Meeting/Workshop Reports

Annual Meeting of the GEWEX Data and Assessments Panel (GDAP)

29 September–2 October 2015
Xiamen, China

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The GDAP meeting was generously sponsored by the China Association for Science and Technology, the Chinese Academy of Sciences (CAS), the Chinese National Committee for Future Earth, the State Key Laboratory of Numerical Modeling for Atmospheric Sciences and Geophysical Fluid Dynamics and the CAS Institute of Atmospheric Physics. The Chinese Meteorological Administration gave a presentation on the Chinese Meteorological Satellite program, which provides long-term operational measurements with a high potential to support GEWEX science.

GDAP activities are currently divided into two major areas: Data Products and Product Quality Assessments. The individual and integrated GEWEX data products enable research related to the WCRP Grand Challenges on changes in water availability, clouds, climate sensitivity, and potentially for climate extremes. Major objectives of the product quality assessments are to provide independent and transparent quality assurance for existing data records, to identify key limitations in data records to stimulate improvements, and to allow objective selections of appropriate data records. In addition, GDAP shares responsibility with the Global Climate Observing System (GCOS) for the Baseline Surface Radiation Network (BSRN), which is essential to setting standards and providing high quality radiation measurements for the evaluation of satellite data sets and climate models.

New directions discussed at the meeting included how GDAP can contribute to the GEWEX Upper Tropospheric Clouds and Convection Process Evaluation Study (UTTC PROES), reprocessing ground-based precipitation radar data in support of several WCRP Grand Challenges, and developing a methodology for uncertainty characterization for satellite-derived data sets.

GDAP Data Sets

The full reprocessing to generate the **International Satellite Cloud Climatology Project** Version 2 (ISCCP V2) data set will begin in 2016. A "final" version of the ISCCP cloud products from 1983 to the present will be available soon.

Version 2.3 of the **Global Precipitation Climatology Project** (GPCP) data is in final testing. This version fixes problems with cross-calibrations among satellites that produced artificial shifts in the data and uses the new Global Precipitation Climatology Centre (GPCC) full analysis.

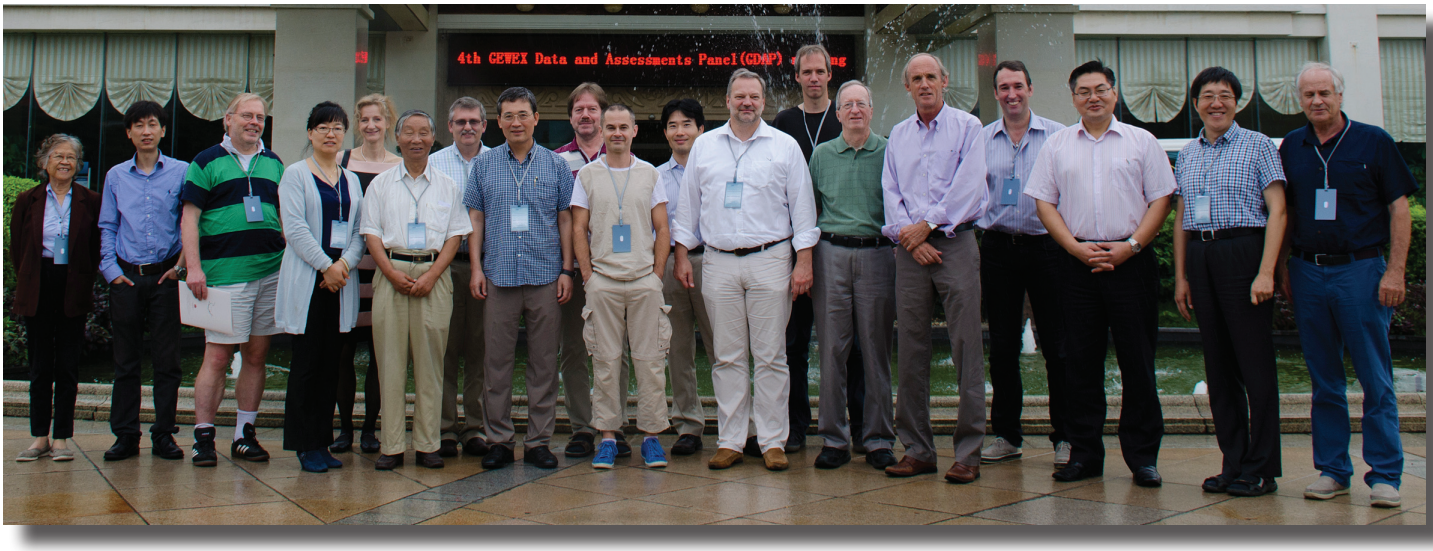
The **Surface Radiation Budget Project** (SRB) continues to assess new neural network High Resolution Infrared Radiation Sounder (nnHIRS) and ISCCP HX data sets, make algorithm improvements and analyze test cases. SRB is testing the use of the land surface temperature product from LandFlux and the diurnal ocean surface skin temperature from the SeaFlux Project. SRB derives a 3-hourly blended global surface skin temperature input using these and the ISCCP HX skin temperature retrievals. This represents the next stage in energy flux integration.

The **SeaFlux Project** produced a climate data record with extensions towards real time from Special Sensor Microwave Imager/Sounder (SSMIS) instrument data for the period of 1988–2007. Neural network derived winds were used instead of the cross-calibrated multi-platform wind product, which reduced the trend in global wind speed. Comparison activities have shown that both latent heat and sensible heat fluxes show inter-product differences of 5-10 Wm^{-2} globally and 10-20 Wm^{-2} over the Southern Ocean. Several of the products show a moderate trend from the early 1990s, which is in contrast to the Woods Hole Oceanographic Institute's Objectively Analyzed Air-sea Fluxes (OAFlux) data and some reanalysis products. At the global scale, temperature, humidity and wind speed differences appear to be important, and offsetting in some cases. Wind speed is in better overall agreement than humidity and temperature differences.

The **LandFlux Project** has made good progress towards completion of the Version 1 global land surface heat fluxes. Simulations covering the period 1984-2007 have been completed using four different methodologies with 1-degree 3-hourly latent heat fluxes. Work is continuing on the development of a global sensible heat flux product to be completed in 2016.

A validation study of the LandFlux product against 45 globally distributed flux towers was recently undertaken (McCabe et al., 2015), providing a first comprehensive evaluation of LandFlux data sets. In a parallel effort, findings from the European Space Agency (ESA) funded Water Cycle Observation Multi-mission Strategy-EvapoTranspiration (WACMOS-ET) Project have also been published, supporting the research being undertaken by investigators within LandFlux (Michel et al., 2015 and Miralles et al., 2015).

SRB used HIRS products together with SeaFlux and LandFlux surface values, along with the latest ISCCP and the Max-Planck-Institute Aerosol Climatology Version 1 (MAC-V1) aerosols to compute fluxes. The shortwave (SW) fluxes look quite good and are ready for distribution, but the longwave (LW) fluxes are biased positive (downwelling is too large) 7 W/m^{-2} over oceans for a net 5 W/m^{-2} bias globally. The HIRS humidity profiles have limitations in the lower atmosphere and close to the surface because there is no HIRS channel that has high sensitivity to water vapor and the lower part of the



Participants at the Annual GDAP Meeting in Xiamen, China.

profile is estimated basically from the differential absorption in window channel differences. Discussion is ongoing regarding using reanalysis instead. However, the National Aeronautics and Space Administration's Modern-Era Retrospective Analysis for Research and Applications (MERRA) ended in December 2015 and some biases found in MERRA-2 data in comparison to BSRN station data have increased and need to be understood. The use of European Centre for Medium-Range Weather Forecasting (ECMWF) reanalysis data presents an alternative, but interfacing it with SRB and analyzing the results would be a major undertaking.

Completion of an **integrated product** that uses common assumptions across the suite of GDAP products is expected in 2016. It is designed to ensure that geophysical signals and their covariance are tied to the data and products themselves rather than inconsistencies in their assumptions. The nnHIRS product, a retrieval of temperature and humidity profiles, is essential to providing temperature and humidity profiles, as well as several surface parameters for the integrated product. Due to issues detected when using earlier versions of the nnHIRS product to compute LW radiative fluxes, the latest version was adjusted to improve agreement with surface station temperatures and humidity. All other ancillary products needed for the integrated product have been completed for the entire time period (currently 1980–2014) and are online. Nearly all products for the integrated product are ready to produce data from 1998 onwards, with only the finalization of ISCCP products for SRB and the decision on the use of temperature and humidity profiles for the LW fluxes outstanding.

GEWEX Data Quality Assessments

The Fifth GEWEX **Water Vapor Assessment** (G-VAP) Meeting was held at the University of Wisconsin in November 2015 (see report in the February 2016 issue of *GEWEX News)*. The water vapor assessment is expected to be finalized by the time of the next GDAP meeting in 2016, when the G-VAP proposal for the biennial reporting of water vapor scientific findings relevant to GEWEX will be discussed.

The final report of the **aerosol assessment**, "A Critical Review of the Efficacy of Commonly Used Aerosol Optical Thickness Retrievals: Literature Assessment," was presented at the GDAP meeting. Publication will follow in 2016.

For the new **precipitation assessment,** key questions for the different phases of the project were identified and high priority was given to evaluating the GPCP climatology. Participating data sets, including reanalysis results, will be identified in 2016. The Global Precipitation Mission radar, ground radar networks and gauge analyses may be helpful for assessing uncertainties from multiple angles if carefully analyzed, keeping individual strengths and weaknesses in mind. Meanwhile, the precipitation assessment team continues to identify key problems for subsequent assessment cycles. Extreme precipitation is among the top priorities after the climatology. Understanding and quantifying the potential uncertainties in the GPCP climatology is of urgent importance to address the budget closure issues of the integrated products.

A white paper on the identification of the evaluation metrics and approaches needed to verify whether products comply with the standards will serve as a baseline for the **soil moisture assessment**. While the interest and need for an assessment of the various products from satellite, reanalysis and models exists, progress has been hampered by how long it has taken to come to an agreement on how to conduct the evaluation.

The GDAP paper on **"Data Set Quality Assessments: Needs, Benefits, Best Practices and Governance"** has been published by the WCRP Data Advisory Council (WDAC). The paper, which has been reviewed across the WCRP programs, provides guidance towards a more homogeneous approach to assessments of data set quality and is expected to be endorsed at the next WDAC meeting in April 2016.

Ground Based Networks and Radar Data Records

The **Baseline Surface Radiation Network** (BSRN) has a new project leader, Charles Long of the National Oceanic and Atmospheric Administration (NOAA). The Alfred Wegener Institute (AWI) hosts the World Radiation Monitoring Center (WRMC, *http://bsrn.awi.de/*), the central archive of BSRN data, which contains over 700 years of BSRN station data that are heavily used and have been cited in over 1200 peer-reviewed articles. Fifty-nine stations provided data to the BSRN archive in 2015. BSRN is directly participating in the World Weather Research Programme Polar Prediction Project and several stations are a part of the International Arctic Systems for Observing the Atmosphere (IASOA) Radiation Working Group.

The **International Soil Moisture Network** (ISMN) serves a large international scientific community through improvement of weather and climate models and remote sensing products, and provides support to agriculture applications. ISMN is coordinated by GEWEX/GDAP in cooperation with the Group on Earth Observations (GEO) and the Committee on Earth Observation Satellites (CEOS). The ISMN database is hosted by the Department of Geodesy and Geoinformation at the Vienna University of Technology (TU Wien). ISMN integrates 49 networks containing almost 2050 stations (1600 last year) that have added over 8000 soil moisture data sets (6500 last year) into the archive. It also contains historical soil moisture data sets dating back to 1952. Operational data sets are updated in near-real time. ISMN is rapidly growing and several new networks and data sets will be integrated in the near future, including China (Wuhan University), Korea, and Romania. Further growth potential, such as adding the hundreds of soil moisture stations operated by the Chinese meteorological service, was discussed at the GDAP meeting with Chinese representatives giving positive signals on a potential integration.

Activities related to radar data reprocessing are far less mature than for satellite data. Thirty years ago, we were in a similar state with regard to satellite data, when it was understood that satellite data could be used for more than weather forecasting or other real-time applications. GDAP plans to work towards a similar extension of the usage of radar data by coordinating and synthesizing activities. Even if the problem of global radar data exchange cannot be solved, a first step by GDAP would be to approach all radar data operators to request that they store their radar data in a format that could be utilized by scientists decades later. As this is a cost-intensive process, it is necessary to demonstrate that there is a much bigger spectrum of potential uses for radar data beyond weather. For instance, documenting changes in climate extremes requires high temporal resolution data sets. The collection of GEWEX data sets could be analyzed in that respect, but surface radar data could be a new source for analyzing precipitation extremes.

NOAA has completed reprocessing of Next Generation Radar (NEXRAD) data for the period covering 2001–2012. The reanalyzed data are available at 1-km and 5-minute resolution. An important step in the process of generating the best possible precipitation estimates is to assess the bias in the radar-only product and to implement techniques for merging in situ data and providing the best bias-adjusted estimates. The Deutscher Wetterdienst (DWD) has completed reprocessing of DWD radar data since 2001 (for Germany), including statistical evaluation with a focus on extreme precipitation and the development of user-specific products for applications (e.g., hydrology, civil protection and agriculture).

Although this was attempted years ago without success, GDAP will again try to assess the value of a new project that brings together scientists working on radar reprocessing, considering aspects of archiving, reprocessing, and exchanging radar data and the development of consistent radar precipitation databases for use in hydroclimatological studies. A workshop on this is planned for 2017.

GEWEX UTCC PROES

The goal of the activities of the GEWEX Upper Tropospheric Clouds and Convection Process Evaluation Study (UTTC PROES) is to provide observational-based metrics for a better understanding of climate related physical processes. One of the WCRP Grand Challenges is to determine the role of convection on cloud feedbacks. The objective of the GEWEX UTCC PROES Working Group is to better understand the interconnection between convection and the heating induced by the outflowing anvils. Widening the focus to the role of all cirrus clouds leads to another key question: how large are the relative cirrus contributions, in occurrence and in radiative heating, originating from convection and from in situ freezing driven by large-scale forcing?

At present the Working Group includes about 30 scientists. The first workshop was held on 16 November 2015 in Paris, France, where feedback hypotheses were presented and discussed, and resources identified to tackle the following scientific topics: (1) cloud systems and atmospheric environment from observations; (2) Lagrangian transport to determine cirrus origin and life cycle; (3) process modeling and large-scale parameterizations; and (4) radiative transfer. The analysis of large-scale convective cloud systems shows that the size of these systems is strongly linked to their convective strength.

UTTC PROES will build a synergetic database of high-altitude cloud systems to be used by the participants. In addition, a simulator of high-altitude cloud systems is being built for the evaluation of different formation schemes in climate models. Informal meetings will be held whenever the coordinators have the occasion (during conferences or visits); and a second workshop is planned for autumn 2016 in New York.

Uncertainty Analysis

Uncertainty analysis is important in making GEWEX related products useful for answering the GEWEX Science Questions. Within Europe, two projects have begun that address the uncertainty characterization of satellite data records. One is Fidelity and Uncertainty in Climate Data Records from Earth Obser-

vations (FIDUCEO); the other is the Gap Analysis for Integrated Atmospheric ECV Climate Monitoring (GAIA-CLIM), which addresses the uncertainty of surface-based reference observations and their use to characterize satellite measurements. In addition, GEWEX data set producers and assessments have further addressed how uncertainty might be quantified in products and through comparisons with other data.

GDAP supported a recent workshop on uncertainties in water vapor measurements at 183 GHz (see report in November 2015 issue of *GEWEX News*), where biases observed between measurements at 183 GHz and calculations using different radiative transfer models were discussed, including using either radiosondes (RAOBS) or short-range forecasts from Numerical Weather Prediction (NWP) systems. The primary objectives of the workshop were: (1) describe the biases, trying to separate the biases that were common to all approaches from those which may have been a result of a particular methodology; (2) identify and, where possible, quantify uncertainty in every component of the comparison; and (3) begin the process of bias attribution where possible, which could in due course lead to bias elimination. In order to address these ambitious goals, experts in many different aspects were assembled. This included specialists in RAOBS calibration, NWP models and data assimilation, instrument biases and radiative transfer models, both the models themselves and the underlying spectroscopy. Comparisons were also undertaken with other techniques for sensing humidity information such as Global Navigation Satellite Systems (GNSS), Differential Absorption Lidar (DIAL), Raman Lidar and infrared radiances.

GDAP will continue to support such activities to achieve better overall uncertainty characterization of satellite-derived data sets. ESA and EUMETSAT are planning a workshop on uncertainty characterization for satellite data sets in 2017.

Next Meeting

The next annual meeting of GDAP and the kickoff workshop for the precipitation assessment is tentatively scheduled for fall 2016 in Washington, DC.

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Annual Meeting of the GEWEX Hydroclimatology Panel

Entebbe, Uganda
17–19 November 2015

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The GEWEX Hydroclimatology Panel (GHP) meeting was held to evaluate the ongoing and planned activities of the Panel to ensure that they are effectively contributing to the leading role that GEWEX plays in hydrological sciences and related modeling activities. Updates were provided for each element of the two main components of GHP—the Regional Hydroclimate Projects (RHPs) and the research topic-based Crosscutting Projects. The meeting was hosted by the Uganda National Meteorological Authority on the shores of Lake Victoria.

Regional Hydroclimate Projects

The RHP project managers provided updates on recent accomplishments and future plans of the RHPs and highlighted the contributions that each one is making to address the GEWEX Science Questions. Two RHPs have successfully concluded—the Northern Eurasia Earth Science Partnership Initiative (NEESPI) and the Monsoon Asian Hydro-Atmosphere Scientific Research and Prediction Initiative (MAHASRI). NEESPI held a well-attended closing workshop in Prague in April 2015. The RHP was a great success in many respects, particularly in terms of engaging with scientists in the northern Eurasia region. MAHASRI held an international conference in March 2016 that served as its final meeting. Broad discussion of the many achievements of MAHASRI research, along with impacts that it has had on the Southeast Asia region, were reported on at the conference. We thank the long serving project leaders of these RHPS—Pasha Groisman (NEESPI) and Jun Matsumoto (MAHASRI)—for their dedicated leadership and encourage them to continue to be involved in existing projects or initiate new GEWEX activities.

The Hydrological Cycle in the Mediterranean Experiment (HyMeX) held a significant workshop in September 2015 that served as a five-year review and involved planning for the next five years. HyMeX has achieved much in its first five years, and now that the community is firmly established, it will be exciting to see how its research evolves going forward. The Changing Cold Regions Network (CCRN) RHP has been progressing well with its extension into the Mackenzie River Basin in Canada, which provides a significant increase in the cold regions research being undertaken. CCRN is connecting with research communities outside traditional GEWEX disciplines, such the ecological community, which is a very positive aspect for the RHP.