

# **Report from the GEWEX Data and Assessments Panel (formerly the GEWEX Radiation Panel) to the International Radiation Commission**

July 2012

Reporting Period: January 2010 – September 2011

URL: <http://gewex.org/projects-GRP.htm>

<http://rain.atmos.colostate.edu/GRP/index.html>

Chair: Christian Kummerow 2008-2014.

Vice Chair: Joerg Schulz 2010 - 2013

## **Panel Background and Objectives**

The GEWEX Radiation Panel was originally formed to understand the short- and long-wave energy balance of the Earth System. The panel focus, however, has evolved over time to focus more on developing data sets of global water and energy variables consistent with the Global Water and Energy Experiment (GEWEX) mission. To that end, GRP expanded to foster global datasets of Surface Radiation Budget (SRB), Clouds (ISCCP), and Precipitation (GPCP). Over time these were further expanded to complete the flux and forcing terms, including turbulent fluxes (SeaFlux and LandFlux), and Aerosols (GACP). These GEWEX reference products represent the legacy of the GEWEX Radiation Panel.

With independent products available for the radiative and flux terms of the Earth system, GRP is now focused on creating an integrated reference product in which the individual products use a common space and time grid as well as common ancillary data and procedures in order to ensure that geophysical signals are due to the data and products themselves rather than inconsistencies in the assumptions. Reviewing the readiness of GEWEX reference products for this reprocessing with common assumptions was a key objective of the GRP team meeting held in Tokyo at the end of August 2011. Once completed, GRP will undertake an assessment of the state of the Water and Energy Budgets based upon this new Integrated GEWEX reference products. This assessment, which is intended to document the state of our observing system, is meant to be the first in a periodic reevaluation of the state of the Water and Energy Observing System. The assessment will 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 components of the budget.

With this focus in mind, the GEWEX Radiation Panel revisited the key functions that such an international panel should perform. Four key roles were identified:

1. **GEWEX Reference Products:** While datasets now abound for many of the essential climate variables, the panel feels it is essential to construct and maintain a consistent long-term reference product of the global and regional water and energy variables. These reference products, referred to as the GEWEX products, are endorsed by the GEWEX radiation panel, must be open, readily accessible, validated and published so as to serve as a benchmark for the community as it strives to improve products with more recent observations or new retrieval paradigms.
2. **Product Assessments:** While the panel has an important role in maintaining reference products, an important evolving role for international panels such as GRP is its experience in doing assessments of global datasets produced by the international community. These assessments include all global water and energy products as well as radiative transfer codes (activities such as CIRC) that form the basis of the retrievals as well as model simulations.
3. **In-Situ Networks:** Assessments commonly bring together a variety of in-situ measurements. Some of these are well coordinated and quality controlled while others exist largely in their own regional domains. The panel, therefore, sees its role as identifying such networks of in-situ observations and fostering the development of integrated global datasets that can be used to both construct and/or validate the global climate products.
4. **Diagnostic and Process Studies:** The Global Data Products lend themselves to verify not only model output, but also model processes. Successful examples have been the ISCCP simulator that allows models to compare their cloud fields directly to ISCCP and thus verify if the right clouds are

being produced. Optimizing these interactions with the climate and cloud-scale modeling groups within GEWEX is ongoing but should be strengthened.

These objectives, dealing now more with global datasets and assessments of data and radiative transfer codes, lead the panel to propose a name change from GEWEX Radiation Panel (GRP) to GEWEX Data and Assessments Panel (GDAP).

### **Status**

Activities in the GRP/GDAP panel focus primarily on the generation of the GEWEX reference products and their assessments. As stated previously, each of the GEWEX reference products is currently preparing for a reprocessing cycle that will result in common space and time grids as well as ancillary data and assumptions. The Working Group for Data Management (WGDMA), being led by Bill Rossow, is responsible for the common ancillary data. The data sets have been identified and are undergoing the final testing within each of the reference product groups. The US National Climate Data Center has agreed to host the "Integrated GEWEX Reference Product" which will archive the core geophysical parameters from each of the reference products in a common file.

While each of the projects prepares for their own reprocessing, the current versions are producing important results. GPCP reported that it had recently released an improved product that utilized a new gauge analysis by GPCC. This product improves the gauge representation over mountainous terrain. GPCP continues to carefully monitor trends in precipitation and continues to find that there is no marked trend in precipitation discernable from the past 30 years of precipitation data. Transient responses from both volcanic eruptions and ENSO events, on the other hand are clearly identifiable in the data. SRB and the surface validation network (BSRN) continue to make good progress (except for some specific surface sites mentioned later). SRB is publishing results for the surface and TOA fluxes. Implied evaporation rates do match the GPCP precipitation but only at the outside of both project's uncertainties ( $\sim 10 \text{ W/m}^2$ ).

SeaFlux continues to make progress with the diurnal cycle of SST showing that regional errors of the order to  $10 \text{ W/m}^2$  are possible if SST is considered constant. The project has recently begun to analyze two new versions of SSM/I intercalibrated brightness temperatures. It is hoped that the analysis of these brightness temperature data sets can shed light into the trends of increased evaporation evident in most surface flux products. In parallel, LandFlux has invested considerably in an assessment activity intended to guide the development of the GEWEX reference product. The current plan is to select a product, or combination of procedures, to begin producing the GEWEX reference product by April of 2012 in concert with the other products.

The ISCCP cloud climatology, aside from continuing to fix existing problems, has led the assessment of the new HIRS temperature and humidity profile database to be used in the consistent reprocessing of the GEWEX reference products. The results are encouraging with respect to producing datasets with fewer artifacts. In the meantime, the project is working with NCDC to transition the operational processing to NCDC.

The assessments are moving forward as well. Reports from the Cloud as well as Radiative Flux assessments suggest that both of these will be finished in early 2012. The panel has appointed three reviewers for each report to help the authors with consistency across chapters. In addition to reviewing these reports, the panel is collectively preparing a short white paper on "Assessments" outlining what we have learned about conducting assessments.

Tianjun Zhou of LASG/IAP/CAS in Beijing, China, joined the panel in 2011. His expertise in modelling of the hydrologic cycle was an immediate and welcome impact on the panel.

### **Key results**

- All GEWEX reference products are on track for reprocessing starting in the April 2012 timeframe
- Taking initial steps to transition GEWEX products to Operational Agencies for sustained processing
- Cloud and Radiative Flux Assessments near completion (early 2012 publication)
- Panel will write a white paper on lessons learned from Assessments
- SRB project has computed new Surface and TOA fluxes. Values will close energy budget with latent heat fluxes inferred from precipitation but uncertainties remain large ( $10 \text{ W/m}^2$ )

### **Future activities and new directions**

As implied in its name, GDAP will continue to focus on generating reference data products of the water and energy budget variables as well as the assessments. The logical framework for this activity is to

think in approximately 10 year cycles in which original data products are improved, new data sets are added, products are assessed, and new benchmarks for the observed global water and energy budgets are published.

Future activities will focus heavily upon new data products that can be added to the inventory. At present, two products appear ripe for inclusion. Vertical heating structures are being computed by a number of research groups using A-train data while soil moisture has matured due to attention from the SMOS and the upcoming SMAP missions. As a panel, both of these are logical next steps in that they are reasonably mature, have research communities interested in joining the activity and perhaps most importantly, serve as cross-checks with other products already being produced. While gravity measurements such as those from GRACE also fit the closure argument, these observations are based on single satellites with existing science teams. As such, they are in less need of coordination and instead appear readily usable by the panel members investigating closure with existing reference products. A new assessment activity for water vapor products (both for Total precipitable water as well as water vapor profiles) was recently initiated.

New activities consist of examining GEWEX reference products over polar regions and examining the relationship between global aerosol concentrations and the water and energy fluxes. A third activity which is being considered deals with the feasibility of assessing satellite simulators that are currently being used in CMIP as well as a number of other activities. There are currently at least 8 such simulators and Hirohiko Masunaga is exploring the possibilities.

### **Issues and Recommendations**

The BSRN project noted a significant decline in funding available for in-situ climate observations within Canada. The project expressed a desire to have GEWEX and WCRP write letters on its behalf highlighting the importance of continuous measurements for climate research.

The Continuous Intercomparison of Radiative Codes (CIRC) project has strong interactions with the radiation community represented in the GRP/GDAP panel but it must also interact more closely with the modelling work going on in different panels. We therefore recommend that CIRC be made a joint activity between GDAP and GASS panels.

### **Summary**

Progress is being made towards an "Integrated GEWEX reference product" containing all fundamental water and energy budget variables on a common space/time grid and with a uniform set of ancillary data and assumptions. The panel will write a "status of the W&E observing network" paper based upon these results. Early indications are that budget closure is within the uncertainties but that these are still large (i.e.  $10\text{W/m}^2$ ) at the surface. Cloud and Radiative Flux assessments will be published in early 2012.

### **List of meetings, workshops held**

- 8-10 March, 2011. GEWEX/ESA DUE GlobVapour Workshop on Long Term Water Vapor Data Sets and their quality assessment. Frascati, Italy
- 08-09 April, 2011. LandFlux Assessment meeting, Vienna, Austria
- 30 Aug - 1 Sept, 2011. GEWEX Radiation Panel meeting. Tokyo, Japan

### **Planned meetings, workshops**

- 4-6 October 2011 – CERES Science Team Meeting at Lawrence Livermore National Laboratory
- November 2011 – Radiation Flux Assessment Meeting
- 14-16 May, 2012 Water Vapor Assessment meeting
- July 2012 – 6<sup>th</sup> SeaFlux Workshop (with LandFlux, AMS Air-Sea and AMS Boundary Layers and Turbulence meetings)
- August 2012 – BSRN meeting (planned around IRS in Germany)
- October 2012 – GRP (GDAP) meeting (Paris –Exact dates TBD)

### **List of members and their term**

Christain Kummerow	2008 – present
Joerg Schulz	2010 – present
Carlos Jimenez	2010 – present
Norman G. Loeb	2005 – present
Hirohiko Masunaga	2010 – present
Matthew McCabe	2008 – present
Enio Pereira	2010 – present
Mark Ringer	2010 – present

Axel Schweiger	2008 – present
Sonia Seneviratne	2008 – present
B.J. Sohn	2007 – present
Claudia Stubenrauch	2007 – present
Susan Van Den heever	2008 – preset
Tianjun Zhou	2011 – present

Would like to nominate Andrew Heidinger, U. of Wisconsin for 2012 -