPPA will continue to support GEWEX Phase-II objectives, but will go beyond GAPP's current focus on land-surface/hydrology and water resource components, and will address ocean-land-atmosphere interaction issues, cloud-boundary layer interaction and some COPES scientific questions.

CPPA has four scientific objectives: (1) to quantify the sources and limits of predictability of climate variations on intra-seasonal to interannual time scale to quantify the sources and limits of predictability of climate variations on intra-seasonal to interannual time scale; (2) to improve predictive understanding and model simulations of ocean, atmosphere and land-surface processes, including the ability to quantify uncertainty; (3) to advance NOAA's operational climate forecasts, monitoring, and analysis systems by transferring research to operation; and (4) to develop climate-based hydrologic forecasting capabilities for decision support and water resource applications.

A CPPA Science Panel was formed in February 2006 to develop a CPPA Science and Implementation Plan. CPPA supports various GEWEX cross-cutting studies, such as, precipitation, diurnal cycle, WEBS, extremes and transferability. The GAPP Core Project that aims at transferring GAPP research into NOAA operations

was reviewed by an external group and has been renewed for the next 5 years (2006-2010) under CPPA. CPPA continues to support CEOP by managing 41 CEOP reference data sites, providing data (in-situ, remote sensing, and model output) in the GAPP region, data analysis, demonstrating the utility of satellite data in research and climate prediction and evaluating the performance of global and regional models across climate regimes and time scales.

Large-scale Biosphere Experiment in Amazonia (LBA)

The Large Scale Biosphere-Atmosphere Experiment in Amazonia (LBA) is an international research initiative led by Brazil. LBA is designed to create the new knowledge needed to understand the climatological, ecological, biogeochemical, and hydrological functioning of Amazonia, the impact of land use change on these functions, and the interactions between Amazonia and the Earth system. LBA Phase 1 ended in December 2005 and LBA Phase 2 (LBA2) is now being organized and implemented.

Some of the components of the LBA phase 1 have been integrated in new ones, with a different approach. The goal of the LBA2 chemical and physical multi-scale interactions between land and atmosphere in the Amazon component (combination of physical climate, atmospheric chemistry and human dimensions) will study the transport and transformation of water, energy, trace gases and aerosols in the atmosphere-land system and assess the effects of and impact on human activities in the region.

La Plata Basin (LPB)

The fundamental issues to be addressed in LPB can be summarized in three main questions:

- What climatological and hydrological factors determine the frequency of occurrence and spatial extent of floods and droughts?
- How predictable is the regional weather and climate variability and its impact on hydrological, agricultural and social systems of the basin?
- What are the impacts of global climate change and land use change on regional weather, climate, hydrology and agriculture?

An LPB Implementation Steering Group is working with research and operational centers on an Implementation Plan. The plan will have two main activities: (1) monitoring of hydroclimate variables and (2) a field experiment to develop a set of unique data that will (a) help understand the land surface-atmosphere processes that may lead to persistent events, and (b) calibrate and improve parameterizations in regional and global models employed for forecasting and prediction up to seasons. The two activities will be complemented with modelling and diagnostics of the coupled system.

Monsoon Asian Hydro-Atmospheric Science Research and prediction Initiative (MAHASRI)

MAHASRI is being planned for 2006-2012 with the objective to improve the prediction of the Asian monsoon and its hydrological cycle. It was first proposed at the last GHP11 meeting at Melbourne, Australia in 2005 and then approved as a CSE at the GEWEX SSG-18 meeting held in Dakar, Senegal in 2006. A Japan national committee for MAHASRI was organized in 2006. National committees are also under development in Thailand, Vietnam, and Bangladesh. Partial support for some pilot projects over selected areas in Indonesian maritime continent, the Indochina Peninsula, the Tibetan Plateau and the equatorial Indian Ocean is being provided from the Japanese government.. Coordination with research projects in China and Thailand has been discussed.

Murray Darling Basin (MDB)

The major objectives of the MDB project are to:

- Observe, understand and model the dynamics of the coupled water, energy and carbon cycles
- Improve predictive tools for water management, including real-time forecasting products for use by water agencies in the MDB

- Strengthen interaction between the climate research community and decision-makers
- Promote education and international exchange to improve global change science capability and innovation in Australia and worldwide.

An active program of activities is continuing in ANSTO, BMRC, CSIRO Land and Water, CSIRO Marine and Atmospheric Research, and Melbourne University. The research activities are also supported by the eWater Cooperative Research Centre, which has over 30 participating research and operational water agencies. Selected highlights of activities over the last year are listed below.

- GRACE satellite observations were used to estimate the variability of terrestrial water storage within the MDB
- Studies to evaluate the assimilation of GRACE observations into a lumped conceptual hydrological model were undertaken
- A study to evaluate the use of a land surface model to predict surface runoff over medium sized catchments was undertaken and improvements to the model were evaluated
- The soil moisture monitoring network in the Murrumbidgee was expanded
- A quality-controlled gap-filled dataset of energy, water and CO2 fluxes at the Tumbarumba flux station has been developed from 2001.

3.3 GHP Projects and Working Groups

Water and Energy Balance Studies (WEBS)

The goal of GHP WEBS is to develop the "best available water and energy budgets", for the global land regions associated with the GEWEX Continental-Scale Experiments (CSEs).

GHP WEBS is using observationally based GEWEX Radiation Panel (GRP) global data sets and two Global Runoff Data Center (GRDC) runoff based global data products developed by the Univ. of New Hampshire, as well as the Climate Prediction Center Merged Analysis of Precipitation (CMAP) precipitation and surface temperature and the Climate Research Unit (CRU) surface temperature global data sets. WEBS is also using global reanalyses from the National Centers for Environmental Prediction (NCEP R1 and R2), the European Centre for Medium Range Weather Forecasts (ERA40), Japanese Reanalysis Agency (JRA) as well as data from the NASA Global Land Data Assimilation System (GLDAS) and GEWEX Global Soil Wetness Project (GSWP).

In order to make progress, the initial GHP WEBS activity has been limited to analysis of the bulk-integrated water and energy processes in the atmosphere and land. State variables include: precipitable water, soil moisture, snow equivalent water, atmospheric energy, surface air and skin temperature. Water and energy budget processes include: precipitation, moisture convergence, evaporation, runoff, heat convergence, latent heat of condensation, atmospheric radiative cooling, surface radiative heating, sensible and latent heat transfers from the surface to the atmosphere, ground heat flux, and the associated radiation fluxes.

Hydrologic Applications Project (HAP)

The Hydrologic Prediction Project (HAP) began in the spring of 2006 and will contribute to GHP by focusing on scientific issues related to assessing current hydrological conditions (nowcasting) and determining the extent to which seasonal hydrological prediction is possible and useful for water resources. The activities include:

- developing procedures for assessing current hydrologic conditions, like water availability and drought assessment, through application of GEWEX supported data products, including remotely sensed observations;
- developing and testing of reliable, skillful hydrologic ensemble forecast procedures based on seasonal climate model forecasts;

- demonstrating that the procedures can be applied at scales useful for water resources through test-bed sites and demonstration projects;
- working with related GHP projects, like WISE, and non-GEWEX groups like the Hydrologic Ensemble Prediction Experiment (HEPEX) and Project for Ungauged Basins (PUB) to share demonstration project sites, approaches and results to further the project goals.

Stable Water Isotope Intercomparison Group (SWING)

SWING aims to use water isotope simulation and analysis to improve understanding of key hydrologic exchange processes, the distribution of water sources, and the ability to model the hydrology. New opportunities have emerged due to availability of high quality satellite data. During 2006, SWING coordination was transferred from the Max Plank for Biogeochemistry in Jena to the University of Colorado in Boulder, with successful migration of the model and observation database and web site to the new location. Four modelling groups have contributed to the archive (contributing models are MUGCM, GISS, ECHAN, NCAR-CAM) with three additional groups expected to contribute as their internal validation is competed. The Phase 1 simulations include a 20 year simulation with climatological SSTs, and a simulation with transient SST from 1870 to 2002. Planning has begun for second phase experiments that target key atmospheric and surface processes, and address variability rather than mean state.

Worldwide Integrated Study of Extremes (WISE) Working Group

A concerted effort to address extremes has begun within GEWEX. This effort builds upon past work within GHP and its CSEs and other working groups and it also utilizes opportunities such as CEOP. A multi-point strategy has been developed, a group of researchers has been brought together, and preliminary activities have been initiated.

The first WISE case study will be a WEBS (Water and Energy Budget Studies) type diagnostic study of a severe drought event that occurred over the Canadian Prairies from 1999-2004/05. The objectives of the study are to (a) evaluate the surface and atmospheric water and energy budgets for the region during the 1997-2002 period; (b) assess the validity and variability of the budgets that are derived from different source datasets and (c) examine the deviations of the budgets from climatological values for this extreme hydrometeorological event. In addition to these scientific objectives, this pilot study will also attempt to establish mechanisms (e.g., in data transfer and task sharing) to facilitate future WISE collaborative studies. The water and energy budgets will be evaluated by using mainly global and regional (re-)analysis and model datasets (right now we have data from NCEP-R2, ERA40, CMC and the CRCM and NARR will be added) with validation data obtained from both in situ and remotely-sensed measurements. Apart from the evaluation of standard WEBS variables and parameters, diagnostics that are useful either in the characterization of drought events or in the understanding of their dynamics, such as precipitation recycling or moisture source tracing diagnostics, will also be conducted.

Transferability Working Group (TWG)

Global Precipitation Climatology Centre (GPCC)

The GPCC (DWD, Offenbach) continues to collect rain gauge data from three sources to produce the monthly, merged, global monitoring precipitation product (available globally at 1^{o} and 2.5^{o} resolution for the period 1986 to present): monthly totals calculated at the GPCC from the SYNOP reports, monthly CLIMAT reports and monthly totals calculated at CPC/NCEP from the SYNOP reports received at NCEP.

Two new analysis products were developed and published by GPCC on the basis of its enlarged monthly precipitation data base:

- **Reanalysis of the GPCC Full Data Product (current Version 3) for the period 1951 to 2004.** Based on all available monthly *in situ* precipitation data (from a maximum of 42,759 stations for June 1987, and 11,422 stations in January 1951, 25,087 stations in December 2000, and finally 11,313 stations in December 2004).

- **VASClimO 50-Year Climatology (current Version 1.1)**. This new analysis product consists of homogeneity-checked and partly homogenized time-series of monthly precipitation for the period 1951-2000 from 9,343 selected stations with an almost complete coverage over the entire period. The VASClimO Climatology has been developed at the GPCC within the project "Variability Analysis of Surface Climate Observations (VASClimO) of the German Climate Research Programme DEKLIM.

International Satellite Land-Surface Climatology Project (ISLSCP)

The ISLSCP Initiative II data collection is now complete and can be accessed at *http://islscp2.sesda.com*. The ISLSCP Initiative II data collection contains 50 global time series spanning the 10-year period 1986 to 1995 (selected data sets span even longer periods) considered by members of the GEWEX community as required to support investigations of the global carbon, water and energy cycle.

ISLSCP has been reinvented under GRP as the LandFlux activity, making the primary goal for its next phase the development of global data products for the turbulent fluxes of energy and water over land.

International Association of Hydrological Sciences (IAHS)

IAHS provides a venue for GHP hydrologic science efforts to interact with the broader science community. In that regard, IAHS has been encouraging various groups to become involved in its Prediction of Ungauged Basins (PUB) 10-year initiative and interacts with the Hydrologic Prediction Project (HAP) to better utilize GEWEX products for various applications. Three years into this 10-year project PUB has continued to grow with over 30 PUB workshops and meetings in the past year with particular involvement of younger scientists. A major success has been the establishment of a PUB Secretariat in Columbo, Sri Lanka funded by the IMWI and headed by Vladimir Smakhtin. Its website and the first newsletter (March 2006) is the best reference for reporting on PUB (link through www.iahs.info). New Working Groups had been established on Cold Regions and Low Flows and Hydrological Drought. These are relevant to GEWEX together with the existing MOPEX, HEPEX, orographic precipitation, model uncertainty, downscaling, top down modelling, and remote sensing and data assimilation Working Groups. Links have been established with the UNESCO IHP, and like HELP and FRIEND is seen as a cross-cutting exercise as well as fitting in well with the WWAP.

International Atomic Energy Agency (IAEA)

The IAEA has an isotope hydrology program that not only provides the international standards for making isotope measurements, but also collects and analyzes global isotope measurements in precipitation and stream-flow. The IAEA is working with and helping to coordinate SWING efforts to develop models capable of simulating and predicting these isotope measurements.

4. RADIATION

4.1 Overview

Through the GEWEX Radiation Panel (GRP), GEWEX has supported the development and maintenance of surface-based long-term networks such as BSRN and the development of satellite data products such as the Global Precipitation Climatology Project (GPCP) products to monitor quantities that are key for identifying natural variability and trends; for validating satellite observations and developing retrieval algorithms; for developing parameterization schemes to more accurately represent the atmospheric behavior, and for evaluating the fidelity of model simulations of the hydrological and energy cycles.

All of the global data products (except SeaFlux and LandFlux) are available through 2004, providing more than two decades of global determinations of clouds, precipitation, aerosols (ocean only) and surface and top-of-atmosphere radiation. Monthly mean global maps of all these and related data products are online at the GRP website for their respective time periods in a common map grid. Formal international assessments of the products from ISCCP, GPCP, GACP and SRB were started two years (the aerosol effort was re-started

this year) to provide a critique of the reliability of these products, as well as any other available data products that provide similar long global records. The Precipitation assessment is complete and has issued a report that has been reviewed by outside colleagues. The Radiation and Clouds assessments have completed their second workshops in the past year and are now working to sharpen comparison results to produce reports. The Aerosol assessment will conduct its first workshop on 14-15 September 2006. Funding for the continuation of the global data projects appears to be in place for GPCP and BSRN, but not for the ISCCP Global Processing Center beyond 2007, or for SRB or GACP. Nevertheless, WGDMA began planning at its last meeting for a coordinated reprocessing of all the products to take place in 2007-2009. CIRC is nearly ready to release a Web site that will provide both synthetic and observation-based tests for any radiative transfer code calculating broadband fluxes (like those used in GCMs). After reviewing current activities, the GRP decided against starting GVAP (Global Water Vapor Project) because, with the exception of the development of microwave water vapor profile retrieval methods over land, sufficient activity is already underway that should produce new global products within the next few years. SeaFlux was re-activated with a workshop in held in March 2006. The GRP is planning a kick-off workshop for LandFlux in spring 2007. A workshop on development of snowfall algorithms was held in October 2005. A Precipitation Radar Network WG has been formed and planning for a first meeting is underway.

4.2 GRP Projects and Working Groups

Global Precipitation Climatology Project (GPCP)

One of the major goals of GPCP is to develop a more complete understanding of the spatial and temporal patterns of global precipitation. Data from over 6,000 rain gauge stations, and satellite geostationary and low-orbit infrared, passive microwave, and sounding observations have been merged to estimate monthly rainfall on a 2.5-degree global grid from 1979 to the present. The careful combination of satellite-based rainfall estimates provides the most complete analysis of rainfall available to date over the global oceans, and adds necessary spatial detail to the rainfall analyses over land. In addition to the combination of these data sets, estimates of the uncertainties in the rainfall analysis are provided as a part of the GPCP products.

Currently there are three GPCP global precipitation products:
Monthly, 2.5º merged analysis [1979-present]
Pentad, 2.5 º merged analysis [1979-present]
Daily, 1º merged analysis [Oct. 1996-present]

International Satellite Cloud Climatology Project (ISCCP)

Using infrared and visible data obtained from polar and geostationary meteorological satellites, ISCCP produces data sets of global cloud cover and cloud radiative properties. ISCCP completed its 23rd year of data collection on 30 June 2006. Radiances from all operating meteorological satellites are being routinely collected by the Sector Processing Centers (SPC) and delivered to the Global Processing Center (GPC). All project data sets are now being delivered via Internet.

Two significant changes to ISCCP are being explored. (1) work is underway at NOAA National Climatic Data Center (NCDC) to refurbish the ISCCP B1 radiance data set, which has a spatial sampling interval of about 10 km instead of the 30 km sampling being used now. The major increase in use of the ISCCP products to study cloud and precipitation processes recommends such a change because the denser sampling would make the results less noisy at mesoscale. This would also significantly decrease the noise level in the shortwave fluxes determined by SRB. (2) Recently, the Group on Earth Observations (GEO) documents have pointed to Global Climate Observing System (GCOS) plans as representing the priorities of its climate activities and GCOS has strongly endorsed the continuation of ISCCP as part of the climate observing system.

GEWEX Global Aerosol Climatology Project (GACP)

A global climatology of the column aerosol optical thickness (AOT) and Ångström exponent over the oceans has been derived from channel-1 and -2 radiances of the AVHRR. The latest version of the climatology covers the period from August 1981 to June 2005 and is based on an adjusted value of the diffuse component of the ocean reflectance as derived from extensive comparisons with ship sun-photometer data.

Key GACP results

1. The global monthly mean optical thickness and Ångström exponent of tropospheric aerosols show no significant trends over the entire period and oscillate around the average values 0.145 and 0.75, respectively. The Northern hemisphere means AOT systematically exceeds that averaged over the Southern hemisphere.
2. Initial comparisons of the GACP aerosol product with MODIS and MISR aerosol retrievals have shown general agreement, the GACP global monthly AOT being lower than the MODIS one by approximately 0.03. Larger differences have been observed on regional scales. Comparisons of the GACP and MODIS Ångström exponent records are less conclusive and require further analysis.

3. The updated GACP climatology and SAGE data have been used to analyze how stratospheric aerosols from a major volcanic eruption can affect the GACP aerosol product. One possible retrieval strategy based on the AVHRR channel-1 and -2 data alone is to infer both the stratospheric and the tropospheric AOT while assuming fixed microphysical models for both aerosol components. The second approach is to use the SAGE stratospheric aerosol data in order to constrain the AVHRR retrieval algorithm. We have demonstrated that the second approach yields a consistent long-term record of the tropospheric AOT and Ångström exponent. The GACP retrieval results during the period affected by the Mt. Pinatubo eruption have been found to be consistent with the retrievals of the stratospheric AOT based on SAGE data.
4. GACP data of the retrieved AOT and Ångström exponent have been used to construct and analyze regional aerosol climatologies for a number of areas affected by different aerosol types (such as dust, biomass burning, anthropogenic, or clear maritime aerosols) which exemplify the range of natural aerosol variation. We have found that variations in the number of individual pixels used to calculate monthly means associated with short- and long-term satellite orbit changes and instrument degradation have little effect on global and hemispherical values of the AOT and Ångström exponent. Aerosol loads are found to be higher and aerosol particles smaller over the Northern Atlantic Ocean off the coast of Europe and Eastern US than off the US West Coast, thereby indicating a significant impact of anthropogenic aerosols. The smallest background levels of maritime aerosols are found in the Southern Pacific Ocean, with seasonal mean optical thicknesses as low as 0.1. We have analyzed time series of AOT in the regions affected by dust outflows form the Sahara and Asian deserts and by biomass burning. An influence of anthropogenic aerosols associated with the high regional industrial activity is apparent in the Eastern China Sea. Two distinct periods have been identified in satellite and sun-photometer aerosol time series over the Black Sea with transition time around 1993. During the first period the aerosol loads in the region significantly exceeded the hemispherical mean, whereas in the second period they became very close. This change has been linked to the reduction in the industrial output in that region.

Surface Radiation Budget (SRB) Project

In 2006 SRB has continued to improve, assess and validate TOA and surface radiation parameters. SRB has and is contributing to the GEWEX Radiation Flux Assessment project. The work and the resulting data sets completed by the SRB team has been included in nine known submitted journal articles two of which (Raschke et al., 2006 and Zhang et al., 2006) are already published and four others “in press”.

GEWEX SRB has completed the following since October 2005:

- Produced and archived a 21.5+ year (258 months) SRB Release 2.5 data set spanning July 1983 – December 2004 for the GEWEX LW, SW Quality Check (QC), and LW QC flux algorithms. 3-hourly, monthly averaged 3-hourly, daily averaged and monthly averaged data sets are now available at the NASA Langley Atmospheric Sciences Center (ASDC).
- Reprocessed the 21.5 year GEWEX SW v2.5 version twice owing to discovery of faulty assumptions and code errors. The latest version is v2.7 and this version is to be archived within the next month.

- Processed ISCCP DX for all codes for Jan. - June 2005 and these data will be added to the archive within a month.
- Prepared and delivered data products for the GEWEX Radiative Flux Assessment project.
- Delivered data sets to several users and contributed to several scientific papers.
- Compared latest gridded flux products to CERES and ISCCP-FD TOA and surface radiative fluxes.

Baseline Surface Radiation Network (BSRN)

In 2006 BSRN project continued to address its primary goals of obtaining the best-possible, high-quality, continuous, long-term, representative, ground-based, observations of the surface radiation budget and select related quantities. Observational data streams from eight sites began in 1992 and have expanded to 36 sites with another candidate 17 sites in various stages of development.

Continuous Intercomparison of Radiation Codes (CIRC)

This joint GRP-ARM working group is nearly ready to release a web site that will provide both synthetic and observation-based tests for any radiative transfer code calculating broadband fluxes (like those used in GCMs).

SeaFlux
SeaFlux is dedicated to producing climatological data sets of air-sea fluxes of heat, moisture, and momentum. The Third SeaFlux Workshop was recently held at Wakulla Springs, Florida on March 2 -3, 2006 with 28 participants from the Americas, Europe and Asia. A final workshop report is being produced and can be obtained from the SEAFLUX website at www.gfdi.fsu.edu/SEAFLUX. Several flux products are being produced by the members of SEAFLUX, including both operational and historical products.

LandFlux
The goal of the LandFlux activity is to determine the global distribution of the land surface turbulent fluxes of heat and water and their space-time variations. To that end, the next tasks will include at least: (a) compilation of *in situ* validation datasets specifically for turbulent fluxes (b) evaluating the state of available satellite radiances that can be used to measure relevant land surface properties, and (c) organizing workshops to evaluate remote sensing products, focusing on albedo and skin temperature but also assessing the state-of-the-art for near surface meteorology, soil wetness indicators and vegetation properties. Evaluation of data products should also include evaluation of the GSWP-2 models and their products. The first LandFlux Workshop is planned for 28 May - 1 June 2007 in Toulouse, France

Working Group on Cloud and Aerosol Profiling (WGCAP)
Formerly the Column Profiling (CPROF) Working Group WGCAP will release a common set of products from common sites collected during the same time period. Together with a linked set of web sites, these data will serve to illustrate the value of this type of measurement set (long-term, continuous measurements from cloud, aerosol and atmospheric profilers) and to prepare for more extensive operations during the flights of CloudSat and Calipso. The first release by WGCAP of a test set of common products in conjunction with release of the first products from CloudSat and Calipso is planned in 2007.

5. MODELLING AND PREDICTION

5.1 Overview

The GEWEX Modelling and Prediction Panel (GMPP) coordinates the activities within GEWEX for improving the representation of the global water and energy cycle processes within Earth System models. The following three groups exist to cover these activities: the GEWEX Cloud System Studies (GCSS)

Project, the Global Land/Atmosphere System Study (GLASS), and the GEWEX Atmospheric Boundary Layer Study (GABLS). GMPP maintains a close link with large scale Numerical Weather Prediction (NWP) models in order to ensure that the activities within the studies are relevant to atmospheric models and that the global modelling community is aware and can take advantage of the improvements proposed in cloud, land-surface and Atmospheric Boundary Layer (ABL) conceptual models. The GMPP strategy consists of identifying important regimes in the climate system; evaluating model performance generally and in the critical regimes using long-term data sets; developing new parameterization approaches through process studies targeting those regimes that are not well represented in current models, and supporting the implementation of the newly developed parameterizations in climate and NWP models. Among recent examples of GMPP contributions to climate modeling is the GLACE project which revolutionized land-feedback studies by elucidating areas of strong land-atmosphere coupling; and GCSS, whose approach to model development contributed in a major way to the first climate models using a cloud-resolving model approach to parameterization.

5.2 GMPP Projects

GEWEX Cloud System Studies (GCSS)

GCSS facilitates the development of better parameterizations of cloud systems for climate models by an improved understanding of the physical processes at work within the following types of cloud systems:

- Boundary layer
- Cirrus
- Extra tropical layer
- Precipitating convective
- Polar

The GCSS working groups and portfolios are all progressing according to their plans. The Boundary Layer Working Group is beginning a new study on the role of precipitation in shallow cumulus clouds based on the Rain In Cumulus over the Oceans (RICO) experiment. The cases for this study have been designed and initial results are becoming available. The Cirrus Working Group remains in a spin-up phase and is currently defining its first study based on an observational case. The Extratropical Layer Cloud Working Group is in the final stages of analyzing their simulations of the ARM March 2000 experiment. Current results identify the inability of GCMs to parametrize the effect of meso-scale circulations in frontal systems on the cloud fields in such systems as a major problem area. The Deep Convection Working Group is in the main phase of conducting their study of the transition from shallow to deep convection over the tropical ocean as part of the MJO. Early results indicate that GCMs develop deep convection too rapidly and with too large an effect on the large scale, not unlike their behaviour in the diurnal cycle. The group is also beginning to address issues related to the role of convection in the Tropical Tropopause Layer (TTL). The chair of the group co-organized the SPARC-GCSS-IGAC workshop on Modelling of Deep Convection and of Chemistry and their roles in the Tropical Tropopause Layer during June 2006 in Victoria, Canada. The workshop was very successful in bringing together the stratospheric dynamics, chemistry and convection modelling community. The formation of a cross-program working group on TTL issues was suggested and a small panel to establish the group was formed. Dr Leo Donner from GFDL is the current GCSS representative on that panel. The Polar Clouds Working Group is continuing on its case study based on recent data from the ARM MPACE experiment. The focus of this study is to better understand in simulate the long-lived mixed-phase clouds frequently found at the top of the Arctic PBL. The Pacific Cross Section Working Group is currently collecting results from the participating GCM groups. Thanks to the strong collaboration of GCSS with WGNE on this project the group has already received results from more than 10 modelling groups and this number is likely to rise to more than 20. All models that participate in the GHP study on transferability will also participate in this study. The group will meet for the first time in New York in September 2006.

The DIME activity is progressing as planned and several new cases have been added to the DIME library. Funding for the continuation of this activity has been secured by Dr W. Rossow (NASA GISS) and the DIME website will play an increasingly important role in the GCSS activities, such as that on moist process metrics.

GEWEX Global Land-Atmosphere System Study (GLASS)

The focus of GLASS is the terrestrial surface within modelling and prediction. The GLASS program is structured in four specific areas:

- "LoUCo" - Local uncoupled projects. This developed out of PILPS and now includes PILPS, iPILPS, SNOWMIP-2, PILPS C-1, PILPS-urban, and PILPS semi arid.
- "LoCo" - Local coupled projects. This includes interactions between the surface and the boundary later.
- "GloUnc" - Global uncoupled. This includes GSWP-2, LDAS initiatives.
- "GloCo" - Global coupled. This includes GLACE and LUCID.

GLASS is working closely within the local coupled projects with GABLS and has links to a large variety of external programs thorough our programs.

GLASS will contribute to the GRP Landflux activities as they relate to modelling terrestrial processes. GLASS also plans to develop closer links to land data assimilation in operational centres. Products including microwave remote sensing – and its assimilation of products into LSMs may be combined with other data sources including SMOS and FAPAR to identify stress. Assimilation of LAI is also a priority area. GLACE-2 is a long-term objective requiring significant encouragement of the community. GLASS plans to work closely within GMPP to build stronger links to GABLS and GCSS. The former link is developing well via LoCo, but links with GCSS require significant development in part due to a relative lack of understanding between the communities.

GEWEX Atmospheric Boundary Layer Study (GABLS)

The objective of GABLS is to improve the representation of the atmospheric boundary layer in regional and large-scale models for weather forecasting and climate studies, which should also benefit air quality and earth system studies.

In February 2006, a special issue of Boundary Layer Meteorology on the first GABLS bench-mark case for stable boundary layers was published. The stable case selected and studied is a simple, shear-driven boundary layer created by an imposed uniform geostrophic wind, with a specified surface-cooling rate over ice. This attains a quasi-steady state SBL (after about 9 hours). Overall the results indicate that the models show quite significant differences for the mean temperature and wind profiles as well as the turbulent fluxes and other model outputs for the same initial conditions and forcing conditions. It appears that this is very strongly related to the choice of the turbulent length scale and/or the stability functions in the turbulence schemes, and not so much to the vertical resolution. Overall the results for the different LES models are much closer than for the 1D models.

A second GABLS bench-mark case was selected on the basis of observed boundary-layers during CASES99 covering three diurnal cycles over land. Detailed observations for three nights are available with rather different characteristics (fully turbulent, intermittent turbulent and non-turbulent). This case is set up for the intercomparison of different column models within GABLS using prescribed surface temperature. For a more detailed intercomparison of LES and 1D models a morning transition will be selected in this period. In addition a LES case is set up for a full diurnal cycle.

The goal of the GABLS2 intercomparison of LES and column models is on the behavior and performance of the various models in comparison with the available observations, with a special focus on the diurnal cycle at clear skies. In addition, the proposed case has received interest from the GLASS/LOCO community as a suitable case to study also the interaction of the ABL with the land surface. Initial results were presented and discussed at the combined LOCO/GABLS workshop (Sept. 2005) and at 17th BLT in San Diego (2006). In addition the CASES99 data is currently used for intercomparison of mesoscale models.

The next SSG meeting will be held 4-8 February 2008 in Buenos Aires, Argentina.

APPENDIX A

LIST OF PARTICIPANTS

GEWEX SSG Members

Soroosh Sorooshian (SSG Chair)
Center for Hydrometeorology and Remote Sensing (CHRS)
Department of Civil and Environmental Engineering
University of California, Irvine
E-4130 Engineering Gateway
Irvine, CA 92697-2175 USA
Phone: 949-824-8825
Fax: 949-824-8831
E-mail: soroosh@uci.edu

Ulrich Schumann (SSG Vice-Chair)
Deutsches Zentrum fur Luft und Raumfahrt
DLR-Institut fur Physik der Atmosphare
Oberpfaffenhofen
Postfach 1116
D-82234 WESSLING, GERMANY
Phone: 49 8153 28 2520
Fax: 48 8153 218 1841
E-mail: ulrich.schumann@dlr.de

Thomas Ackerman
Atmospheric Radiation Msmt Program
Pacific Northwest National Laboratory
902 Battelle Blvd
PO Box 999 MS # K9-34
Richland, WA 99352-0999 USA
Phone: 509-372-6032
Fax: 509-372-4434
E-mail: ackerman@pnl.gov

Anton Beljaars
ECMWF
Shinfield Park, Reading
Berkshire RG2 9AX
UNITED KINGDOM
Phone: 44-118-9499-035
Fax: 44-118-986-9450
E-mail: Anton.Beljaars@ecmwf.int

Franco Einaudi
Earth Sciences Division, Code 610
East Campus, Building 33, Rm. E122
NASA Goddard Space Flight Center
Greenbelt, MD 20771 USA
Phone: 301-614-5634
Fax: 301-614-6301
E-mail: Franco.Einaudi@nasa.gov

Amadou Thierno Gaye
Laboratoire de Physique de l'Atmosphère et de l'Océan Siméon Fongang
Ecole Supérieure Polytechnique
Université Cheikh Anta Diop Dakar
BP 5085 Dakar-Fann
Dakar, SENEGAL
Phone: (221) 825 93 64
Fax: (221) 825 93 64
E-mail: atgaye@ucad.sn or atgaye@yahoo.fr

Jun Matsumoto
Department of Earth and Planetary Sciences
University of Tokyo
Bldg. No. 5
7-3-1 Hongo Bunkyo-ku
Tokyo 113-0033 JAPAN
Phone: 81-3-5841-4575
Fax: 81-3-5841-4575
E-mail: jun@eps.s.u-tokyo.ac.jp

David Randall
Department of Atmospheric Science
Colorado State University
200 West Lake Street
Fort Collins, Colorado 80523-1371 USA
Phone: (970) 491-8474
Fax: (970) 491-8693
E-mail: randall@atmos.colostate.edu

Kapil Dev Sharma
Director, National Institute of Hydrology
Roorkee 247667
INDIA
Phone: +91-1332-272-106
Fax: +91-1332-272-123
E-mail: sharmakd@nih.ernet.in

GEWEX Panel Chairs

Christian Jakob
School of Mathematical Sciences
Monash University
VIC 3800
AUSTRALIA
Phone: + 61 3 99054461
Fax: + 61 3 99054403
E-mail: c.jakob@bom.gov.au

Toshio Koike
Department of Civil Engineering,
School of Engineering, University of Tokyo
Bunkyo-ku, Tokyo 113-8656, JAPAN
Phone: +81-(0)3-5841-6106
Fax: +81-(0)3-5841-6130
E-mail: tkoike@hydra.t.u-tokyo.ac.jp

John Roads
UCSD, 0224
La Jolla, CA 92093-0224 USA
Phone: 858-534-2099
Fax: 858-534-8561
E-mail: jroads@ucsd.edu

William B. Rossow
City University of NY
Steinman Hall (T-107)
New York, NY 10031 USA
Phone: 212-650-5389
Fax: 212-650-8097
E-mail: wbrossow@ccny.cuny.edu or
wbrossow@gmail.com

GEWEX Project Leaders (or Reps)

Lydia Dumenil Gates
International Project Office
Walter-Flex-Str. 2
53113 Bonn GERMANY
Phone: 49 228 73 61 87
Fax: 49 228 73 60 834
E-mail: Lydia.dumenilgates@uni-bonn.de

Pasha Groisman
UCAR Project Scientist at NCDC
National Climatic Data Center
Federal Building, 151 Patton Avenue
Asheville, NC 28801 USA
Phone: +1 828 271-4347
Fax: +1 828 271-4328
E-mail: Pasha.Groisman@noaa.gov

Wei-Kuo Tao
Mesoscale Modeling and Dynamic Group
Mesoscale Atmospheric Processes Branch
Code 613.1
Laboratory for Atmospheres
NASA/Goddard Space Flight Center
Greenbelt, MD 20771
Phone: (301) 614-6269
Fax: (301) 614-5492
E-mail: tao@agnes.gsfc.nasa.gov

Pavel Kabat
Afd. Water en Millieu
ALTERRA
P.O. Box 47
NL-6700
Wageningen AA
THE NETHERLANDS
Phone: +31 317 474314
Fax: +31 317 424812
E-mail: Pavel.Kabat@wur.nl

Pier Siebesma
Royal Netherlands Meteorological Inst.
Wilhelminalaan 10
De Bilt, 3730AE
THE NETHERLANDS
31-30-2206 760
31-30-21-0407
E-mail: Pier.Siebesma@knmi.nl

Eric Wood
Dept. Civil and Environmental Engineering
Princeton University
Princeton, NJ 08544 USA
Tel: +1-609-258-4675; Fax: +1-609-258-2799
E-mail: efwood@princeton.edu

Steve Williams
NCAR/Earth Observing Laboratory (EOL)
P.O. Box 3000
Boulder, Colorado 80307 USA
Phone: (303) 497-8164
Fax: (303) 497-2044
E-mail: sfw@ucar.edu

International GEWEX Project Office

Dawn Erlich
International GEWEX Project Office
Suite 450, 1010 Wayne Avenue
Silver Spring, MD 20910 USA
Phone: 301-565-8345
Fax: 301-565-8279
E-mail: gewex@gewex.org

Rick Lawford
International GEWEX Project Office
Suite 450, 1010 Wayne Avenue
Silver Spring, MD 20910 USA
Phone: 565-8345
Direct Phone: 204-272-1540
Fax: 301-565-8279
E-mail: gewex@gewex.org or
lawford@umbc.edu

Robert Schiffer
Goddard Earth Sciences and Technology Center
Univ. of Maryland, Baltimore County
5523 Research Park Drive, Suite 320
Baltimore, MD 21228 USA
Phone: 410-455-8810
Fax: 410-455-8806
E-mail: schiffer@umbc.edu

Peter van Oevelen
Mission Experts Division
ESA-ESTEC
Land Surfaces Unit (EOP-SML)
PO Box 299
2200 AG Noordwijk zh
THE NETHERLANDS
Phone: 31-71-565-8189
Fax: 31-71-565-5675
E-mail: Peter.vanOevelen@esa.int

Yuping Yan
Beijing Climate Center
China Meteorological Administration
46 Zhongguancun Nandajie
Haidian
Beijing 100081 CHINA
Phone: 86-10-68400091
Fax: 86-10-68400097
E-mail: yanyp@cma.gov.cn

WCRP Programme Chairs (or Reps)

Jim Caughey
THORPEX International Programme Office
World Meteorological Organization
7 bis, Avenue de la Paix
Case Postale 2300
Geneva 2 CH-1121 SWITZERLAND
Phone: +41-22-730-8454
Fax: +41-22-730-8049
E-mail: jcaughey@wmo.int

Howard Cattle
International CLIVAR Project Office
National Oceanography Centre,
Southampton Empress Dock,
SOUTHAMPTON, SO14 3ZH, UK
Phone: +44 (0) 23 80596208
Fax: +44 (0) 23 80596204
E-mail: hyc@noc.soton.ac.uk

Bin Wang
Professor of Meteorology/IPRC
University of Hawaii
1680 East West Road, POST 401
Honolulu, HI 96822, USA
Phone: 1-808-956-2563
Fax: 1-808-956-9425
E-mail: wangbin@hawaii.edu

Tetsuzo Yasunari
Hydrospheric-Atmosph. Res. Ctr (HyARC)
Nagoya University
Furo-cho, Chikusa-ku
FRSGC/JAMSTEC
Nagoya Aichi 464-8601
JAPAN
Phone: +81-52-789-3465 or 5926
Fax: +81-52-789-3436
E-mail: yasunari@hyarc.nagoya-u.ac.jp

Agency Delegates or Other Invitees

Kiran Alapaty
ARM Science Program Manager
BER-1000 Independence Avenue, SW
SC-23.3 G-139/G
Washington, D.C. 20585-1290 USA
Phone: (301) 903-3175
Fax: (301) 903-8519
E-mail: Kiran.Alapaty@science.doe.gov

Sam Benedict
CEOP International Coordinator
742 "H" Avenue
Coronado, CA 92118-2134
Phone: 619-437-7904
E-mail: sam.benedict@gewex.org

Jared Entin
Sun-Earth System Division
NASA Headquarters
NASA Science Mission Directorate
300 E St., SW, Mail Code 5H79
Washington, D.C. 20546-0001 USA
Phone: 202-358-0275
Fax: 202-358-2770
E-mail: jentin@hq.nasa.gov

Einar-Arne Herland
Head, Science Strategy, Coordination and Planning Office
European Space Agency
Frascati, Italy 00044
Phone: 39-06-941-80600
Fax: 39-06-841-80602
E-mail: Einar-Arne.Herland@esa.int

Diane Hohnbaum
Center for Hydrometeorology and Remote Sensing (CHRS)
University of California, Irvine

E/4130 Engineering Gateway
Irvine, CA 92697-2175 USA
Phone: +1 (949) 824-8821
Fax: +1 (949) 824-8831
E-mail: dhohnbau@uci.edu

Robert A. Houze, Jr.
Professor, Atmospheric Sciences
ATG Building, Room 604
Box 351640
University of Washington
Seattle, WA 98195-1640 USA
Phone: 206-543-6922
Fax: 206-543-0308
E-mail: houze@atmos.washington.edu

Riko Oki
Earth Observation and Appl. Center (EORC)
JAXA
2-1-1 Sengen Tsukuba-shi
Ibaraki 305-8505 JAPAN
Phone: 81-29-868-2732
Fax: 81-29-868-2961
E-mail: oki.riko@jaxa.jp

Anni Reissell
iLEAPS International Project Office Department of Physical Sciences
PO Box 68 (Gustaf Hällströmin katu 2 B, Exactum) 00014 University of Helsinki, FINLAND
Phone: +358 (0)9 191 50570
Fax: +358 9 191 50860
E-mail: anni.reissell@helsinki.fi

Eileen Shea
NOAA Integrated Data and Environmental Applications Center
1601 East-West Road
Honolulu, Hawaii 96848 USA
Phone: 808-944-7253
Fax: 808-944-7499
E-mail: sheae@EastWestCenter.org

Gilles Sommeria
OMM/GCOS 7bis Avenue de la Paix
Case Postale 2300 CH-1211Geneve 2
Phone: 0041-227308247
Fax: 0041-227308052
E-mail: GSommeria@wmo.int

Duane E. Waliser
Jet Propulsion Laboratory, MS 183-505
California Institute of Technology
4800 Oak Grove Drive
Pasadena, CA 91109
Phone: 818-393-4094
Fax: 818 354 0966
E-mail: duane.waliser@jpl.nasa.gov

Martin Werscheck
Department Climate Monitoring
Deutscher Wetterdienst
Satellite App. Facility on Climate Mon.
P.O. Box 10 04 65
63004 Offenbach, GERMANY
Phone: 49-0-69-8062-4919
Fax: 49-0-69-8062-4955
E-mail: martin.werscheck@dwd.de

APPENDIX B

AGENDA
19th Session of the Scientific Steering Group of the
Global Energy and Water Cycle Experiment

East-West Center
Honolulu, Hawaii
22-26 January 2007

The primary purpose of this meeting is to examine GEWEX program structure and to determine how GEWEX can strengthen its contributions to WCRP priority activities and to associated programs.

Monday, 22 January 2007:

08.00 – 09.00: **Executive Session:**
(Session for SSG members only to discuss background, issues and what the SSG meeting should achieve)

08.30 – 09.00: **Registration**

09.00 – 09.15: **1. Introduction and Welcoming Remarks**
- 1.1: Welcome from Chair of GEWEX SSG (Soroosh Sorooshian)
- 1.2: Remarks by a Representative from the East-West Center (Jay McCreary)

09.15 – 10.45: **2. Overview of Activities and Plans**
- 2.1: Chairman's Report (Soroosh Sorooshian)
- 2.2: International GEWEX Project Office Report (Rick Lawford)
- 2.3: European GEWEX Coordination Activities Report (Peter van Oevelen)
- 2.4: Chinese GEWEX Coordination Activities Report (Yuping Yan) (Probably Unable to attend)
- 2.5: Review of Outstanding Action Items from the Last JSC, the 18th GEWEX SSG Meeting, and the Pan-GEWEX Meeting

---
10.45 – 11.15: BREAK

11.15 – 12.00: **3. GEWEX Plans**
- 3.1: Update on the GEWEX Roadmap (Rick Lawford)
- 3.2: Overview of the JSC GEWEX Roadmap Review and its Recommendations (Tetsuzo Yasunari)

12.00 – 13.00: LUNCH

13.00 – 13.30: **4. Presentation on Local Projects**
- 4.1: NOAA Applications Research in the Hawaii Region (Eileen Shea)

13.30 – 14.30: **5. Relations between GEWEX and THORPEX**
- 5.1: THORPEX Presentation (Jim Caughey)
- 5.2: Summary of GEWEX Links with THORPEX (TBD)
- 5.3: Discussion on Next Steps

14.30 – 15.00: **6. Relations between GEWEX and iLEAPS**

6.1: Summary of GEWEX Links with iLEAPS (Peter van Oevelen/ Rick Lawford)

6.2: Discussion on Next Steps

15.00 – 15:30: BREAK

15.30 – 17.00: **7. GEWEX and International Coordination Programs for Observing Activities**

7.1: Panel Overviews
GCOS (Gilles Sommeria)
IGOS [IGWCO & CRYO] (Rick Lawford)
GEO (Gilles Sommeria)
WOAP (Bill Rossow)

7.2: Discussion on GEWEX Participation in International Coordinating Programs for Observing Activities.

7.3: Discussion on Next Steps

17.00 – 18.00: **8. GEWEX and GWSP**

8.1: GWSP Presentation (Lydia Dümenil Gates)
8.2: HAP (Eric Wood)
8.3: Discussion on Next Steps

18.30: WELCOME COCKTAIL RECEPTION

Tuesday, 23 January 2007:

08.30 – 09.30: **9. Status of GEWEX Hydrometeorology Panel**

9.1: GHP Overview and GHP Contributions to the GEWEX Roadmap (John Roads)
9.2: CPPA (John Roads for Jin Huang)
9.3: NEESPI (Pasha Groisman)
9.4: Response to 2006 Rapporteurs' comments (if necessary)

09.30 – 10.30: **10. Status Report on CEOP**

10.1: CEOP Overview and CEOP Contributions to the GEWEX Roadmap (Toshio Koike)
10.2: WESP (John Roads)
10.3: CIMS (Bill Lau)

10.30 – 10.45: BREAK

10.45 – 11.15: **10. CEOP (*Continued*)**

10.4: Data Systems (Steve Williams)
10.5: Response to 2006 Rapporteurs' comments (if necessary)

11.15 – 12.30: **11. A Combined Future for CEOP and GHP**

11.1: Background to the CEOP/GHP Merger (Soroosh Sorooshian)
11.2: Summary of the CEOP/GHP Merger Plan (Toshio Koike)
11.3: Summary of reactions and concerns to the Merger Plan and how the Merger Plan has been adapted to address these concerns (John Roads)
11.4: Discussion, Decision and Next Steps

12.30 – 13.30: LUNCH

13.30 – 14.15: **12. Science Talks and Observational System updates**

12.1: TRMM data and latent heating estimates (Bob Houze/ Wei-Kuo Tao)
12.2: JAXA Precipitation Measurement Programs (Riko Oki)
12.3: Updates on the Decadal Survey and NEWS (Jared Entin)

14.45 – 15.15: BREAK

15.15 – 17.00: **13. Plans for Pan-WCRP Monsoon Activities**

13.1: Background (Rick Lawford)
13.2: GEWEX Monsoon Activities (Jun Matsumoto)
13.3: CLIVAR Monsoon Activities (Bin Wang)
13.4: The International Year of Convection (Duane Waliser)
13.5: Content of the JSC Submission on Monsoons
13.6: Discussion

17.00 – 18.00: **14. Second Executive Session**

(Review of outcomes from Days 1 and 2: SSG Members and Panel Chairs)

Wednesday, 24 January 2007:

09.00 – 10.15: **15. GEWEX Modelling and Prediction Panel (GMPP)**

15.1: Overview of GMPP Activities and GMPP Contributions to the GEWEX Roadmap (Christian Jakob)
15.2: GCSS Activities (Pier Siebesma)
15.3: Summary of GMPP interactions with WGNE, WGCM and WMP

10.15 – 10.45: BREAK

10.45 – 11.45: **15. GEWEX Modeling and Prediction Panel (*Continued*)**

15.4: GCSS and the Cloud Feedback MIP (Christian Jakob)
15.5: GEWEX Interactions with Modelling Panels – What Works and What Doesn't (Christian Jakob)
15.6: GMPP Response to 2006 SSG Comments on GMPP (Christian Jakob)
15.7: Summary and Actions Needed

11.45 – 12.45: LUNCH

13.00 – Evening: Excursion to the Polynesian Cultural Center with Dinner Included (Optional)

Thursday, 25 January 2007:

08.30 – 10.15: **16. GEWEX Radiation Panel (GRP)**

16.1: Status of GRP Projects and Assessments and GRP Contributions to the GEWEX Roadmap (William Rossow)

16.2: Actions Needed from the SSG

10.15 – 10.30: BREAK

10.30 – 12.00: **17. Scientific Presentations:**

17.1: EUMETSAT's Satellite Applications Facility (Martin Werscheck)

17.2: CloudSat and its Implications for Global Data Sets (Bill Rossow)

17.3: Monsoon Research Needs (Bin Wang)

12.00 – 13.00: LUNCH

13.00 – 14.30: **18. GEWEX Links with CLIVAR, CliC and SPARC**

18.1: Overview of CLIVAR (Howard Cattle)

18.2: CliC/GEWEX Interactions (Peter van Oevelen)

18.3: Review of the SPARC/GEWEX Workshop on the Role of Convection in the TTL (Christian Jakob)

18.4 Discussion on Next Steps and Future Interactions

14.30 – 15.00: **19. Discussion of Possible Locations for the 6th International Scientific Conference on the Global Water and Energy Cycle**

19.1: Presentation of the Options

19.2: Decision

15.00 – 15.30: BREAK

15.30 – 16.30: **20. 2007 Rapporteur Comments on GEWEX Activities and the Contributions of Panels to GEWEX Roadmap**

201: Merged CEOP/GHP

202: GMPP

203: GRP

21.4: Other Issues

16.30 – 17.30: 21 Third Executive Session
(Review of outcomes from Day 3 and Day 4: SSG Members and Panel Chairs)

Friday, 26 January 2007:

08.30 – 10.00: 22 Discussion of Inputs to WCRP priorities for the Next JSC Meeting
(These discussions will proceed with a very preliminary outline of the issue, discussion about what GEWEX needs or wants to add and the conclusion or position GEWEX wishes to promote)
22.1.: Extremes
22.2: Anthropogenic Climate Change
22.3: Decadal Prediction
22.4: Aerosols
22.5: IPY

10.00 – 10.30: BREAK

10.30 – 12.00: 23. Other Issues of Relevance to GEWEX
23.1: Succession Planning (Soroosh Sorooshian)
23.2: The Role of GEWEX in the New WCRP Order (All)
23.3: Other Issues (All)
23.4: Chairman's Summary Remarks (Soroosh Sorooshian)