2019 GEWEX Data and Analysis Panel (GDAP) Meeting

Tucson, AZ, USA
22–24 January 2020

International GEWEX Project Office and GDAP Panel Co-Chairs Rémy Roca and Tristan L'Ecuyer

Hosted by Ali Behrangi, the 2019 GDAP Meeting took place at the University of Arizona in Tucson, Arizona, USA, from 22–24 January 2020. During the meeting, participants shared and reviewed the status of current projects, discussed potential new initiatives and heard about the activities of collaborating partners. We evaluated the progress of GDAP's transition to its new identity, a process that began in 2018 and that forms the basis for GDAP's input to the GEWEX Science and Applications Traceability Matrix (SATM). We welcomed Eui-Seok Chung from the IBS Center for Climate Physics as a new panel member, and thanked Tianjun Zhou as his service as panel member ended after his second four-year term.

GDAP seeks to describe the complete water and energy budgets using consistent, long-term, global data sets of radiative fluxes and surface energy and water exchanges as well as the atmospheric parameters affecting them. With a focus on establishing consistency, GDAP oversees a number of assessments of key parameters related to Earth's energy and water cycles as well as the development of a GEWEX Integrated Product (IP). The IP incorporates several previously-supported energy and water flux data sets into a long-term product on a common grid for energy and water cycle closure studies. Additionally, GDAP sponsors ground-based observing networks that provide high-quality, calibrated observations for evaluating satellite data sets and coordinates the formation of a new international effort to advance the next generation International Satellite Cloud Climatology Project (ISCCP-NG). GDAP's new identity, developed in 2018, concentrates on i) reformulating and restructuring the terms of reference for panel members and projects, ii) increasing focus on and linking to Process Evaluation Studies (PROES), iii) providing a new paradigm for assessments and iv) repositioning GDAP with other bodies like the World Meteorological Organization (WMO)/ Coordination Group for Meteorological Satellites (CGMS), the World Climate Research Programme (WCRP) Data Advisory Council (WDAC), the Task Team for Intercomparison of Reanalyses (TIRA) and the Global Climate Observing System (GCOS).

Assessments

Cloud Assessment

The GEWEX Cloud Assessment (2005–2012; Stubenrauch et al., 2013) provided the first coordinated intercomparison of publicly-available, standard global cloud products (gridded, monthly statistics). Phase II of the assessment, which will end in 2020, saw several teams improve their data sets and new global long-term data sets emerge. In general, the data sets agree well, within the retrieval uncertainties. Differences in average cloud properties are mostly explained by the inherent instrument capability for detecting or identifying or both detecting and identifying optically-thin cirrus. Ancillary data affect low-level cloud amount. Even if instantaneous cloud properties are not very accurate, the synergy of different variables provides invaluable potential for improving our understanding of clouds. This synergy is also important for model evaluation to compare correlations of physical variables or statistics organized by weather states or cloud system. The GEWEX Cloud Assessment database now contains seven updated and four new data sets.

Water Vapor Assessment

The GEWEX Water Vapor Assessment (G-VAP) initiated in 2011 aims to quantify the state-of-the-art in water vapor products being constructed for climate applications. G-VAP supports GDAP's selection process of water vapor products for its generation of globally-consistent water and energy cycle products. The water vapor data records exhibit significantly different trend estimates. These differences are at least partly caused by break points, which typically coincide with changes in the observing system and are a function of region. Already highly successful, this is a work in progress, which will be further consolidated in the near future.

Precipitation Assessment

The Precipitation Assessment is carried out jointly between GDAP and the International Precipitation Working Group (IPWG). The joint assessment considers a large ensemble of observational sources for precipitation. It aims to evaluate the performance of these new products across multiple topics and a set of various metrics ranging from the extreme to climate model evaluations. The assessment benefited from the momentum of the earlier start from the GDAP precipitation effort and organizers now anticipate a release in late 2020 (postponed by a few months, owing to the COVID-19 pandemic). Consistent with the GDAP approach to assessments, a multi-product database was built and released as part of the assessment. More information on the Frequent Observations of Rain on GridS (FROGS) can be found at http://frogs.ipsl.fr.

Earth's Energy Imbalance Assessment

Following the Earth's Energy Imbalance (EEI) meeting in Toulouse, France, in 2018, the idea came about to run a new integrated assessment on EEI. EEI is defined as the global annual mean of top-of-atmosphere net irradiance. More than 90% of EEI heats oceans. The goals of the EEI assessment are to:

- provide quantitative assessments of EEI uncertainty associated with different methods;
- use this assessment to produce our most definitive estimate of EEI, its annual to decadal variability and the trend in EEI;
- quantify the contributions from the different components of the Earth system to EEI, including from the cryo-

sphere, atmosphere, land storage and ocean heat content changes; and

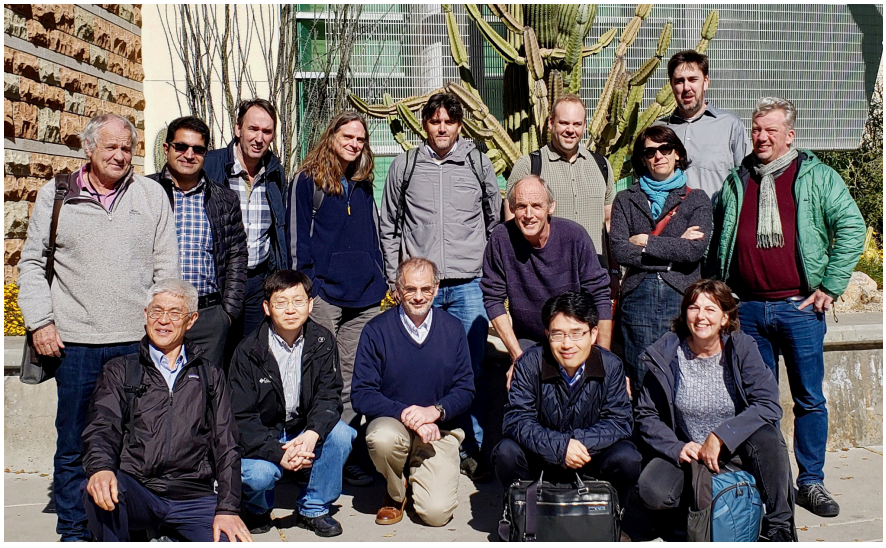
- compare current with historical EEI.

Soil Moisture Assessment Tools

New tools have been introduced for independent and transparent assessment of satellite soil moisture products. The Quality Assurance for Soil Moisture (QA4SM) online validation platform provides the user with an interface for comparing satellite soil moisture data against land surface models and the International Soil Moisture Network.

Integrated Product

The Integrated Product (IP) Working Group seeks to integrate the various water and energy cycle products as consistently as possible and focuses on physical consistency among the products. The first version of IP was released in 2019 and can be found at *ftp://rain.atmos.colostate.edu/ftp/pub/pbrown/GEWE_X_IP_2019/*. Results were published in *GEWEX Quarterly* (Kummerow et al., 2019) and a journal article is being prepared. The objective of the IP Workshop scheduled for March 2021 is to broaden the community, discuss the utility of the product and get feedback on how to proceed.



Participants of the 2019 GDAP Meeting

Networks

BSRN

The Baseline Surface Radiation Network (BSRN) aims at detecting important changes in the Earth's radiation field at the Earth's surface that may be related to climate change. It provides observations of the best possible quality for short- and long-wave surface radiation fluxes with a high sampling rate, implementing instrument calibration traceability and up-to-date quality controls.

In 2019, 69 stations submitted Logical Records (LR)0100 data. Five of these stations were accepted as candidates during the 2018 BSRN Workshop and are now flagged as operational sites. Indonesia, Cyprus, Romania, China, Korea-Italy (Ross Sea, Terra Nova Bay, Antarctic) and Argentina-Italy have expressed interest in joining BSRN. The imbalance between the number of northern (approximately 71%) and southern (approximately 29%) stations persists. At the GCOS Joint Panel Meeting in March 2019, BSRN representatives and Ocean Observations Panel for Physics and Climate (OOPC) members established contact to coordinate best practices. A splinter meeting to enhance the interaction between the land and ocean radiation communities was planned for the European Geosciences Union 2020 (EGU 2020) conference. Most of the station scientists participated in the poll on common practices of operational BSRN sites. The suggestion to appoint a BSRN co-chair will be discussed at the next BSRN meeting.

Sadly, 2019 was marked by the passing of Chuck Long, the former Project Manager of BSRN from 2014–2018. His contributions to BSRN activities, radiation measurement and the exploitation of surface-based data to determine cloud radiative effects on shortwave and longwave radiation are invaluable. Chuck will be remembered as an inspiring scientist, mentor and friend to many.

GPCC

Since 1989, the Global Precipitation Climatology Centre (GPCC) has provided global precipitation analyses based on in situ rain gauge measurements for monitoring and researching Earth's climate. GPCC is archiving the data from different sources separately in source-specific slots in its relational database management system (RDBMS) to enable intercomparison of data from the different sources.

In 2019, GPCC increased the database with regard to the number of quality-controlled stations to more than 121,500 stations through the integration of large data sets from Australia, Canada and Brazil among other methods. The quasi-operational monthly Monitoring Product and First Guess Products (daily and monthly) have been updated regularly. The next release of the GPCC precipitation data product portfolio of daily and monthly full data analyses was scheduled for March 2020. Furthermore, GPCC contributed to the most recent WMO annual and 5-year statements on the status of the global climate, and the *Bulletin of the American Meteorological Society*'s "State of the Climate".

ISMN

The International Soil Moisture Network (ISMN) is an international cooperative effort to establish and maintain a global in situ soil moisture database. This database is an essential means for validating and improving global satellite products, and land surface, climate and hydrological models. It currently includes 60 networks with over 2500 measurement stations.

Assessment of citizen science sensors are to be included. It is funded by the European Space Agency Quality Assurance for Earth Observations program (2019–2022). At this time, ISMN is not linked to the U.S. Soil Moisture Network. Efforts to reconnect are suggested.

ISCCP-NG

The Earth observing capabilities from geostationary orbit have advanced substantially over recent years. The ISCCP-NG effort will: i) maintain continuity of the original ISCCP, ii) develop a new global radiance data set that exploits the increased spatial and temporal resolution, spectral diversity and improved calibration afforded by advanced geostationary imagers, and iii) develop more advanced cloud products and support new research and application. The first ISCCP-NG workshop was held at the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT) headquarters in Germany in 2019. There was consensus among participants to move forward with this project and to start by defining the scope of ISCCP-NG. The current ISCCP processing will be maintained in parallel to ISCCP-NG. Synergy with the aerosol climate data processing should be explored. To engage the space agencies, and to develop terms of reference for ISCCP-NG and its relationships to other international bodies, a report was planned for presentation at the Coordination Group for Meteorological Satellites 48 (CGMS 48) in August 2020.

Other Activities

Several groups reported on achievements, developments and future plans during the 2019 GDAP Meeting. These included updates from the Atmospheric Radiation Measurement (ARM) User Facility of the Pacific Northwest National Laboratory (PNNL), the "Evaluation of modeled precipitation in oceanic extratropical cyclones using satellite observations" project, the International Clouds Working Group (ICWG), the Global Precipitation Climatology Project (GPCP), TIRA and a study of warm rain process through newly-retrieved marine boundary layer (MBL) cloud and drizzle microphysical properties.

The next GDAP meeting will be held virtually due to the COVID-19 pandemic and will be shortened to accommodate time zone constraints.

References

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32nd Meeting of the GEWEX Scientific Steering Group

27–31 January 2020
Pasadena, CA, USA

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The 32nd Meeting of the GEWEX Scientific Steering Group (SSG-32) was hosted by the National Aeronautics and Space Administration (NASA) Jet Propulsion Laboratory (JPL) at the Cahill Center for Astronomy and Astrophysics in Pasadena, California from 27–31 January 2020. In addition to GEWEX Scientific Steering Group (SSG) members and GEWEX Panel Co-Chairs, delegates from collaborating organizations attended the meeting, including representatives from the U.S. Department of Energy (DOE); the European Space Agency (ESA); the Japan Aerospace Exploration Agency (JAXA); NASA; the National Oceanic and Atmospheric Administration (NOAA); the U.S. Global Change Research Program (USGCRP); the United Nations Educational, Scientific and Cultural Organization (UNESCO); the World Climate Research Programme (WCRP); WCRP's core programs and working groups and other partners of GEWEX.

SSG-32 reviewed the major results, goals and plans of GEWEX and its four Panels for the 2019 calendar year. Activities ranged from installing new Panel members and initiating new projects to fostering current projects, developing and marketing products and organizing meetings and workshops. An important aspect of this meeting in anticipation of Phase IV of GEWEX (2023–2032) is the "Science and Applications Traceability Matrix" (SATM), which is being drafted with the input of all SSG and Panel members. The GEWEX SATM will provide traceability from WCRP strategies to core science, defined metrics, applications and programs. It will serve as the backbone of, and provide direction to, the revision of the GEWEX strategic plan and science questions for the coming years.

Each Panel presented its annual overall report, which is based on the annual reports of the individual working groups and coordinated by the Panel. More information on all the activities and these reports can be found at www.gewex.org.

The Global Atmospheric System Studies (GASS) Panel is doing well after its restructuring, and added two new members in 2019, a representative of the WCRP Grand Challenge on Clouds, Circulation and Climate and an Early Career Scientist. GASS has four active projects that are entering their productive stage: Constraining Orographic Drag Effects (COORDE); Demistify: a Large Eddy Simulation (LES) and numerical weather prediction (NWP) fog modeling intercomparison; Impact of Initialized Land Temperature and Snowpack on Sub-Seasonal to Seasonal Prediction (LS4P) and Improving the Simulation of Diurnal and Sub-Diurnal Precipitation over Different Climate Regimes. The GEWEX Atmospheric Boundary Layer Study 4 (GABLS-4) is the fifth active GASS project. It is in its final stage and the project is discussing follow-up activities. In addition to