



*Global Energy and Water Cycle Experiment*



Report of the

Twenty-Third Session of the  
GEWEX Scientific Steering Group

SSG-23: Seattle, Washington, 27-28 August 2010

[Click here and type publication date: month year]

[Click here and type publication number: WCRP  
Informal/Series Report No. X/Y]

## Table of Contents

<b>RECOMMENDATIONS AND ACTION ITEMS.....</b>	<b>2</b>
<b>ACTIONS .....</b>	<b>3</b>
<b>1. INTRODUCTION AND OVERVIEW .....</b>	<b>6</b>
<b>1.1 GEWEX Planning for Post-2013.....</b>	<b>6</b>
<b>2. GEWEX PANEL STATUS REPORTS.....</b>	<b>10</b>
<b>2.1 GEWEX Hydroclimatology Panel (GHP), formerly the Coordinated Energy and     Water-Cycle Observations Project (CEOP).....</b>	<b>10</b>
<b>2.2 GEWEX Radiation Panel (GRP) .....</b>	<b>12</b>
<b>2.3 Global Land Atmosphere System Study (GLASS).....</b>	<b>16</b>
<b>2.4 GEWEX Cloud Systems Study (GCSS)/GEWEX Atmospheric Boundary Layer     Study (GABLS).....</b>	<b>18</b>
<b>List of Participants .....</b>	<b>21</b>
<b>AGENDA for SSG-23 .....</b>	<b>23</b>

# RECOMMENDATIONS AND ACTION ITEMS

From the 23<sup>rd</sup> Session of the GEWEX Scientific Steering Group (SSG)  
27-28 August 2010, Seattle, Washington  
Seattle, Washington, 27-28 August 2010

## Recommendations to GEWEX Panels

### General

Pan-GEWEX Meetings will be scheduled every three years and International GEWEX Science Conferences every four years. The next Pan-GEWEX Meeting will be held in conjunction with the GEWEX Science Conference, preferably in late 2013 or early 2014. Between Pan-GEWEX Meetings, the SSG recommends joint panel meetings of opportunity (e.g., at science conferences).

The SSG and the GEWEX Panels found the presence of dedicated SSG members attending the panel meetings to be very helpful and it is recommended that this practice continue.

### GHP

Effective immediately, the name of the GEWEX Hydroclimate Panel is changed from the Coordinated Energy and Water Cycle Observations Project (CEOP) to the GEWEX Hydroclimatology Panel (GHP).

The Terms of Reference for the GEWEX Hydroclimatology Panel (GHP) were approved.

*TOR: The GHP chair or co-chairs and panel members are appointed by the GEWEX SSG. There should be not fewer than eight or more than 12 panel members. Panel members should include at least one Regional Hydroclimate Project (RHP) representative; other members should be selected to span the diversity of GHP goals, objectives, and projects, but need not necessarily be allocated to particular projects. Terms of the panel members are two years, with the option for reappointment. Ordinarily, panel members will not serve for more than six years.*

GHP recommended that the HYdrological cycle in the Mediterranean EXperiment (HyMeX) be approved as a new RHP and this was approved by the SSG. See statement below:

*Based on the GHP review of the HyMeX plan and the HyMeX presentation to the GHP meeting in Seattle on August 24, 2010, GHP recommends that GEWEX approve HyMeX as an RHP within the GHP. The HyMeX plan is comprehensive and addressed scientific issues of relevance to GHP. Based on the plan in the HyMeX presentation, GHP believes (with one reservation) that the project meets the criteria for a new RHP. Furthermore, the project is fully funded and has support from a number of nations in the HyMeX study area.*

*It should be noted that CEOP expressed the view that HyMeX should make a clearer commitment to the GHP policy of full and open exchange of data. HyMeX is requested to provide a statement that ensures that GEWEX/WCRP scientists will have full and unrestricted access to their data when they register as HyMeX data users.*

*Note: GHP has launched a reassessment of the RHPs and hence the above is subject to change.*

Regional modeling will continue to reside within the GHP RHPs, but strong collaboration with the Global Land/Atmosphere System Study (GLASS) and the GEWEX Cloud System Study (GCSS) is encouraged.

## **GMPP**

Effective 1 November 2010, the GEWEX Modeling and Prediction Panel (GMPP) will be removed from the GEWEX organization and modelling activities within GEWEX will be directly represented at the SSG level by GCSS/GEWEX Atmospheric Boundary Layer Study (GABLS) and GLASS. Oversight of GCSS will be provided by a Science Steering Committee (SSC). New GCSS projects may be proposed to the SSC by any member of the GCSS community, but they must conform to specific criteria for projects approved by the GCSS SSC. GABLS will be integrated into this structure and its participants may propose projects as well.

It was agreed that the Framework on Atmospheric Model Enhancement (FAME) is a key area that should be addressed by GEWEX.

It is recommended that GLASS explicitly add model development to its mission, in particular to address Land Surface Model (LSM) and Hydrological Model improvement.

## **GRP**

Recognizing its value, the SSG recommends that the GEWEX Radiation Panel (GRP) prepare and make available a synthesis of their data assessments available to the science community as soon as possible.

# **ACTIONS**

## **A. GENERAL**

1. Provide a list of priority meetings for the next 12 to 16 months that require travel support from WCRP and any IGPO organizational support two weeks before the next SSG meeting (ACTION: Panel Chairs, IGPO)
2. Give suggestions for WCRP Open Science Conference conveners to SSG Chair (ACTION: Panel Chairs, SSG Chair)
3. Develop a GRP/GLASS cluster of posters for the WCRP Open Science Conference (ACTION: Chris Kummerow, Bart van de Hurk)
4. Deliver panel summary status reports to IGPO within a month of the start of the SSG meeting (ACTION: GRP, GHP, GCSS/GABLS, GLASS)
5. Plan an open workshop to be held in 2012 to develop advanced diagnostics methods for water and energy balance studies. One goal of the workshop is to establish a working group that sits between GRP, GHP, and the modeling groups. The SSG will identify other communities to involve in this workshop (ACTION: SSG, GRP, GHP, GCSS/GABLS, GLASS)
6. Identify a representative of the European Union Integrated Project on Water and Global Change (WATCH) Programme to invite to the Workshop on Metrics and Methodologies of Estimation of Extreme Climate Events organized by Olga Zolina and held in September 2010. Roll the results of this workshop into the extremes workshop planned next year by WATCH. Recognizing the importance of research related to extremes, publish a workshop report in GEWEX News and the Bulletin of the American Meteorological Society (BAMS), and submit a paper to BAMS or other journal (ACTION: Olga Zolina, Eleanor Blythe)

## **B. IGPO**

1. Panel Chairs will send IGPO lists of upcoming GEWEX meetings and GEWEX-relevant meetings for posting on the GEWEX website. Meetings requiring funding support for attendance should be identified and IGPO will place this list on the wiki server and provide the location to the SSG and panel chairs (with restricted access to panel chairs and SSG Members). 2011 meetings are needed immediately (ACTION: Panel Chairs, IGPO)

2. The next GEWEX Science Conference will take place in 2013/2014. Representatives from Brazil and Italy offered to host the next GEWEX Science Conference in their countries. IGPO will provide the SSG with detailed proposals from both locations at the next SSG meeting (ACTION: IGPO)
3. IGPO and SSG Chair will arrange status update teleconferences periodically with the SSG (ACTION: IGPO, SSG Chair)
4. The demands on IGPO staff are expected to increase and it is likely that support for the CEOP Coordinator will be lost at the end of the year. IGPO will provide a list of demands on the project office and suggestions for staff positions needed and will submit this to SSG members for their suggestions for resources to properly staff the office (ACTION: IGPO)
5. Work with SSG Chair on date in November 2011 and location for the next SSG meeting (Europe is favored) (ACTION: IGPO, SSG Chair)
6. Provide suggestions to IGPO for reorganizing content on the GEWEX web site (ACTION: GRP, GHP, GLASS, GCSS/GABLS)

#### C. SSG

1. Consider options for a GEWEX Executive Meeting to be held in conjunction with the WCRP Open Science Conference (ACTION: Kevin Trenberth, IGPO)
2. Circulate a revised set of Imperatives that includes the comments of the SSG and panel members provided at the SSG meeting. Responsible leads for each of the Imperatives will submit their inputs to the SSG Chair by September (ACTION: SSG Chair, all panel contacts)
3. Provide suggestions to IGPO for ways to thank long-term panel chairs/chairs, in addition to a letter of thanks (ACTION: SSG members and panel chairs/co-chairs)
4. Provide IGPO with the integrated Rapporteur reports for each panel (ACTION: GRP: Olga Zolina; GHP: Howard Wheeler; GMPP: Jan Polcher)

#### D. GHP

1. Develop criteria for RHPs and nominations for GHP members and present these to the GEWEX SSG (ACTION: Dennis Lettenmaier)
2. Establish an advisory group to oversee the development of the 10-year GHP data sets (ACTION: Dennis Lettenmaier)
3. Research and suggest potential candidates to replace for GHP co-chair (ACTION: Howard Wheeler, Dennis Lettenmaier)
4. Review options for integrating the COordinated Regional climate Downscaling Experiment (CORDEX) into GEWEX and recommend GEWEX names for participation in the Task Force on Regional Climate Downscaling (ACTION: Howard Wheeler, Jan Polcher, Amadou Gaye, Eleanor Blyth)
5. Because of concerns expressed by the SSG members about the value of producing the 10-year GHP data set, GHP will develop a list of users for the data and their requirements for the dataset. GHP will also consult/work with the EU-CLIPS Project to ensure the usefulness of the data set (ACTION: Toshio Koike, Steven Klein)
6. Develop guidelines for maintaining the legacy of RHPs after their completion

#### E. GRP

1. GPCC was criticized for not having daily products, which may be due to data availability constrictions placed on GPCC by the countries producing the data. Investigate this and report to the SSG (ACTION: Chris Kummerow)
2. Consult with GPCC to see how it can make more of its data available for Extremes studies (ACTION: Chris Kummerow)

3. Develop a joint GRP/GHP project to evaluate water and energy cycle data products using RHP data sets (ACTION: Christian Kummerow, Dennis Lettenmaier)

#### F. GCSS/GABLS

1. Provide SSG with suggestions for members of the GCSS Scientific Steering Committee. SSG to approve and or comment on members before 1 November 2010 (ACTION: Chris Bretherton)
2. Circulate the FAME mission statement, components, approach, and partners discussed at the SSG meeting to the SSG members for comments. Due in two weeks (ACTION: IGPO, SSG Chair)
3. Over the next year, GMPP will consult other groups (e.g., the Working Group on Numerical Experimentation, WGNE) about the best way to plan FAME and will provide a report with its recommendations on this at the next SSG meeting. It will also develop a proposal for presentation to the JSC (ACTION: Christian Jakob, Kevin Trenberth)

#### G. GLASS

1. Develop a plan for a workshop on advanced diagnostics for model error analysis. Two GHP members will be included in the planning committee (ACTION: Christian Jakob, Chris Kummerow)
2. GLASS will invite GHP to nominate a person to attend their meetings (ACTION: Martin Best, Joseph Santanello)
3. GLASS and GHP should investigate how the regional and hydrological modeling activities in GHP are to be integrated with the relevant activities in GLASS (ACTION: Dennis Lettenmaier, GHP Co-CHAIR, Joseph Santanello, Martin Best)

# 1. INTRODUCTION AND OVERVIEW

The annual meeting of the GEWEX Scientific Steering Group (SSG-22) was held in New Delhi, India, on 25-29 January 2010. A special session of the GEWEX SSG was held after the 2<sup>nd</sup> Pan-GEWEX Science Meeting in Seattle, Washington, 23-27 August 2010. The goal of the 2<sup>nd</sup> Pan-GEWEX Meeting was held to develop a strategy for GEWEX activities in the post 2013 era that fit within the framework of the World Climate Research Programme (WCRP). To foster planning, the Meeting brought together the project and working group members of the GEWEX panels, members of the GEWEX SSG, and a number of agency program managers and young scientists. The Twenty-Third Session of the SSG (SSG-23) was held the afternoon of August 28<sup>th</sup> and the morning of August 29<sup>th</sup> to review the results of the Pan-GEWEX Meeting, and this report summarizes the main developments from that meeting.

## 1.1 GEWEX Planning for Post-2013

In its planning for the post 2013 timeframe, the WCRP Joint Scientific Committee (JSC) recommended that the four core projects of WCRP should have revised responsibilities to better facilitate climate system research at the interface of the physical Earth system components. These include:

1. Land-atmosphere (cf. GEWEX);
2. Ocean-atmosphere (cf. the current Climate Variability and Predictability Project, CLIVAR);
3. Cryosphere (cf. Climate and Cryosphere Project, CliC); and
4. Stratosphere-troposphere (cf. Stratospheric Processes And their Role in Climate Project, SPARC).

Each core project will have a common set of basic “themes,” including:

1. Observations and analysis;
2. Model development, evaluation, and experiments;
3. Processes and understanding;
4. Applications and services; and
5. Capacity building.

Coordination of these themes across the projects is to be facilitated by the new WCRP Modeling and Observations Councils.

In preparation for the forthcoming changes, the GEWEX SSG met in January 2010 in New Delhi and began formulating plans for a revised mission statement, a set of Imperatives (things that must be done), and a set of long-term frontiers or challenges for the future. The draft of these was published in the May 2010 issue of *GEWEX News* as a basis for discussions at the August Pan-GEWEX Meeting. The SSG agreed that the three GEWEX panels: (1) the GEWEX Radiation Panel (GRP); (2) the GEWEX Modeling and Prediction Panel (GMPP), and (3) the Coordinated Energy and Water Cycle Observations Project (CEOP) were relevant to the organization of GEWEX and similar components were strongly recommended in future plans for GEWEX. The original motivation for these being together is that they correspond to the “fast” processes in the climate system, and this still applies.

Following the JSC meeting, which was held in February 2010, key questions arose, such as “how much science falls under the category of land-atmosphere?” and “what about the science that does not?” Accordingly, the approach taken at the 2<sup>nd</sup> Pan-GEWEX Meeting was that while the future GEWEX should be the place where land-atmosphere interactions are featured, it should also retain the global energy and water cycle as a core focus while highlighting regional aspects. In addition, GEWEX should also include hydrological and land-surface processes and modeling, and interactions with the atmosphere. Further, GEWEX should retain a strong atmospheric component related to the water and energy cycles, and hence scientific issues related to radiation, clouds, convection, precipitation, boundary layers, surface

fluxes, runoff, and human influences, which should also be included in terms of observations, process understanding, and modeling.

### ***Results from the 2<sup>nd</sup> Pan-GEWEX Science Meeting***

The 2<sup>nd</sup> Pan-GEWEX Meeting provided a venue for vigorous discussions about future directions for GEWEX, and after consideration, the SSG has agreed upon the Mission Statement and Imperatives shown below.

### **GEWEX Mission Statement and Imperatives for Post 2013**

#### **Mission Statement:**

To measure and predict global and regional energy and water variations, trends, and extremes (such as heat waves, floods, and droughts), through improved observations and modeling of land, atmosphere, and their interactions, thereby providing the scientific underpinnings of climate services.

#### **Imperatives:**

***Data Sets:*** Foster development of climate data records of atmosphere, water, land, and energy-related quantities, including metadata and uncertainty estimates.

***Analysis:*** Describe and analyze observed variations, trends, and extremes (such as heat waves, floods, and droughts) in water and energy-related quantities.

***Processes:*** Develop approaches to improve process-level understanding of energy and water cycles in support of improved land and atmosphere models.

***Modeling:*** Improve global and regional simulations and predictions of precipitation, clouds, and land hydrology, and thus the entire climate system, through accelerated development of models of the land and atmosphere.

***Applications:*** Attribute causes of variability, trends, and extremes, and determine the predictability of energy and water cycles on global and regional bases in collaboration with the wider WCRP community.

The header in each Imperative highlights the link between the Imperative and the themes outlined by the JSC. There is still much left to be done to flesh out these Imperatives with more details regarding what they mean in terms of actions to be taken, what lead groups in GEWEX will be involved, and how interactions with other parts of WCRP and the other organizations will be involved.

#### ***Modeling***

Prior to the Pan-GEWEX Meeting, discussions via e-mail set the stage for the modeling discussions in Seattle, in particular, the desire of the Chair of the GEWEX Modeling and Prediction Panel (GMPP) to step down and his proposal to remove the reporting layer of GMPP, as well as the need to address the future structure of GEWEX modeling. The proposal to replace GMPP with two panels, (1) the Global Land/Atmosphere System Study (GLASS) Panel; and (2) the GEWEX Cloud System Study (GCSS)/GEWEX Atmospheric Boundary Layer Study (GABLS) Panel, which both report directly to the SSG, was positively received during the Pan-GEWEX Meeting and this new structure was later approved by the SSG.

As a part of the organizational changes, GCSS will abandon its current working group structure and will instead operate through projects, which can be initiated by any member of the community. Members of a GCSS/GABLS Science Steering Committee (SSC) will provide oversight of the program, including the approval of proposals for new activities. GABLS activities will be fully integrated into this structure through specific projects as well as GABLS membership on the SSC.

There was much discussion at the meeting regarding the proposal for a new post 2013 activity called the Framework for Atmospheric Model Enhancement (FAME), which would improve the representation of physical and dynamical processes in the troposphere in models for all purposes, and especially weather and climate services. Its main focus would be the improvement of the representation of clouds and precipitation in atmospheric models, which can only be achieved by improving our understanding of the



intricate coupling of physical and dynamical processes associated with clouds and precipitation at various scales.

FAME was proposed in recognition of the need expressed by the Intergovernmental Panel on Climate Change (IPCC) in several reports, which highlighted the significant shortcomings in models of the simulation of clouds and precipitation with consequences for the simulation of important climate feedbacks and climate sensitivity. Other important factors included the recent revolution in the ability to observe clouds and precipitation, especially from space, and improvements in ability to model the processes involved at the process-scale. The experience of more than 15 years of the GCSS project and almost 10 years of the GABLS project makes the time right for a more concerted effort in atmospheric model improvement that builds on the existing strengths and adds to them the important new research area of physics-dynamics coupling.

The envisaged components of FAME would be programs on the planetary boundary layer (GABLS), clouds, convection and precipitation (GCSS), radiation (currently residing in GRP and SPARC), coupling to dynamical processes (new), and potentially also coupling to numerics (new). FAME will be built around the core approaches identified by the WCRP JSC (e.g., observations, modeling, data analysis and model diagnosis, and process studies). Through the direct involvement of operational modeling centers in FAME, as well as through the engagement of scientists throughout the world, the activities in FAME could make major contributions to capacity building and services.

As FAME is tightly focused on providing a means for the improvement of the representation of core physical processes in atmospheric models, it would partner with many other programs to contribute to the research on phenomena that go beyond the physics-dynamics coupling in the atmosphere. Those include partnerships with GLASS and the GEWEX Hydroclimatology Panel (GHP) (land); CLIVAR (oceans); the Aerosols, Clouds, Precipitation and Climate Initiative (ACPC); the Integrated Land Ecosystem-Atmospheric Processes Study (iLEAPS) (aerosols); SPARC and International Global Atmospheric Chemistry (IGAC) (atmospheric chemistry); SPARC (stratosphere); and CliC (cryosphere). Necessarily, these go well beyond GEWEX alone.

FAME could be seen as a natural extension to the existing GCSS/GABLS panel described above. This would maintain continuity, provide close links to the land and limited area modeling communities, and ensure FAME's natural focus on the energy and water cycles. These activities were originally grouped together to provide a focus on relatively "fast processes" as compared with those involving the ocean or cryosphere. FAME could also make a major contribution to a potential cross-WCRP effort on atmospheric model development.

This proposal was discussed by the SSG, which strongly recommend keeping FAME within the post 2013 GEWEX structure. Questions include how FAME will be organized, whether as a panel or working group. Many of the other modeling activities within WCRP are under working groups (WG). The CLIVAR WG on Seasonal to Interannual Prediction (WGSIP) is an example of where the WG reports to the CLIVAR SSG but acts on behalf of WCRP to deal with seasonal to interannual prediction. A new group, integrating FAME and possibly called WGAP, short for WG on Atmospheric Processes and modeling for climate, could operate similarly within the new post 2013 GEWEX. However, as the activities relate to the established WGs, especially the WMO (CAS)/JSC Working Group on Numerical Experimentation (WGNE), this aspect has yet to be decided after broad consultation with the community.

#### *Hydrometeorology*

Under the leadership of Toshio Koike, the original CEOP (Coordinated Enhanced Observing Period) developed an impressive and extensive program, including the Regional Hydrometeorological Programs (RHPs), associated modeling and data base development, and the Hydrologic Applications Project (HAP). CEOP remains at the core of the GEWEX mission, including more than a thousand researchers, and providing important regional and modeling data and a valuable end-user interface.

### *Regional Projects*

The concept for the RHPs was developed in the 1990s for the development, diagnosis, and testing of coupled land-atmosphere models with a focus on water and energy budget closure at near-continental scales. The first CSE, the GEWEX Continental-Scale International Project (GCIP), was located in the Mississippi River Basin, which featured extensive observing instrumentation. CSEs in other regions were developed later [the Mackenzie GEWEX Study (MAGS), the Baltic Sea Experiment (BALTEX), the GEWEX Asian Monsoon Experiment (GAME), the Large-scale Biosphere Atmosphere Experiment in Amazonia (LBA), and the African Monsoon Multidisciplinary Analysis Project (AMMA)]. GEWEX established the GEWEX Hydrometeorology Panel (GHP) in 1994, primarily to coordinate the wide range of regional interests and activities involved in these CSEs. The overall GHP mission was to “demonstrate the capability to predict changes in water resources and soil moisture at time scales up to seasonal and interannual as a component of the WCRP’s prediction goals for the climate system.”

To take advantage of the observations becoming available via new satellites and other resources, the Coordinated Enhanced Observing Period (CEOP) was initiated in 2001. This activity, which also developed extensive data management activities, led to the development of new projects that overlapped existing projects within GHP and resulted in some duplication of effort. Accordingly, the first CEOP activity was combined with GHP and evolved to become the Coordinated Energy and Water Cycle Observations Project with the same acronym, CEOP, in 2007. The initial observing period grew to become an effort to produce a 10-year data set and archive especially set up for the regional projects. However, other developments had already occurred in observations and data management, which suggested that the activity should be wrapped up and refocused, even as it is utilized and hopefully becomes part of the heritage of GEWEX. In particular, the development of the many flux towers around the globe provides alternatives to the CEOP reference sites for local studies of energy, water, and biogeochemistry.

Accordingly, the GEWEX community began what might be called a “back to basics” movement, with recognition of the need to reinvigorate the regional hydrological projects. In particular, there was a call by the new co-chair, Dennis Lettenmaier, for stronger hydrological activities that would foster the next generation of hydrologically realistic land-surface schemes and provide a home for activities like the Project for the Intercomparison of Land-Surface Parameterization Schemes. This was discussed at the Pan-GEWEX Meeting and the recommendation made to the GEWEX SSG was along these lines. Thus, a new GEWEX Hydroclimatology Panel (GHP: note the change in the name from the first version) was created to replace CEOP, effective immediately. The SSG also followed up on the recommendation from CEOP to approve a new RHP, the Hydrological cycle in the Mediterranean Experiment (HyMeX), which is focused on the 20 countries around the Mediterranean Sea and the fresh water and salinity of the Sea itself.

GHP is thus the home for hydrologic science and modeling within WCRP and there is considerable scope for developments in this area (e.g., in seasonal forecasting, the detection and attribution of change) and the development and analysis of climate projections. Challenges remain in dealing with monsoons and to help coordinate the multitude of national initiatives in this area. There are also opportunities for linkage with GLASS in bringing disciplines together in the development of next generation Land-Surface Models as well as increasing interactions with the Coordinated Regional Downscaling Experiment (CORDEX). Changes in the management structure are likely to accompany the new consolidation of efforts as GHP realizes its considerable potential.

### *Radiation*

Changes in atmospheric water vapor, precipitation, clouds, and aerosols affect the energy balance of the Earth, and since these processes are intertwined, complex, and simultaneous, considerable uncertainty remains concerning their feedbacks. Addressing these issues requires coordinated global observations, and satellite observations must be employed. The GEWEX Radiation Panel (GRP) was organized in the 1990s to bring together theoretical and experimental insights into these aspects. However, it is looking for a name change as it encompasses a lot more than radiation.

The original GEWEX data sets were developed under the auspices of GRP and their production continues today. These data sets deal with all of the global satellite data related to energy and water and their synthesis into products. GRP is also leading and promoting the reprocessing of the data sets with a goal of creating climate data records of sufficient quality to be useful for examining trends. Some of the data sets, such as the Global Precipitation Climatology Project (GPCP) and the International Satellite Cloud Climatology Project (ISCCP) are well known and already used extensively. However, scientists are confident that the data sets can be improved and made more consistent with each other, and with better estimates of uncertainties. In general GRP is working well toward these goals and has produced simulators that take into account the sampling and characteristics (such as thresholds) of the observations to enable intercomparison of satellite products with model data. Interactions between GRP and the other GEWEX panels were fostered by the Pan-GEWEX Meeting. GRP data sets have great potential for use in the evaluation and improvement of models on issues such as clouds and the indirect effects of aerosols; precipitation frequency, intensity, and amount; and in providing context for the RHPs.

### *Extremes*

The recent summer record breaking flooding in Pakistan, India, and China, and heat waves and wildfires in Russia highlight the extremes of the hydrological cycle of drought and floods that are changing from human activities. Dealing with extremes in WCRP is a cross-cutting activity that involves all projects although GEWEX plays a leading role. Olga Zolina, who is a member of the GEWEX SSG, led the WCRP extremes workshop involving some 150 people at UNESCO in late September 2010. Breakout groups were held on issues of (1) data requirements and availability (such as the need for hourly precipitation data to properly characterize extremes); (2) representation of extremes in models, including scaling and spatial issues (how station data relate to grid squares, comparing apples to apples); and (3) methodologies for estimating extremes across areas and disciplines, including statistical methods. Continuing issues are sorting out the extremes that are to human activities and how to best communicate with the general public on such technical attribution issues.

## **2. GEWEX PANEL STATUS REPORTS**

### **2.1 GEWEX Hydroclimatology Panel (GHP), formerly the Coordinated Energy and Water-Cycle Observations Project (CEOP)**

**Full Name (Acronym):** GEWEX Hydroclimatology Panel (GHP)

**Reporting Period:** January–August 2010

**Co-Chair(s) and term dates:** Dr. Dennis Lettenmaier (2010-2012); Co-Chair to be determined

The Coordinated Energy and Water-Cycle Observations Project (CEOP) meeting included more than 40 international participants. In response to a series of questions posed before the meeting, project representatives presented status reports that included strategies for activities for the next 3 years. Additionally, the participants were challenged to address the changes needed to be responsive to the GEWEX Imperatives.

The new Co-Chair, Dennis Lettenmaier, with the support of the GEWEX Scientific Steering Group (SSG) and those present, agreed to take on more activities related to the expansion of regional land-surface models within the Regional Hydroclimate Projects (RHPs). To delineate this shift in focus and to preserve the legacy of CEOP as a separate but important contribution to GEWEX, the GEWEX Hydroclimatology Panel (GHP) was formed to replace CEOP. The main actions undertaken or planned for implementation by the co-chairs of GHP with respect to the comments and advocacy of the participants and the mandates of the SSG are included in the text below.

A special GHP advisory group of eight to ten members will be established and it is anticipated that the members within this group will assist in broadening the interdisciplinary scope of GHP. In addition, an RHP “Council” is planned to ensure stronger dialogue within the RHPs and will have representation on the GHP advisory group.

A draft GHP Terms of Reference (TOR) was developed at the meeting and will be reviewed and refined, first by the Panel members and then by the broader GHP community, before it is presented to the SSG for final approval.

An updated set of performance criteria for RHPs was established and presented in draft form for further review and iteration by the GHP/RHP community. The objectives and performance of all of the RHPs will be reviewed in the context of these “new” criteria, including those already within the GHP framework, those just newly established, such as the HYdrological cycle in the Mediterranean Experiment (HyMeX), and those in the process of being established. These criteria will be used to determine at what level all the RHPs are or will be contributing to the most important GEWEX (and by association the World Climate Research Programme) science and technical issues as expressed in the new GEWEX Imperatives. The RHP review/evaluation process will evolve over time, since the Imperatives themselves are still being expanded and formalized for full implementation post 2013.

To take advantage of the extensive data management activities that began under CEOP, especially the satellite and in situ data collection and quality verification process (beginning as far back as 2001), it was recommended that an advisory group be established within GHP to provide guidance on developing a 10-year GHP data set. An existing white paper on the topic has already gone through an initial review and been updated to include plans for selection of sites from within GEWEX-established networks and the FLUXNET Project.

The GHP Co-Chairs were asked, along with other key individuals, to provide details to the GEWEX Imperatives in the next step toward production of a GEWEX “next phase” Implementation Plan. Specifically, GHP was asked to take this action with respect to the “Application” Imperative.

A GHP working group was formed to review options for integrating the Coordinated Regional Climate Downscaling Experiment (CORDEX) into GEWEX and to make a recommendation for GEWEX membership in the WCRP Task Force on Regional Climate Downscaling. Because of the extensive expertise that GHP has in regional climate downscaling (RCD) techniques and since CORDEX is aimed at improving coordination of international efforts in RCD research, GHP agreed to take a lead role in this work on behalf of GEWEX.

Other items discussed at the meeting included:

- GHP involvement in the planning of a model error analysis workshop with the GEWEX modeling community.
- The engagement of the RHPs in a joint GEWEX Radiation Panel/GHP project to evaluate water and energy cycle data products using RHP data sets.
- Nomination of a representative of GHP to attend the Global Land/Atmosphere System Study (GLASS) meetings and investigate the feasibility of a joint GHP/GLASS initiative built upon GLASS expertise in land-surface studies and the GHP/RHPs focus on application models.

## 2.2 GEWEX Radiation Panel (GRP)

**Full Name (Acronym):** GEWEX Radiation Panel (GRP)

**Reporting Period:** January–August 2010

**URL:** <http://www.gewex.org/projects-GRP.htm> and <http://rain.atmos.colostate.edu/GRP/index.html>

**Chair and term dates:** Christian Kummerow (2007–2010)

### *Background*

The GEWEX Radiation Panel (GRP) was born of a need to understand the short- and longwave energy balance of the Earth System, requiring expertise in satellite and in situ observing systems. Soon after its formation, GRP began developing data sets of global water and energy variables, including surface radiation (Surface Radiation Budget Project, SRB), clouds (International Satellite Cloud Climatology Project, ISCCP), and precipitation (Global Precipitation Climatology Project, GPCP). Later, these were further expanded to complete the flux and forcing terms, including turbulent fluxes (SeaFlux and LandFlux) and aerosols (the Global Aerosol Climatology Project, GACP). These products represent the legacy of GRP.

GRP is conducting an assessment of the state of the water and energy budgets based upon its radiation products, which is intended to document the state of our observing system, and is meant to be the first in a periodic re-evaluation of the state of the water and energy observing system. It will also consist of closure tests on the global scale, temporal variability in the fluxes and states, attribution of changes to observed forcings, and a maturity index of various components based upon ongoing assessments of individual elements of the budget.

Success in this objective allows GRP to expand its scope to certain related areas:

*Product assessments.* GRP has led a number of assessment activities related to its own products but stands ready to help with future assessments of products related to the water and energy budgets—whether it be its own products or those generated under different auspices.

*Regional water and energy budget closures through collaboration with the Regional Hydroclimate Projects (RHPs).* These basins are of sufficient size to allow validation of global products and for GRP products to begin serving regional model validation. This collaboration has not been very successful to date as GRP's focus has remained global, but with some stewardship it should produce results quickly.

*Development of new radiative transfer codes to model and understand forcings in the climate system.* This effort includes an assessment of new potential satellite and in situ observing systems that would help close budgets.

*Diagnostic and process studies.* The global data products produced under GRP auspices lend themselves to verify not only model output, but also model processes. Successful examples include the ISCCP simulator that allows models to compare their cloud fields directly to ISCCP and thus verify if the right clouds are being produced. Similar simulators have been/are being created for CloudSat and the Tropical Rainfall Measuring Mission. Precipitation databases also let models verify if partitions between cloud- and rainwater correspond to observations. Optimizing these interactions with the climate and cloud scale modeling groups within GEWEX is ongoing.

The GRP meeting during the August 2010 Pan-GEWEX Meeting focused on reviewing progress in its objectives and individual panel activities, as well as the integrating function led by the Working Group on Data Management and Analysis (WGDMA) to bring the global products into a unified framework to address the current assessment of the global water and energy cycle state. Four new GRP members were

welcomed: (1) Prof. Hirohiko Masunaga from the University of Nagoya, with expertise in the areas of clouds, aerosols, and precipitation; (2) Dr. Carlos Jimenez, from the Laboratoire d'Etude du Rayonnement et de la Matière en Astrophysique (LERMA), with expertise in land turbulent fluxes (he has also been active in LandFlux assessment activities); (3) Dr. Mark Ringer from the UK Met Office, who will help guide diagnostic activities; and (4) Dr. Enio Pereira from the National Institute for Space Research (INPE), who has expertise in surface radiation measurements.

The first presentation, on the National Climatic Data Center (NCDC), was given by Dr. Kummerow, the GRP Chair, on behalf of Dr. John Bates, and covered: (1) the transition of ISCCP data from a research product to an operational production stream at NCDC; (2) the status of the previous year's request by GRP to NCDC to study the Clouds and the Earth's Radiant Energy System (CERES) FM6 calibration issue; and (3) the recently completed Earth Radiation Budget (ERB) Requirements Workshop. The transition of ISCCP data to an operational product is going smoothly with enough current and planned scientific involvement to ensure long-term care of the product. Calibration changes sought by the CERES team were prioritized for implementation based upon availability of funds, with the highest priority being the changing of the Longwave Window Filter, followed by changes in the Mirror Attenuator Mosaic. Presentations made at the ERB Workshop showed that radiation budget measurements are made by a large number of international agencies and that their coordination is paramount if they are to be optimized.

Dr. Robert Adler reported that Version 2.1 of GPCP data uses a more sophisticated gauge analysis over land and that improvements are particularly noticeable in regions dominated by orographic rain. Uncertainty estimates based upon differences among mature rainfall products have also been added and climate rainfall trends can be obtained from the 30-year record. When volcano and El Niño Southern Oscillation signals are removed, precipitation trends are shown to be 0.0154 mm/day (0.6%) per decade. Preparation of Version 3 is on track to be released in 2011 and will use a new microwave algorithm that produces higher temporal and spatial resolution products. The Global Precipitation Climatology Centre reported that it is producing valuable products and that the breadth of its gauge data record continues to increase.

During the new panel member presentations, Prof. Masunaga presented his science interests, including satellite observations of tropical convection and the large-scale environment. Dr. Jimenez showed his work on model intercomparison studies and observational products comprising land-surface temperature, emissivity, and turbulent fluxes.

Prof. Carol Anne Clayson reported on the 5<sup>th</sup> SeaFlux Workshop, which was held jointly with the Climate Variability and Predictability Project (CLIVAR) Working Group on High Latitude Surface Fluxes. The Workshop demonstrated the need for improved measurements of near-surface properties in high latitudes where many of the existing flux estimates still diverge. The SeaFlux product itself is being evaluated and appears robust against in situ measurements. All models seem to have large unrealistic latent heat trends, while some of the observationally based trends seem to be correlated to ocean swell with drifts in the Special Sensor Microwave Imager (SSM/I) brightness temperatures through the time series from F08 through F15. Version 2.0 of the SeaFlux product will use a homogeneous time series of SSM/I Tb from Remote Sensing Systems.

Prof. Mathew McCabe reported that there are now at least 12 different candidate global products for the LandFlux data set. While papers are being written about the similarities and differences among these, the main goal of these intercomparisons is to determine the range of uncertainty between them. It is premature to attempt to quantify the absolute accuracy of any of the products or to make claims about the superiority of one over another.

Dr. Paul Stackhouse presented the status of the Baseline Surface Radiation Network (BSRN) for Ellsworth Dutton, and reviewed the SRB Project and Radiative Flux Assessment activities. BSRN has grown to 58 participating sites in 23 countries, with new sites at the Marcos and Cocos Islands, which are very small islands representative of oceanic conditions. Significant progress continues in pyrheliometer

instrument comparisons, and in the archive of BSRN data at the Alfred Wegener Institute. Twenty-four years of SRB data are now available and are being validated against BSRN and newly processed CERES measurements. The next reprocessing is scheduled to begin in June 2011, following significant improvements in the input data and radiative transfer codes, as well as new ISCCP products. The Radiative Flux Assessment report will be available in 2011 and is intended to be a useful reference for the development of future climate system observation requirements for radiative fluxes and for understanding current data limitations.

Prof. William Rossow reported on ISCCP and WGDMA. ISCCP cloud products are available through June 2008 and include cloud radiances (B3 and B1U), DX cloud products at 25 km and 3-hourly resolution, D1/D2 cloud products (280 km, 3hr/monthly), radiative flux products, cloud particle sizes, Lagrangian tracking of mesoscale systems, mid-latitude cycle tracking, and weather states. Current calibration activities include radiance, both in absolute terms as well as calibration transfer schemes between satellites. Product improvements include better polar cloud detection schemes, more realistic surface emissivity for improved surface skin temperatures, and better ice treatment (phase function characterization) in the visible spectrum. Preparations are underway for the reprocessing in 2011 to a new 10 km, 3-hourly global product.

WGDMA coordinates the ancillary data used by the various GEWEX products and only if these are common does it make sense to integrate the distinct products to produce a unified water and energy budget from these observations. Common ancillary products include a land/water mask with topography, ozone, snow/ice, surface albedo, surface emissivity, surface temperature (over land and ocean), aerosols and atmospheric temperature, and humidity. The latter is deemed the most important for GEWEX products. WGDMA is currently testing the new High Resolution Infrared Radiation Sounder (HIRS) product. Plans were reviewed for reprocessing GEWEX products, which is scheduled to begin in mid-2011. Assessments of Climate Data Records are critical for understanding product strengths and weaknesses, residual uncertainties, and relative differences among parallel climate products. A workshop is planned to elucidate “best practices” in the assessment area and was hosted by the European Space Agency (ESA) Centre for Earth Observation (ESRIN) in April 2011 in Frascati, Italy.

As reported by Dr. Stefan Kinne, the Cloud Assessment Working Group is assembling all major multi-year data sets of cloud climatologies to produce a concise summary of individual sensor capabilities and their limitations. The assessment will go beyond cloud cover fractions to include cloud optical depth and microphysical properties. An interim result shows that total cloud cover is very sensitive to the instrument being used—ranging from approximately 75% for Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations (CALIPSO) to 65% for ISCCP. The draft assessment will be completed in 2010 and a summary paper is planned for the *Bulletin of the American Meteorological Society* in 2011.

An update on the aerosol assessment activity was presented by Dr. Paul Stackhouse on behalf of Prof. Sundar Christopher and Dr. Jeffrey Reid. The U.S. National Aeronautics and Space Administration (NASA) established a GEWEX Aerosol Project to examine the most common global aerosol products: Advanced Very High Resolution Radiometer [AVHRR (GACP and NOAA)]; Multi-angle Imaging SpectroRadiometer (MISR), Moderate Resolution Imaging Spectroradiometer [MODIS (Standard and Deep Blue)], Ozone Monitoring Instrument (OMI), and Polarization and Directionality of the Earth’s Reflectances (POLDER). The first phase of the Project consists of a comprehensive literature review and evaluation. Deliverables will include a report on the state of the science, the application of satellite aerosol data, the identification of shortcomings, and broad recommendations to the field for future development and verification needs. Early findings show that there is no shortage of validation studies; however, these tend to be direct regression based over limited time periods and/or locations. Hence, they tend to be of limited utility. Even well designed third party studies are generally not utilized or cited by the production teams. While there are many cases of satellite calibration/validation components to field missions, analyses are usually not repeated for new product versions. Over ocean there tends to be remarkable consistency both in aerosol optical depth and in correlated bias across sensors, and over land there are strong regional and temporally correlated biases across both algorithms and sensors.

The GEWEX Water Vapor Assessment is a new activity intended to address the need for a global time series of temperature and humidity profiles for water vapor transport estimates, for use within the derivation of long-term (i.e., 30 years) cloud properties, as well as surface radiation flux data sets and components of the radiation budget climatology. To that end, GRP organizing an assessment workshop held at the ESA/ESRIN in Frascati, Italy on 8-10 March 2011 to review the existing data sets for total column water vapor and water vapor profiles, including an analysis of their appropriateness for long-term climate applications needed by GEWEX.

In a discussion session focused on short-term goals, it was unanimously agreed that the largest single priority for GRP is to finish the individual product improvements and begin reprocessing all the products with a unified set of ancillary data sets. This integrated product forms the heart of GRP's effort to contribute to the understanding of the current observed state of the water and energy budget together with an uncertainty related to our current inability to fully close the water and energy budgets based upon observations alone.

GRP met with the GEWEX Modeling Panel during the 2<sup>nd</sup> Pan-GEWEX Meeting to explore issues of joint interest, including the need to foster advanced diagnostic studies. A joint workshop was proposed to explore how to extract relevant information on the water and energy budget from advanced diagnostics of observations and model results. This would include information on: (i) the interaction between the components of the climate system [e.g., studies exploring local coupling between surface and atmosphere require variables that are integrated somewhere in the Planetary Boundary Layer (PBL) but are sensitive to both surface and atmospheric states and processes], (ii) the conditional skill of models (compositing of cloud data is needed to distinguish between various types of clouds), (iii) the causes of variability (lagged correlations are fairly simple but do not necessarily reveal causal relationships); and (iv) techniques like Lagrangian tracking in space or time, or advanced neural networks, give more insights on best estimates of the state of the system (data assimilation increments reveal a lot of information on inherent drifts in data or models). Aside from exploring advanced diagnostics, the workshop would also explore establishing a Working Group on Advanced Diagnostics composed of experts who are not involved with the generation of data sets or model data, but who use both.

Following the joint session with the GEWEX Modeling Panel, GRP met to discuss progress in the Cloud/Aerosol and Precipitation area. Prof. Sue van den Heever led the discussion. She posed a number of broad questions that a combination of global and in situ observations should address, such as: (i) are aerosol responses different under different environments? (ii) what is the relative role of aerosol indirect forcing versus environment? (iii) do precipitation responses to aerosol indirect forcing differ based on storm type? (iv) does the precipitation response to aerosol indirect forcing vary based on when in the storm life cycle it is examined? (v) are raindrops larger, smaller, or the same size in polluted conditions compared with clean conditions? and (vi) is there a dynamic response to aerosol indirect forcing? The discussion focused on examining each of the questions from a GRP and U.S. Department of Energy Atmospheric Radiation Measurement (ARM) Climate Research Facility data perspective to see what data sets could be developed that begin to directly address the above questions.

Jim Mather then gave an update on ARM that included an overview of significant improvements made to the ARM radar facilities that will allow better validation of cloud and precipitation products. The update was received as very positive but some members expressed hope that the high quality data that ARM is known for would not suffer as a result of the greatly expanded observing capabilities.

Dr. Axel Schweigert gave a presentation that summarized some of the GRP priorities in polar regions. Cloud detection in polar regions is still an issue and he showed examples of cloud amount differences between MODIS and CALIPSO that were clearly dependent on sea-ice concentration. Precipitation in the polar regions, while small, is still important for ice growth and fresh water budgets. In situ observations are few but there are former Soviet ice-drifting stations that could be exploited. With regard to turbulent fluxes, he reiterated the need for more open ocean observations at high latitudes.



GRP also met with the GEWEX Hydroclimatology Panel. Both Panels agreed upon using the RHPs as a way of evaluating the global products at the proper regional scales while helping put the regional efforts of the RHPs into the global context afforded by GRP's data sets. The next step in this synthesis will be the selection of the appropriate RHPs for conducting these comparisons. It was felt that the integrated GRP data set should be produced first to get a good estimate of the closure, or lack thereof, in various basins around the world. Dr. Mitch Goldberg gave a presentation on the Committee on Earth Observation Satellites (CEOS) activities related to Environmental Climate Variables in order to ensure that all the products discussed remain consistent with CEOS expectations.

The meeting ended with a discussion of the GRP's role in the future of GEWEX and the assignments related to elucidating the GEWEX Imperatives in the next five to ten years. The outcome of this discussion is embedded in the broader GEWEX plan and Imperatives being prepared by the GEWEX Scientific Steering Group.

## 2.3 Global Land Atmosphere System Study (GLASS)

**Full Name (Acronym):** Global Land Atmosphere System Study (GRP)

**Reporting period:** January–August 2010

**URL:** <http://www.gewex.org/glass.html>

**Co-Chair(s) and terms:** Martin Best (2008- ); Joseph A. Santanello (2010- )

The Global Land/Atmosphere System Study (GLASS), which had been a project within the former GEWEX Modeling and Prediction Panel, is now a separate panel under GEWEX modeling activities. Bart van den Hurk stepped down as Chair in January 2011 and Martin Best of the Joint Centre for Hydro-Meteorological Research at the UK Met Office continues to co-chair. Joseph Santanello of the Hydrospheric and Biospheric Sciences Laboratory of the National Aeronautics and Space Administration (NASA) Goddard Space Flight Center in Maryland serves as the new Co-Chair. Gerrit de Rooij, Deputy Head of the Soil Physics Department at the Helmholtz Centre for Environmental Research in Germany, and Hyungjun Kim of the University of Tokyo in Japan were introduced as new Panel members.

Plans for new studies were discussed and included cross-cutting activities with the GEWEX Radiation Panel (GRP) and the GEWEX Hydroclimatology Panel (GHP, formerly CEOP). In light of the Pan-GEWEX Meeting discussions on the GEWEX Imperatives, the following mission statement was formulated:

GLASS will support improved estimates and representations of land states and fluxes in models, and the interactions with the overlying atmosphere to maximize the utilized fraction of inherent predictability.

The GEWEX Scientific Steering Group (SSG) recommended that GLASS explicitly promote model development and use of observations, including diagnostics of land-atmosphere interactions based on observations. In addition, the SSG is encouraging GLASS to host a future intercomparison experiment aimed at a new generation of land-surface models with a strongly developed hydrological component.

The first cross-cutting session was held with GRP and revealed two primary areas of common interests: (1) the LandFlux Project; and (2) the area of advanced diagnostics for model quality. The LandFlux Project provides a valuable data set for testing and benchmarking land-surface models and the data from the Global Soil Wetness Project (GSWP) would be a valuable addition to the LandFlux archive. There is shared interest in expanding the current metrics of model quality or system states by developing advanced diagnostics that give information on items such as the nature and strength of coupling between land and atmosphere, including the causes of observed variability of system components (attribution), and the conditional performance of models or process representations. Bart van den Hurk (GLASS) and

Carlos Jimenez (Landflux) are joint conveners of a dedicated poster session on advanced land-surface diagnostics at the World Climate Research Programme (WCRP) Open Science Conference in Denver, Colorado, on 24–28 October 2011.

Two broad areas of common interests were identified in the GLASS/GHP cross-cutting session: (1) modeling activities; and (2) the role of land-surface characteristics on precipitation in the West African Monsoon. Martin Best (GLASS) and Dennis Lettenmaier (GHP) were tasked with defining a joint hydrological modeling project. Yongkang Xue (GLASS) and Toshio Koike (GHP) will develop a local coupled land-atmospheric Modeling-African Monsoon Multidisciplinary Analysis Project (AMMA) type experiment that is suitable for identifying the relationships between surface properties and precipitation variability.

#### *PILDAS*

A pilot phase of a Project for the Intercomparison of Land Data Assimilation Schemes (PILDAS) was discussed. NASA and MeteoFrance are foreseen as initial partners (with more organizations invited to participate in the second phase). The goal of PILDAS is to organize a community effort through GLASS that provides a framework for comparing and assessing land-surface data assimilation systems. PILDAS-1 will focus on the assimilation of synthetic observations of surface soil moisture in preparation for the use of such data from the European Space Agency's Soil Moisture and Ocean Salinity (SMOS) Mission and NASA's Soil Moisture Active and Passive (SMAP) Mission. The initial design would be for a multi-year period with a limited domain (e.g., Red Arkansas River Basin).

#### *LoCo and LIS*

The Land Information System (LIS) contains a myriad of land-surface models, including the European Centre for Medium-Range Weather Forecasts' land-surface scheme (HTESSEL), the Joint UK Land Environment Simulator (JULES), and a data assimilation feature and standardized verification system. The first order Local Coupled land-atmospheric Modeling (LoCo) Experiment is now testing a wide range of land-atmosphere coupling diagnostics, such as: (i) traditional mixing diagrams; (ii) lifting condensation level (LCD) deficit quantifying the impact of land perturbations on the planetary boundary layer (PBL); (iii) Findell-Eltahir diagnostics of triggering of convection; (iv) revised relative humidity tendency variables; and (v) the McNaughton coupling coefficient. One paper has been submitted (Santanello et al., *Journal of Hydrometeorology*), and three papers are in preparation that describe the set-up of the software and diagnostics: (i) Santanello et al: Coupling indicators on the southern Great Plains site using LIS-WRF; (ii) Jacobs et al: Coupling indicators diagnosed from reanalysis datasets; and (iii) Ek et al.: Derivation of the diagnostics and sensitivity formulations.

The experiments focus on daytime studies when the first-order impact of the land-surface conditions through turbulent fluxes is at a maximum. Now that verification data are available over West Africa, the relative contributions in the parameterizations of the local variability of rainfall or convection can be evaluated.

#### *GSWP-3/CHEESE*

A Global Soil Wetness Project-2 (GSWP-2) follow-on project (with the suggested name of CHEESE, for the Coupled Hydro-Energy-Eco System Experiment) was proposed at a dedicated workshop held in Tokyo in June 2010. CHEESE would cover 1979–present, a period during which interesting global trends occurred, such as regionally different temperature increases and trends in (pan) evaporation and atmospheric dimming/brightening. Carbon models would be used to explore possible carbon-related effects or changes in ecosystem functioning related to these trends and uncertainties in forcings (e.g., precipitation) with multiple data sets. In addition, simulations using Coupled Model Intercomparison Project–Phase 5 (CMIP5) models for both present day and future conditions would be used with a routing scheme, such as the Total Runoff Integrated Pathways (TRIP), as a standard diagnostic tool.

Results of pilot error propagation analysis were presented by Hyungjun Kim, showing that the spread between the different land models was generally larger than in the precipitation forcings, which indicates model dependent sensitivity on evaporation and runoff. A white paper on experimental protocol is

currently in preparation by Taikan Oki and Kim. The GLASS Panel recommends that the project focus on climate experiments using CMIP5 forcings for present day climate conditions (uncertainty propagation, trend attribution, hydrological modeling, vegetation and carbon processes).

#### *PALS and Benchmarking Activities*

The development of a beta version of the Protocol for the Analysis of Land Surface Models (PALS, <http://pals.unsw.edu.au>) is underway. PALS is a web application for evaluating land surface models and the observed data sets used to test them. The PALS website is designed to analyze in a standard way uploaded single site model simulations with FLUXNET observations. Extensions to other data sets and creation of benchmarking tests are under development. Synchronization with components of the land information system (e.g., the verification package) is being considered. A number of suggestions were presented and discussed, including a presentation given by Bill Rossow on advanced diagnostics in the plenary session. A new benchmarking subgroup led by Christa Peters-Lidard will focus on how to promote the use of benchmarks in land-surface model development and testing. Projects like the International Land-Model Benchmarking (ILAMB) Project, GSWP-3/CHEESE, and the AMMA Land-Surface Model Intercomparison Project (ALMIP-2) are good candidates to serve as test beds.

#### *ALMIP-2*

The goal of ALMIP-2 is to provide parameterizations of runoff scaling and it is being planned with higher spatial resolution (5 km) than ALMIP-1. It will focus on subtle hydrology and vegetation processes (e.g., very large rooting depths, land use change, sloping bedrocks removing water from the catchment, strong variability in runoff). The study will cover a four-year period and will use a blend of in situ and radar data as well as Landsat and other satellite data. The call to participate will come soon (via GEWEX News) and results are expected by the end of 2011.

#### *GLACE-2*

Results from the second Global Land Atmosphere Coupling Experiment (GLACE-2) show that skill in temperature and precipitation increases mainly in areas where the precipitation forcing quality is high (high station density gives better initial soil moisture data), when soil moisture is relatively extreme, and where potential predictability is high. A longer experiment is needed to capture the extreme conditions leading to better skill in some areas not showing a large skill right now (e.g., Europe). Eric Wood and Luofeng Luo are planning an extension of GLACE-2 to examine the degree to which more accurate initialized forecasts can lead to better hydrological forecasts by hydrological models driven by the GLACE-2 models.

## **2.4 GEWEX Cloud Systems Study (GCSS)/GEWEX Atmospheric Boundary Layer Study (GABLS)**

**Full Names (Acronyms):** GEWEX Cloud Systems Study (GCSS)  
GEWEX Atmospheric Boundary Layer Study (GABLS)

**Reporting period:** January–August 2010

**URLs:** GCSS: [www.gewex.org/gcss.html](http://www.gewex.org/gcss.html)

GABLS: <http://www.gewex.org/gabls.htm>; <http://www.met.wau.nl/projects/Gabls/index.html>

**GCSS Co-Chairs and terms:** Jon Petch (November 2010-October 2014); Christopher Bretherton (January 2010-December 2014)

**GABLS Co-Chairs and terms:** Bert Holtslag (1999- ); Gunilla Svensson (2004- )

Several breakout sessions of the GEWEX Cloud System Study (GCSS) and GEWEX Atmospheric Boundary Layer Study (GABLS) were held during the 2<sup>nd</sup> Pan-GEWEX Science Meeting and the discussions focused on three subjects: (i) the removal of the GEWEX Modeling and Prediction Panel (GMPP) layer in the GEWEX structure; (ii) reorganization of GCSS and GABLS; and (iii) a proposal for

an extended tropospheric physics and dynamics research framework for the post 2013 World Climate Research Programme (WCRP) structure.

Prior to the Pan-GEWEX Meeting, discussions via e-mail set the stage for the modeling discussions in Seattle; in particular, the desire of the Chair of GMPP to step down and his proposal to remove the reporting layer of GMPP, as well as the need to address the future structure of GEWEX modeling. The proposal to replace GMPP with two panels, the Global Land/Atmosphere System Study (GLASS) Panel and GCSS/GABLS Panel, both of which both report directly to the GEWEX Scientific Steering Group (SSG), was positively received and this new structure was later approved by the SSG.

As a part of the organizational changes, GCSS will abandon its current working group structure and will instead operate through projects, which can be initiated by any member of the community. Members of a GCSS/GABLS Science Steering Committee (SSC) will provide oversight of the program, including the approval of proposals for new activities. GABLS activities will be fully integrated into this structure through specific projects as well as GABLS membership on the SSC.

There was much discussion at the meeting regarding the proposal for a new post-2013 activity called the Framework for Atmospheric Model Enhancement (FAME), which would improve the representation of physical and dynamical processes in the troposphere in models for all purposes, and especially weather and climate services. Its main focus would be the improvement of the representation of clouds and precipitation in atmospheric models, which can only be achieved by improving our understanding of the intricate coupling of physical and dynamical processes associated with clouds and precipitation at various scales.

FAME was proposed in recognition of the need expressed by the Intergovernmental Panel on Climate Change (IPCC) in several reports, which highlighted the significant shortcomings in models of the simulation of clouds and precipitation with consequences for the simulation of important climate feedbacks and climate sensitivity. Other important factors included the recent revolution in the ability to observe clouds and precipitation, especially from space, and improvements in ability to model the processes involved at the process scale. The experience of more than 15 years of the GCSS project and almost 10 years of the GABLS project makes the time right for a more concerted effort in atmospheric model improvement that builds on the existing strengths and adds to them the important new research area of physics-dynamics coupling.

The envisaged components of FAME would be programs on the planetary boundary layer (GABLS), clouds, convection and precipitation (GCSS), radiation (currently residing in GRP and the Stratospheric Processes and their Role in Climate, SPARC), coupling to dynamical processes (new), and potentially also coupling to numerics (new). FAME will be built around the core approaches identified by the WCRP Joint Scientific Committee (JSC), including observations, modeling, data analysis and model diagnosis, and process studies. Through the direct involvement of operational modeling centers in FAME, as well as through the engagement of scientists throughout the world, the activities in FAME could make major contributions to capacity building and services.

As FAME is tightly focused on providing a means for the improvement of the representation of core physical processes in atmospheric models, it would partner with many other programs to contribute to the research on phenomena that go beyond the physics-dynamics coupling in the atmosphere. Those include partnerships with GLASS and the GEWEX Hydroclimatology Panel (GHP) (land); Climate Variability and Predictability (CLIVAR) (oceans); the Aerosols, Clouds, Precipitation and Climate Initiative (ACPC); the Integrated Land Ecosystem-Atmospheric Processes Study (iLEAPS) (aerosols); SPARC and International Global Atmospheric Chemistry (IGAC) (atmospheric chemistry); SPARC (stratosphere); and CliC (cryosphere). Necessarily, these go well beyond GEWEX alone.

FAME could be seen as a natural extension to the existing GCSS/GABLS panel described above. This would maintain continuity, provide close links to the land and limited area modeling communities, and ensure FAME's natural focus on the energy and water cycles. These activities were originally grouped

together to provide a focus on relatively “fast processes” as compared with those involving the ocean or cryosphere. FAME could also make a major contribution to a potential cross-WCRP effort on atmospheric model development.

This proposal was discussed by the SSG, which strongly recommend keeping FAME within the post-2013 GEWEX structure. Whether it would be a panel or working group are questions to be addressed. Many of the other modeling activities within WCRP are under working groups. The CLIVAR Working Group on Seasonal to Interannual Prediction (WGSIP) is an example of a working group that reports to the CLIVAR SSG but acts on behalf of WCRP to deal with seasonal to interannual prediction. A new group, integrating FAME and possibly called WGAP, short for Working Group on Atmospheric Processes and modeling for climate, could operate similarly within the post-2013 era of GEWEX. However, as the activities relate to the established working groups, especially the World Meteorological Organization Commission for Atmospheric Sciences/JSC Working Group on Numerical Experimentation (WGNE), this aspect has yet to be decided after broad consultation with the community.

# List of Participants

23<sup>RD</sup> SESSION OF THE GEWEX SCIENTIFIC STEERING GROUP  
SEATTLE, WASHINGTON • 27-28 AUGUST 2010

## GEWEX SCIENTIFIC STEERING GROUP

### **Peter Bauer**

Head of Satellite Section  
Research Department  
European Centre for Medium-Range Weather  
Forecasts (ECMWF)  
Shinfield Park  
Reading, Berkshire RG2 9AX, UK  
Phone: +44 118 949 9080  
E-mail: [peter.bauer@ecmwf.int](mailto:peter.bauer@ecmwf.int)

### **Eleanor Blyth**

Centre for Ecology & Hydrology  
Maclean Building  
Benson Lane  
Crowmarsh Gifford  
Wallingford  
Oxfordshire, UK OX10 8BB  
E-mail: [emb@ceh.ac.uk](mailto:emb@ceh.ac.uk)

### **Amadou Gaye**

Ecole Supérieure Polytechnique  
Labo de Physique de L'Atm et de L'Océan  
Université Cheikh Anta Diop Dakar  
Dakar-Fann, Senegal BP5085  
Phone: (221) 33 825 93 64  
E-mail: [atgaye@ucad.sn](mailto:atgaye@ucad.sn)

### **Steve Klein**

Program for Climate Model Diagnosis and  
Intercomparison  
Lawrence Livermore National Laboratory  
7000 East Avenue, L-103  
Livermore, CA 94551  
Phone: (925) 423-9777  
E-mail: [klein21@llnl.gov](mailto:klein21@llnl.gov)

### **William K. M. Lau**

Chief, Laboratory for Atmospheres  
NASA Goddard Space Flight Center  
Code 613  
Phone: 301-614-6332  
E-mail: [William.K.Lau@nasa.gov](mailto:William.K.Lau@nasa.gov)

### **Jun Matsumoto**

Tokyo Metropolitan University  
Minami-Ohsawa 1-1  
Hachioji, 192-0397 Japan  
Phone: 042-677-2596  
E-mail: [jun@center.tmu.ac.jp](mailto:jun@center.tmu.ac.jp)

### **Jan Polcher**

Lab de Météorologie Dynamique du CNRS  
Tour 25, 3ème étage, Case 99  
4 pl. Jussieu, 75252  
Paris, CEDEX 05 France  
Phone: 33-1-44-274763  
E-mail: [jan.polcher@lmd.jussieu.fr](mailto:jan.polcher@lmd.jussieu.fr)

### **Ronald Stewart**

University of Manitoba  
Dept. of Environment and Geography  
Room 213, Isbister Building  
183 Dafoe Road  
Winnipeg, MB Canada R3T 2N2  
Phone: 204-474-9081  
E-mail: [ronald.e.stewart@gmail.com](mailto:ronald.e.stewart@gmail.com)

### **Kevin Trenberth**

UCAR/NCAR  
Climate and Global Dynamics Division  
P.O. Box 3000, ML  
Boulder, CO 80307  
Phone: 303-497-1318  
E-mail: [trenbert@ucar.edu](mailto:trenbert@ucar.edu)

### **Howard Wheeler**

Imperial College of London  
Civil and Environmental Engineering  
Skempton Building  
London, United Kingdom SW7 2AZ  
Phone: 44 (0) 20 7594 6066  
E-mail: [h.wheater@imperial.ac.uk](mailto:h.wheater@imperial.ac.uk)

### **Rucong Yu**

China Meteorological Administration  
46 Zhongguancun Nandajie  
Beijing 100081 China  
Phone: 86-10-6840-9698  
E-mail: [yrcc@lasg.iap.ac.cn](mailto:yrcc@lasg.iap.ac.cn)

### **Olga Zolina**

Meteorologisches Institut, Universität Bonn  
auf dem Huegel 20  
Bonn, Germany D-53121  
Phone: 49 228 735779  
E-mail: [ozolina@uni-bonn.de](mailto:ozolina@uni-bonn.de)

## JOINT PLANNING STAFF (WCRP)

### Ghassem Asrar

Director, World Climate Research Programme  
Avenue de la Paix  
7 bis Case, Postale 2300  
Geneva 2, Switzerland CH 12  
Phone: 41 (0) 22 730 8246  
E-mail: [GAsrar@wmo.int](mailto:GAsrar@wmo.int)

## WCRP JOINT SCIENTIFIC COMMITTEE

### Antonio Busalacchi

Director, Earth System Science Interdisciplinary  
Center  
University of Maryland  
5825 University Research Court  
Suite 4001, M Square Office Bld. #950  
College Park, MD 20740 USA  
Phone: 301-405-5599  
Fax: 301-405-8468  
E-mail: [tonyb@essic.umd.edu](mailto:tonyb@essic.umd.edu)

## GEWEX PANELS

### Christian Jakob

Monash University  
School of Mathematical Sciences  
Victoria, Australia 03800  
Phone: 61 3 99054461  
E-mail: [christian.jakob@sci.monash.edu.au](mailto:christian.jakob@sci.monash.edu.au)

### Toshio Koike

University of Tokyo  
Department of Civil Engineering  
7-3-1, Hongo, Bunkyo-ku  
Tokyo, Japan 113-8656  
Phone: 81-(0)3-5841-6106  
E-mail: [tkoike@hydra.t.u-tokyo.ac.jp](mailto:tkoike@hydra.t.u-tokyo.ac.jp)

### Chris Kummerow

Colorado State University  
Department of Atmospheric Science  
Ft. Collins, CO 80523 USA  
Phone: 970-491-7473  
E-mail: [kummerow@atmos.colostate.edu](mailto:kummerow@atmos.colostate.edu)

### Dennis Lettenmaier

202D Wilson Ceramic Lab, Box 352700  
University of Washington  
Seattle, WA 98195-2700 USA  
Phone: 206-543-2532  
E-mail: [dennisl@u.washington.edu](mailto:dennisl@u.washington.edu)

### Gunilla Svensson

Department of Meteorology and  
Bert Bolin Centre for Climate Research  
Stockholm University  
106 91 Stockholm  
SWEDEN  
Phone: +46-(0)8-164337  
E-mail: [gunilla@misu.su.se](mailto:gunilla@misu.su.se)

## INTERNATIONAL GEWEX PROJECT OFFICE

### Dawn Erlich

International GEWEX Project Office  
8403 Colesville Road, Ste. 1550  
Silver Spring, MD 20910 USA  
Phone: 240-485-1855  
Fax: 240-485-1818  
E-mail: [gewex@gewex.org](mailto:gewex@gewex.org)

### Rick Lawford

University of Manitoba  
Center for Earth Observation Science  
Environment and Geography  
125 Drysart Road, Wallace Bldg, Rm 495  
Winnipeg, MN, Canada R3T 2N2  
Phone: 204-272-1540  
Fax: 204-272-1532  
E-mail: [lawford@umbc.edu](mailto:lawford@umbc.edu)

### Peter van Oevelen

Director, International GEWEX Project Office  
8403 Colesville Road, Ste. 1550  
Silver Spring, MD 20910 USA  
Phone: 212-485-1855  
Fax: 212-485-1818  
E-mail: [gewex@gewex.org](mailto:gewex@gewex.org)

# AGENDA for SSG-23

**23<sup>rd</sup> Session of the Scientific Steering Group (SSG)  
of the Global Energy and Water Cycle Experiment**

**University of Washington, Seattle, Washington, USA  
27-28 August 2010**

## Friday, 27 August

<b>14.00</b>	<b>18.30</b>	<b>SSG-23 MEETING</b>	<b>Room: Johnson 22</b>
14.00	15.00	Welcome and Meeting Expectations	K. Trenberth
15.00	15.30	Review/Status of Action Items from 2010 WCRP JSC Meeting and 22 <sup>nd</sup> GEWEX SSG Meeting	P. van Oevelen
15.30	16.00	BREAK	
16.00	17.00	Review of the Pan-GEWEX Meeting and Reports of SSG Members Who Attended Panel Sessions (from assignments made earlier)	SSG Members
17.00	17.30	GRP Rapporteur's Report on Pan-GEWEX Meeting and Discussion	O. Zolina, P. Bauer, W. Lau, R. Yu
17.30	18.00	CEOP Rapporteur's Report on Pan-GEWEX Meeting and Discussion	A. Gaye, J. Matsumoto, H. Wheater, R. Stewart
18.30	18.30	GMPP Rapporteur's Report on Pan-GEWEX Meeting and Discussion	J. Polcher, S. Klein, E. Blyth

## Saturday, 28 August

<b>08.30</b>	<b>12.15</b>	<b>SSG-23 MEETING cont'd</b>	<b>Room: Johnson 22</b>
08.30	08.45	Status Report on September Workshop on Extreme Climate Events	O. Zolina
08.45	10.00	GEWEX Modelling: The Future of GMPP	C. Jakob
10.00	10.30	BREAK	
10.30	12.00	GEWEX Imperatives Status and Next Steps	K. Trenberth
12.00	12.15	Wrap-Up	