

# GDAP annual report

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GDAP stands for GEWEX Data Analysis Panel and we have engaged in emphasizing the analysis part and it is slowly building up. We have promoted the consistency theme as a way to channel the undergoing various new activities.

GDAP is sponsoring some surface networks, organizing and publishing community-based assessments of various water and energy fluxes and encouraging and managing some data-related projects. We summarize below the recent achievements of these three activities and sum up the other efforts undertaken at the panel level to better connect with the other panels and the SSG.

## GDAP networks

This is the more formal and historical activity we are dealing with in the panel. Indeed, we have no say about the directions or the evolution of the networks and just make sure the networks data and effort are connected to the satellite world. The GPCC precipitation network is reporting to us and is well used in many of the assessment chapters. The ISMN deals with soil moisture and is going under change of leadership. A better connection to the US network into the global picture is under discussion. Note that here Peter is involved, probably more than GDAP. The BSRN network thrives thanks to its dynamical leadership, reinforced this year with a deputy chair. Tristan L'Ecuyer participates actively in the BSRN science meetings. While not officially in our portfolio, we include the ARM facility management into GDAP as well in the same spirit as for BSRN. There are ongoing discussions about including these networks better with GDAP and are developing ideas for a cross-panel emerging surface budget project centered on these networks (see below).

## GDAP assessments

This is the more community-oriented activity since under each assessment group there is a large gathering of worldwide scientists involved in the actual assessment effort. Note that the terminology "assessment" is vague and may represent many things. In our case, the report it is often a review of the literature with added specifically design benchmarks and intercomparison exercise. The reporting can take the form of a BAMS article and/or a 200 pages WCRP report. TLE and RR have renewed the exercise when we took over and make it community-centric and broad following the example of the Cloud assessment.

### Clouds (C. Stubenrauch)

While the cloud assessment is officially finished and published, the community asked Claudia Stubenrauch to run a subset of the diagnostics on the latest version of the cloud product. This little extension is undergoing and progressed substantially this past year offering a perspective on the progress of the various satellite cloud groups.

### GVAP-2(M. Schröder et al.)

This is the second phase of the water vapor assessment that follow a successful first phase and a hefty report of more than 200 pages. The GEWEX Water Vapour Assessment (G-VAP, <http://gewex-vap.org>) quantifies the state-of-the-art in water vapour products being constructed for climate applications. G-VAP considers total column water vapour, profiles and humidity in the upper/free troposphere, with a focus on satellite data records and stability. Interim results on an assessment of

water vapor products in the Arctic was published in AMTD (Crewell et al., 2020). Among others it was concluded that for monthly mean values, systematic differences are present in the Arctic which particularly appear over different surface types, e.g. ocean and sea ice. The full-blown report is due in 2021.

### Precipitation (R. Roca and Z. Haddad)

The initial precipitation assessment has been scaled up by making it jointly with IPWG (a WMO/CGMS body dedicated to precipitation) and is now in press after 3 years of co-writing with 19 contributors. The report enjoys 9 chapters entertaining from the high-resolution precipitation product capability to the research directions for uncertainties modelling. There is a dedicated chapter on precipitation extreme that benefited from a cooperation between GDAP and GC Extreme, between R. Roca and L. Alexander that yield to a workshop and a special issue with ~15 papers. A side product of this cooperation is the FROGS database that ease the access to more than 30 precipitation products. Beyond satellite products, FROGS includes ground based datasets as well as reanalysis. It is worth noting that we have incorporated the GLASS sponsored centennial reanalysis into FROGS following the last SSG discussion. Also note a specific chapter by the GDAP crew where the consistency between the various global products and the global radiation budget is explored revealing large discrepancies among the precipitation products and the lack of consistency. The overall recommendation from the precipitation community towards the space and operational agencies are currently being worked out.

### Earth Energy Imbalance (B. Meyssignac and T. Boyer)

There is a growing focus in the energy balance community to understand where the excess heat in the climate system resulting from increased concentrations of greenhouse gases actually goes. Globally, the annual mean net energy absorbed by the Earth is referred to as Earth Energy Imbalance (EEI). It is a fundamental variable defining the status of global climate change but very challenging to estimate from observations. A range of EEI estimates have been published in the last decade, often with error bars that are difficult to robustly trace to measurement principles. Within the consistency paradigm, GDAP has recently initiated an assessment of the current available EEI estimates from observations. Since the ocean stores more than 90% of the total planetary heat uptake, the EEI assessment focuses on intercomparing estimates of the time rate of change of ocean heat content (ocean heat uptake). The results of this first of its kind EEI assessment focus on: (a) understanding the spread of global and regional ocean heat content and ocean heating rate among products, (b) determining systematic errors that depend on assumptions, models, and combined observations, and (c) understanding the spread of uncertainties depending on the method and formulae used. A second phase of the EEI project may further seek to assess estimates of ocean heat uptake on regional scales and determine error covariance matrices that depend on region and ocean depth.

## GDAP projects

### The ISCCP-NG project

While slowed by the pandemic due to the lack of in-person meetings, GDAP continues to coordinate a community effort to develop a next generation International Satellite Cloud Climatology Project (ISCCP-NG). The goals of this ISCCP-NG effort are to (a) maintain continuity of the ISCCP while (b) developing new global cloud products that exploit the increased spatial and temporal resolution, spectral diversity, and improved calibration afforded by advanced geostationary imagers to support new research and applications. This is viewed by many of the major satellite and weather agencies around the globe as a critical step to maximizing the benefits of the advanced observing systems of today and tomorrow but requires considerable effort to engage this broad community and ensure

this is a truly *International* effort. Through a series of workshops, GDAP is currently facilitating the gathering of international community input to maximize the benefits of the ISCCP-NG product for meeting user needs. Current efforts have centered on generating a set of intercalibrated radiances from the constellation of modern geostationary satellites (termed L1g) that will form the basis for a series of associated atmospheric parameter products. It is anticipated that a geostationary cloud assessment ISCCP-NG effort will be required to move the project forward to producing cloud products and GDAP will play a key role in coordinating that effort.

### The Integrated Product project

The IP project was the longest lasting project in GDAP, starting in 2010 or before. It was very ambitious and was supposed to provide an integrated product. For various complicated and valid reasons that have been articulated in a GEWEX newsletter article by Chris Kummerow, it was failing and about to be stopped as a GDAP sponsored project late 2019 when a less ambitious solution was promoted. We now have all the fluxes and the ISCCP clouds on the same grid same resolution and same period. Yet the surface sensible and latent flux over land are not homogeneous over the period and include both satellite retrievals and ERA-5 data. The aerosols and cloud products that were supposed to be include in all the fluxes computations (aka integrated) ended up being used with various versions and not as integrated as planned. Yet this is an important dataset that can help the community investigating science questions. This effort is now sunsetting since there is no financial nor strong scientific support to improve the existing 20 years record called the IP product; yet the actual individual products are likely to be extended in time as is.

### Regional Energy and Water Cycle Consistency over Land project (new)

As an outgrowth of the IP project, a workshop focusing on using the IP to study regional energy and water cycle closure over land was initially planned for Toledo, Spain in spring 2020. Due to two postponements because of the pandemic, this workshop is being repurposed to develop the foci of a cross-panel GDAP-GLASS activity centering on land-atmosphere heat and moisture exchanges. The project will fill a long-desired need to better engage local field sites like ARM and BSRN (as well as others) in GDAP regional and global assessments as well as bridge the local scales addressed by GLASS process studies and larger scales addressed by GDAP consistency studies. The study will be built around establishing consistency between land-atmosphere heat and water exchanges and observed surface temperature and water storage changes on local scales using field observations and local process modeling. Insights gleaned from these scales will be expanded to regional and ultimately global scales using satellite energy and water cycle datasets and global models (including reanalyses). One possible deliverable from this activity is an assessment of land energy and water cycle fluxes but that requires additional discussion. A workshop is planned, likely in early 2022 to bring together relevant members of both panels and others in related communities to produce a white paper outlining the project goals and plan for achieving them.

## GEWEX-centric activities

### Contribution to the SSG discussion

We have contributed to the high email traffic about the positioning of GDAP and GEWEX with respect to the space agencies in the first quarter of 2021. We have produced and communicated notes for people to access some of the reasoning behind the positioning of GDAP. We understand we have contributed to improve the communication in the SSG by providing the much-needed background of the GDAP activity for interested folks.

### Liaison with GLASS

In support of developing a cross-panel project with GLASS and fostering increased interaction between the panels in general, a formal GDAP-GLASS liaison has been appointed. Dr. Yunyan Zhang from LLNL has been appointed as a member of both panels and will serve in this role in the coming years to increase communication between the panels.

### Emerging discussion with GAS

The simultaneous maturity of GAS and incorporation into GEWEX of the momentum of the GC on Clouds and Circulation is a good trigger for further interactions between GDAP and GAS. Sandrine Bony and Rémy Roca have planned to discuss these possible connections in the coming months.

### Update of the web site

While it may look trivial, it actually is a time-consuming task that has been performed mainly by Tristan this year. The GDAP webpages are now reflecting well the panel activity.

## WCRP-centric activities

### WCRP ESMOC

RR is representing GEWEX in the ESMOC discussion. First meeting planned on May 3<sup>rd</sup>.

### Light house etc..

We have had little if no time to actually articulate GDAP activity into the reorganization of the WCRP. Please also note that GDAP is not directly involved in any of the WCRP working groups and this is a topic of concern since the GEWEX representatives are belongs to the other panels.

