

22nd Session of the GEWEX Radiation Panel

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The GEWEX Radiation Panel (GRP) Meeting was hosted by the Japanese Aerospace Exploration Agency (JAXA). Prof. Hirohiko Masunaga from Nagoya University was the local host and Prof. Christian Kummerow chaired the meeting.

The current focus of the Panel is on creating an integrated product in which the individual GRP products use a common set of ancillary data and procedures in order to ensure that geophysical signals are due to the data and products themselves rather than to inconsistencies in assumptions. Once complete, GRP will then undertake an assessment of the state of the water and energy budgets based upon these new integrated GEWEX products. Reviewing the readiness of GEWEX reference products for this reprocessing with common assumptions was a key objective of this Meeting. With the new focus of the Panel, the members agreed to change its name to the GEWEX Data and Assessments Panel (GDAP).

The first half day was set aside for the second joint meeting with the World Meteorological Organization initiative for the Sustained Coordinated Processing of Environmental Satellite Data for Climate Monitoring (SCOPE-CM), which is a network of operational space agencies interested in the long-term production of climate data sets, such as those produced by GRP. The joint meetings are intended to lead to implementation strategies that are consistent in creating long-term climate data records, while benefitting from the long-term continuity that only operational systems can provide. Discussions centered largely upon the idea that the operational agencies need to retain someone akin to a Principal Investigator (PI) or small science team intimately familiar with the product to provide guidance for continually improving the product. The operational agencies, meanwhile, would increase the level of automated stability and quality monitoring in order to alert PIs or science teams of any changes.

Teruyuki Nakajima, a member of the World Climate Research Programme's (WCRP) Joint Scientific Committee, provided opening remarks for the stand-alone portion of the GRP Meeting, including an overview of the new WCRP Working Group on Climate Services, which will identify climate information needs and help coordinate and prioritize related efforts across WCRP. This was followed by a presentation by Riko Oki, who gave an overview of upcoming JAXA missions and activities, including a new near real-time Global Rainfall Map and Spectral Latent Heating product (pixel level, grid and monthly data at 0.5-degree resolution).

A new GRP member, Tianjun Zhou from the State Key Laboratory of the Numerical Modeling for Atmospheric Science and Geophysical Fluid Dynamics Group of the Institute of Atmospheric Physics, Chinese Academy of Sciences, gave

a presentation on numerical modeling of monsoon changes during past decades. He presented evidence to suggest that tropical ocean warming, in particular the Indo-Western Pacific warming during 1950–2000, is one mechanism for the weakening tendency of both the global land monsoon rainfall and East Asian Monsoon Circulation (see figure on page 13).

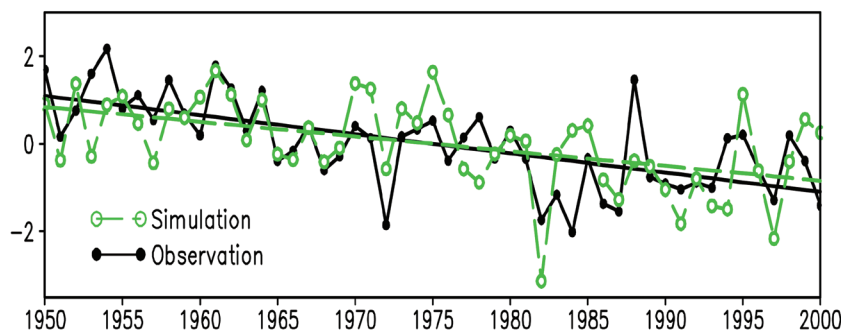
Bill Rossow reviewed the status of the common ancillary data sets being prepared by the Working Group for Data Management for use by each of the GRP products in the next reprocessing. The reprocessed data will serve as the basis for the integrated GEWEX product. The hierarchical map grids and topographic information have been completed. Utilities to convert back and forth from equal area map grids to equal-angle projections are available. The mask has the 1-degree International Geosphere-Biosphere Programme land cover product that includes the Global Land Ice Measurements from Space glaciers database. A combination of the TOMS Ozone Monitoring Instrument and the TIROS Operational Vertical Sounder products for ozone data will be used to produce composite daily 1°–2.5° time series. The Aerosol Comparisons (AEROCOM) product will be used to ensure a consistent aerosol data set over land and ocean. Surface snow will be obtained from the National Oceanic and Atmospheric Administration (NOAA) Climate Prediction Center (CPC) weekly snow cover analysis at 2° resolution and sea ice from the Ocean and Sea Ice Satellite Application Facility on a daily basis at 0.25° resolution.

Robert Adler began the individual project status updates by reporting that the new Global Precipitation Climatology Project (GPCP) V2.2 product is now available. This version was necessitated by the failure of the last Special Sensor Microwave Imager (SSM/I) instrument, which required a change to the SSMI/Sounder on F17 as the calibrating satellite. About 9 months of overlap exists between SSM/I and SSMI/S, which will allow robust testing of the product across the interface.

GPCP V2 product processing will be transferred to the NOAA National Climatic Data Center (NCDC) for operational processing and the transfer will begin with a 3-year effort to clean up, streamline, test, and validate software from various organizations to work in as close to an automated fashion as possible. NCDC will develop software requirements, standards, and approaches.

Global Precipitation Climatology Centre (GPCC) gridded gauge analysis is merged with the satellite product to form the GPCP global product. Robert Adler presented an update on GPCC for Udo Schneider, which reviewed the standard products being readied, and then focused on the underestimation of precipitation over China, which is expected to be resolved by the recent addition of over 700 gauge stations.

Akiyo Yatagi gave an update on the Asian Precipitation-Highly Resolved Observational Data Integration Towards Evaluation (APHRODITE) rain gauge data set, which represents a significant effort to collect, quality control, and analyze gauge data that are not otherwise found in the Global Historical Climate



The black line with circles represents the global land monsoon precipitation changes derived from observational data. The green line with circles represents the results from the atmospheric general circulation model, CAM2, forced by historical SST. The observations show global land monsoon precipitation decreasing in the last half of the 20th Century. T. Zhou et al. (2008) found that when driven by historical SST, CAM2 can reasonably reproduce the observed global land monsoon precipitation changes. This demonstrates that the observed weakening tendency of the global land monsoon is forced by the tropical ocean warming.

Network (GHCN) and GPCC archives. A daily gridded precipitation product at 0.25° resolution for 1951–2007 (APHRO-V1003R1) has been released, in addition to a higher resolution version, APHRO-JP (0.1°), for 1900–2010 for Japan.

Bill Rossow reported that the D-Version of the International Satellite Cloud Climatology Project (ISCCP) data (gridded, 30-km data) is complete for July 1983–December 2009. The 10-km resolution data (B1) deliveries are up to date and the calibration is finished through December 2009. The cloud detection algorithm has been updated for improved polar cloud detection, and all revisions to the cloud retrieval algorithms are done and are being tested.

Ells Dutton reported that 53 Baseline Surface Radiation Network (BSRN) sites have contributed over 6080 station-months of solar and infrared data since 1992. The Canadian sites located at Alert, Bratt's Lake, and Eureka are in significant danger of losing funding due to cutbacks in the measurement program. BSRN accepted an invitation by the Network for the Detection of Atmospheric Composition Change to become a co-op network.

Paul Stackhouse reported that Release 3 of Surface Radiation Budget (SRB) data has improved documentation, and that a paper describing the details of this version will be published soon. Production of Release 4 will begin in April 2012. It is important to note that both short- and long-wave downwelling radiative fluxes are higher than previous estimates, leading to significant discrepancies with the current precipitation as estimated from GPCP.

While the GEWEX Aerosol Climatology Project built a long-term climate record of aerosol optical depth, it is limited to ocean regions. The Integrated GEWEX Product requires uniform aerosol assumptions across its product suite. In order to obtain coherent estimates of not only aerosol optical depth but also single scattering albedo and the asymmetry factor needed in the radiative transfer computations, the AEROCOM product is being adopted as the common aerosol input data.

Carol Anne Clayson reported that SeaFlux Version 1.0 (1997–2006) is now available in beta release. Of interest is that the locations of the largest surface heat flux tendency do not coincide with the largest uncertainties of the surface heat

fluxes. During the next 6 months, the project will investigate the impact of common atmospheric temperature and humidity profiles and sea-surface temperature (SST). Production of SeaFlux V2.0 will begin in the summer of 2012 and include common ancillary data sets and assumptions.

Results from the LandFlux assessment given by Carlos Jimenez showed that all assessed products capture the seasonality of the heat fluxes, as well as expected spatial distributions (major climatic regimes and geographical features). The products correlate well with each other in general; however, there are large evaporative fraction differences, suggesting different partitioning of the radiative fluxes. Overall, the activity constitutes the first systematic characterization of the uncertainty in the existing global estimates of land-surface heat fluxes from a large range of products, including satellite-based (diagnostic) estimates, atmospheric reanalyses, off-line land surface models, and climate model simulations.

Matthew McCabe presented the status of the LandFlux multi-decadal global land-based surface flux data set. His talk covered the state-of-the-art global evapotranspiration (ET), the design of a LandFlux-Evaluation (LandFlux-EVAL) benchmarking database from existing global ET data sets, and the strategy and timeline towards development of GEWEX Version 0 global ET and sensible heat flux products. Three issues emerge when existing product differences are analyzed. The main discrepancy can be attributed to the “forcing” data sets. Nonetheless, based upon the earlier meeting of the LandFlux working group in April 2011, there was a level of consensus that a number of schemes should be implemented with common forcings. The final details are still under discussion, but it is essential that the selected forcing data set is consistent with the other GRP products in order to allow a joint science analysis of the GRP suite of products.

Ken Knapp led a discussion on the preparations for creating and hosting the Integrated GEWEX Product at NCDC. As per agreement, the product would contain data at 1° and 3-hourly intervals and consist of the longest possible common record. Most of the discussion focused on the specifics of the fields that would be archived with the product. Generally, the agreement was to not include all the diagnostic fields from each of the products, but include as many sorting parameters (e.g., terrain type, climate parameters) as possible.

Paul Stackhouse presented the status of the Radiative Flux Assessment. The activity is supported by nearly all the space and weather agencies around the world and its goal is to assess our understanding and capability to derive top-of-atmosphere (TOA) and surface radiative fluxes from analysis of satellite observations. Significant progress was made towards producing a community assessment of TOA and surface radiation flux estimates from satellite and model analysis.

The Clouds and the Earth's Radiant Energy System (CERES) instruments on Terra and Aqua are performing nominally (except for the shortwave channel on FM4, which failed in March 2005). A paper, "Heating of Earth's Climate System Continues Despite Lack of Surface Warming in Past Decade," led by Norman G. Loeb has been submitted to *Nature Geosciences*.

For the Cloud Assessment activity, Stefan Kinne reported that the absolute values of cloud amount, especially high cloud amount, depend mostly on the sensitivity of the instruments to thin cirrus; however, their geographical distributions and seasonality agree quite well. The major challenge of this assessment was to build a database in a common format, including various cloud properties from the 12 participating teams. The database and assessment report will be released soon.

In the Aerosol Assessment update it was noted that the aerosol field has recently grown exponentially with literally dozens of products and applications. Most products can be categorized as simultaneously having aspects of research, development, and production. This is reinforced with the funding situation where money for product development, maintenance, and verification is limited. Developers spend more time "using" than "supporting" their products. By the time the wider community figures out how a product is performing, a new version is released. There is confusion and some rancor in the community as to the actual efficacy and appropriate application of these data sets. The Assessment is therefore critical to bring some order to the field. Phase 1 will consist of a comprehensive literature review and evaluation. An important early conclusion is that the AERONET and Micropulse Lidar Network (MPLNET) are clearly the backbone networks for verification. Phase 2 will consist of detailed independent evaluation and will begin when the Moderate Resolution Imaging Spectroradiometer (MODIS) Collection 6 and Multi-angle Imaging SpectroRadiometer (MISR) Version 23 are officially released, and will examine specific issues in the generation of retrieval and gridded products.

In reference to the Water Vapor Assessment, Joerg Schulz reported on the GEWEX/ESA Data User Element GlobVapour Workshop, which was held in Frascati, Italy, in March 2011. The consensus at the Workshop was that total column water vapor, as well as water vapor profiles and their related temperature profiles, should be assessed. However, a decision was made not to include stand-alone temperature profiles or deep layer temperature data sets, such as those derived from the Microwave Sounding Unit and the Advanced Microwave Sounding Unit (AMSU). Likewise, the assessment will not address SST and land-surface temperature and 2-meter temperature or hu-

midity unless these are integral parts of the vapor profile. Phase 1 of the assessment will begin with 3 years of recent data, when more satellite data sets and more validation data sets are available. Phase 2 will look at longer data sets with less validation data. It was agreed that a validation database would consist of ground-based remote sensing data, quality-controlled radiosondes, and BSRN and CERES radiation flux data.

In a discussion on polar priorities that would help the Panel improve the quality of its global products in the polar regions, where many of the GEWEX variables are notoriously difficult to retrieve, it was suggested that it would be useful to separate different surface types and examine status and future activities separately. The new ISCCP/SRB cloud properties should be revalidated over polar surfaces and the records examined for potential biases due to sea ice and snow cover retreat. Precipitation products over the polar regions are known to be problematic and it was recommended that the Russian North Pole stations and International Polar Year stations be added to the GPCC gauge record. To improve light rain and solid precipitation measurements, the current efforts by Bennartz and Haddad using CloudSat and AMSU data could be integrated. There are also alternate techniques that should be explored, such as accumulation-based precipitation techniques that rely on the Ice, Cloud, and land Elevation Satellite (IceSAT)/CryoSat.

Links with the WCRP Climate and Cryosphere (CliC) Project in the area of sea-ice temperature, which is important for radiative fluxes, will be investigated. There are a number of very positive developments with the sea-ice concentration data set needed for the integrated GEWEX product. A CliC workshop in March 2011 on ice concentration noted the developments of a sea ice climate data record that uses a NASA Team bootstrap algorithm. The Ocean and Sea Ice Satellite Application Facility has reprocessed data (SMMR, SSM/I period, 1978–2009) with a robot technology middleware-based atmospheric correction, dynamic tie points, and a comprehensive error assessment. This product looks very promising.

The Continual Intercomparison of Radiation Codes (CIRC) Project was intended to be the standard for documenting the performance of radiative transfer codes used in large-scale models. CIRC provides benchmark, line-by-line results against which radiative transfer codes of global climate models can be assessed. Despite useful results, the Project is now unfunded.

The meeting concluded with a presentation by B. J. Sohn on clear-sky dry biases and their implications in cloud forcing determination. He argued that the humidity in clear sky scenes is drier than in all sky conditions, but that this effect is not properly accounted for when cloud radiative forcings are computed. The next Panel meeting is planned for 1–3 October 2012 in Paris, France.

Reference

Zhou Tianjun, R. Yu, H. Li, and B. Wang, 2008. Ocean Forcing to Changes in Global Monsoon Precipitation over the Recent Half-Century. *J. Climate*, 21(15), 3833–3852.