19th Session of the GEWEX Radiation Panel Meeting

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Christian Kummerow
Colorado State University, Fort Collins, CO, USA

The 19th Session of the GEWEX Radiation Panel (GRP) was hosted by Byung-Ju Sohn of the School of Earth and Environmental Sciences at Seoul National University (SNU), Korea, and chaired by Chris Kummerow. The meeting was sponsored by the Korean Meteorological Society and the National Institute of Meteorological Research, Korea.

At the last meeting of the GEWEX Scientific Steering Group (SSG), the members approved new Terms of Reference for GRP as the following: "The GEWEX Radiation Panel guides GEWEX radiation projects in determining global water and energy fluxes in the atmosphere and the surface, as an element of seasonal-to-interannual climate variability, and the response of the climate system on decadal-to-interannual time scales to changes in anthropogenic forcing." The SSG also supported the new GRP goal to produce data products that can be used for climate trend analysis and developing a global hourly precipitation product.

All GRP projects are currently funded and are making plans for a reprocessing cycle to begin in 2010. This reprocessing will focus not only upon improvements within individual products, but also upon the use of common ancillary data across all products in order to bring uniformity to data. GRP will also begin to produce an integrated water and energy cycle product that combines basic elements from each of its stand-alone products. The integrated data should be useful to process studies.

The host country institutions gave six science presentations. Byung-Ju Sohn gave a talk on the impact of water vapor on measured longwave cloud radiative forcing. Soon-Chang (School of Earth and Environmental Sciences, SNU) gave a presentation about the Atmospheric Brown Clouds (ABC) East Asia Regional Experiment with emphasis on the Gosan super observatory as well as the unmanned aerospace vehicles campaigns in Cheju (the Cheju ABC Plume Monsoon Experiment (CAPMEX)). Soon-Chang Yoon (SNU) reviewed scientific findings from the site and presented preliminary results from the 2008 CAPMEX experiment, and Kum-Lan Kim (Korea Meteorological Administration (KMA)) presented the status of the Korean geostationary Communication, Ocean and Meteorological Satellite (COMS) that is scheduled to be launched in June 2009. Data from COMS will be available 6–9 months after launch to authorized users of the research community via the KMA Internet home page. Hee-Sang Lee from the National Institute of Meteorological Research (NIMR) of KMA gave an overview of the Predictability and Observations Experiment to assess the suitability of using the Weather Research and Forecasting model as the operational KMA forecast model. Mi-Lim Ou (KMA) presented the validation activities planned for the Global Precipitation Mission.

Reports were given from the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT), the Japan Aerospace Exploration Agency (JAXA), the Japan Meteorological Agency, the Instituto Nacional de Pesquisas Espaciais (INPE) and the U.S. National Oceanic and Atmospheric Administration (NOAA). J. Schmetz (EUMETSAT) noted that the rapid scanning capabilities (10–15 min. full disk) of Meteosat Second Generation and Third Generation systems will provide data needed for some of the GRP process studies. JAXA's presentation summarized the Earth Observations Missions

that JAXA is developing for the Group on Earth (GEO) Societal Benefits area (Disasters, Climate and Water), which also fits in well with GEWEX objectives. On the science side, JAXA has just begun distributing daily global maps of rainfall and latent heating. In the NOAA report, GRP received positive news about the restoration of the Clouds and the Earth's Radiant Energy System (CERES) and the Total and Spectral Irradiance Sensor to the National Polar-orbiting Operational Environmental Satellite System mission. This, together with acknowledgement of concrete funding for starting the Climate Data Records at the National Climatic Data Center (NCDC), were all perceived as positive steps. Last year INPE took over the collection of the Geostationary Operational Environmental Satellite-10 data from NOAA; they are working on providing this data to the International Satellite Cloud Climatology Project (ISCCP).

W. Rossow (CREST at the City College of New York) reported on the 2008 Fall Meeting of the World Climate Research Programme (WCRP) Observation and Assimilation Panel (WOAP) in Boulder, CO, USA. WOAP endorses the GRP production of long-term data sets, planning for their archival and conducting assessments of data products. WOAP also endorses the transition of ISCCP from research to operational as is currently planned. The plans and the necessary funding are now in place for ISCCP to be transferred to NCDC.

ISCCP celebrated its 25th anniversary of data processing on 1July 2008. A symposium was held at the National Aeronautics and Space Administration (NASA) Goddard Institute for Space Studies (GISS) on 23–25 July to mark the occasion, to review the status of knowledge about clouds and their role in the climate's radiation and water cycles, and to discuss future satellite cloud measurements and analyses.

The calibration of visible and infrared satellite radiances proceeded routinely over the past year: at the time of the GRP meeting, normalization of geostationary to polar orbiting radiometers was complete through May 2008 and the absolute calibration of the polar orbiters had been extended through December 2007. The main reduced resolution radiance data set (Stage B3) has been delivered to the archives for the period July 1983 – June 2007.

The primary set of cloud data products (DX, D1 and D2) and the two ancillary data products (atmospheric temperature and humidity, snow/ice cover) have been delivered for the period July 1983 – June 2007. The radiative flux product produced by ISCCP is available for the period July 1983– December 2006. Other specialized products (mesoscale convective tracking; tropical, low latitude and mid-latitude weather states analysis; cyclone tracking) are currently being extended beyond 2004 through 2006. A new cloud particle size climatology, covering July 1983–September 2001, will be released in 2009.

A primary focus of ISCCP has been to convert to the higher space time resolution (B1 data) and the conversion to operational data processing. Over the next few years, ISCCP code will be updated to provide an operational and more standardized data set. ISCCP is looking into the reprocessing of sounder data versus the possible use of the Modern Era Retrospective-analysis for Research and Applications (MERRA) reanalysis as the source temperature/humidity structure for the next version of the product.

The Global Precipitation Climatology Project (GPCP) continues to process data routinely with research products being delivered about 3 months after observation time. While processing is on temporary hold until new gauge analysis is incorporated, products are generally available through May/June 2008. Consistency among the GPCP and Tropical Rainfall Measuring Mission (TRMM) satellite products was shown. Routine production of monthly and pentad GPCP products is now reaching 29 years and there

are over 900 journal publications making use of the GPCP data sets. The Global Precipitation Assessment was published in May 2008 as a WCRP report. Planning is underway to replace the current algorithm with one that produces instantaneous rainfall products. Plans for GPCP Version 3 are underway. The Global Precipitation Climatology Centre (GPCC) is developing a product that addresses the need for daily precipitation products and is a combination of Hamburg Ocean Atmosphere Parameters and fluxes from Satellite data version 3 rainfall over oceans with GPCC gages. This may become operational as early as 2011 and will assist GRP in determining how robust the climatologies of these products are compared to the Japanese Global Satellite Mapping of Precipitation and the GPCP products.

The Surface Radiation Budget (SRB) Version 3 is being processed now and the short-wave (SW) product is complete and awaiting archival; long-wave (LW) product will be processed next. Much of the SRB effort has gone into validation, specifically against BSRN sites. Agreement among products is quite good. Future efforts continue to focus on validation and assessment of the flux products. Algorithm upgrade activities include:

Developing improved parameterizations for the conversion of narrow-band radiance to flux in GEWEX SW model using new CERES information in collaboration with R. Pinker of the University of Maryland.

- Assessing and selecting new temperature and humidity meteorology for processing in collaboration with NASA GISS. A new High-Resolution Infrared Radiation Sounder-based data set and MERRA will be evaluated, which will improve the homogeneity between ISCCP and SRB products.

- Improving aerosol treatment in SW and LW codes in collaboration with NASA Goddard Space Flight Center and GISS, with assessments relative to GISS, the Global Aerosol Climatology Project (GACP) and the Global Ozone Chemistry Aerosol Radiation Transport.

BSRN began in 1988 and now consists of 43 partner sites; of these, four new sites in Brazil are submitting data. Five sites have recently been proposed: two in Spain and one each in Portugal, Canada and Kenya. Unfortunately, there are also three sites in Africa—Saudi Arabia, Nigeria and South Africa—that are in jeopardy. Scientifically, BSRN sites have seen a 5 W/m^{-2} per decade increase in surface downwelling long-wave radiation, generally in good agreement with models. The transition of the BSRN archive from Swiss Federal Institute of Technology, Zurich to the Alfred Wegener Institute (AWI) is complete. G.-K. Langlo (AWI) gave an overview of the PANGAEA software used that offers a Google-like interface for searching and distributing BSRN data via the Web.

GACP has been relatively inactive but received funding in 2008 to re-energize both the program itself (led by M. Mischenko) and the product assessment (led by S. Christopher). In particular the Multi-angle Imaging SpectroRadiometer, Moderate Resolution Imaging Spectroradiometer Advanced Very High Resolution Radiometer, and Polarization and Directionality of the Earth's Reflectances products are to be compared. They do not currently agree very well with respect to Aerosol Optical Depth.

The SeaFlux intercomparison is expected to be complete in mid-2009. Version 1.0 of the sea surface temperature and version 0.5 of the latent and sensible heat fluxes are available for testing. Much of 2008 was spent on comparing available products against one another and against very limited *in-situ* data. A novel aspect of the current validation strategy is that each input into the flux products is being assessed independently so that parameters such as wind and humidity can be evaluated separately.

LandFlux activities continued during the past year with two topical workshops, one on the retrieval of land surface skin and air temperatures (7–9 April, Asheville, NC, USA) and one on retrieval of land surface properties from microwaves, including soil moisture and flooding extent (20–22 October, Oxnard, CA, USA). Both workshops are being followed up with comparisons of products and investigations into their differences. The next event will be a 1-day workshop held in conjunction with the GEWEX- Integrated Land Ecosystem-Atmospheric Processes Study Scientific Conference in August 2009, where an inventory of available global surface latent and sensible heat flux products will be made—including observationally-based (*in-situ* and satellite), model-based and mixed observation-model—and plans for systematic comparisons initiated. The idea is to conduct these comparisons and investigate the causes of differences over the coming year, leading up to the production of revised products and preparation for the systematic processing of long-term global products.

The International Soil Moisture Working Group (ISMWG) was established in 2005 under the Integrated Global Observing Strategy (IGOS). Its first core objectives were to "Coordinate forthcoming exploratory satellite missions" (e.g., the European Space Agency's Soil Moisture and Ocean Salinity mission and NASA's Soil Moisture Active and Passive mission), as well as the development of a global *in-situ* Soil Moisture network. For real coordination between solid moisture products, the working group has expanded to include all such products including the Earth Remote Sensing Satellite and the Meteorological Operational satellite scatterometers, the Advanced Microwave Scanning Radiometer for the Earth Observing System solid moisture products, and passive microwave radiometers such as the TRMM Microwave Imager and WIndSat. With the folding of IGOS-Partners into GEO—hence the disappearance of the Integrated Water Cycle Observations—a new home is needed for ISMWG. GEWEX was suggested with three distinct objectives for the working group. (1) the development of a global *In-Situ* soil moisture network and data sets to support the validation of satellite soil moisture retrieval and assimilation; (2) the assimilation of soil moisture and satellite data (both active and passive) into numerical weather prediction and hydrological modelling for forecasting as well as process studies, and (3) data fusion activities, or the development of long-term consistent global soil moisture products and their derivatives.

After a series of meetings, the Radiative Flux Assessment group is ready to put together the first draft of its assessment in the December '08 – January '09 timeframe. The final document should follow within 3 to 4 months of January 2009. The web page describing the activity is already operational.

The Cloud Assessment project (see article on page__) is working on its final report, which should be finished at the end of 2009. It discusses existing long-term climatologies and gives comparisons of climatologies from improved instruments aboard the NASA Earth Observing Satellite and the A-Train. Climatology averages as well as their regional, seasonal and diurnal variations will be presented, and differences between results from the various data sets will be discussed in the report.

The Continual Intercomparison of Radiation Codes (CIRC) is a new GRP activity that began last year that uses observationally based input from the ARM flux closure studies (see article on page __).

There are a number of activities currently being encouraged; the first is to revisit the GEWEX Global Water Vapor Project. It is not clear at this time whether such a product can or should exist separate from the data assimilation community that has so successfully brought diverse data sets into a coherent framework. GRP is exploring this issue and may hold a joint workshop with the International Television and Infrared Observation Satellite (TIROS) Operational Vertical Sounder (TOVS) Working Group. At the same time, the NASA MERRA reanalysis is being assessed as a consistent source of vapor for the next reprocessing of all GRP products.

Related to the unification of water and energy variables, GRP continues to foster the Cloud, Aerosol, Precipitation initiative. While not independent of the modelling activity, GRP sees potential in collecting simultaneous global-scale data on aerosols, clouds and precipitation in order to provide global-scale observations to what otherwise tends to be a very case-oriented analysis of data.

A. Schweiger (Applied Physics Lab/Polar Science Center, University of Washington) gave the first of the new member science presentations on the relationship between Arctic Sea ice variability and clouds, in particular how clouds and radiation figured into the record sea ice anomaly of 2007. Ice thickness is quite sensitive to radiation, with a $10W/m^{-2}$ increase in longwave flux causing up to 50 cm reduction in ice thickness. Shortwave is not as effective at melting ice because of the high albedo; lost sea ice aligns better with the downwelling long-wave anomaly. National Centers for Environmental Prediction forcing confirms that it was really longwave forcing, and not the cloud-free (i.e., shortwave) forcing at all. Furthermore, it appears the reduction in sea ice thickness was not extraordinary, as the large areal extent of the sea ice loss was due primarily to the already thin ice in the anomalous LW flux region. Wind also played a role in thickness reduction.

S. Van Den Heever (Colorado State University, Ft. Collins, Colorado) a new GRP member, described her research related to Cloud Condensation Nuclei (CCN) versus Giant CCN. Whereas enhanced CCN tends to lead to greater numbers of small drops with a narrow drop spectrum, reduce the collision and coalescence processes and thus reduce the event of warm rain, giant CCN tends to widen the cloud drop size distribution, enhance collision and coalescence processes and thus enhance warm rain processes. The main findings suggest that CCN has the greatest impact on the initial stages of the convection but that giant CCN and ice nuclei had a greater impact in the mature states. A case study off the southeast coast of Asia showed marked differences between rain sensed by different instruments. Some of the findings suggest that enhanced CCN concentrations delay the onset of warm rain and increase the liquid water path and the ratio of cloud water to rain water consistent with the errors in the observations.

M. McCabe (School of Civil and Environmental Engineering, UNSW, Sydney, Australia) a new GRP member, showed how hydrologic consistency tests can be used as an alternative method to improve independent water and energy variables through knowledge of the linked or coupled system. His research includes working with isotopes, which can be used to identify source regions of groundwater recharge; calculating relative contributions of surface runoff and groundwater discharge to streamflow; and discriminating soil evaporation from plant transpiration in water vapor return to the atmosphere.

S. Seneviratne (ETH Zurich), a new GRP member, gave a presentation on soil moisture-atmosphere interactions in a changing climate. She began by showing a number of plots concerning the coupling between precipitation and vegetation. Strong coupling is clearly evident in the transition zones between wet and dry climates. An indirect measure of the coupling between soil moisture and land surface temperature is the correlation between summer evapotranspiration and temperature. A negative correlation implies a strong soil moisture-temperature coupling (i.e., high temperature as a result of low or no evapotranspiration). The opposite is true for positive correlations. Correlation maps once again show high coupling between soil moisture and interannual variability of temperature in transition zones. In particular, the Mediterranean stands out as a region of strong coupling.

The next GRP meeting will be held 13-16 October in Bonn, Germany.