

2017 GEWEX Data Assessments Panel Annual Meeting
9-12 October 2017
Boulder, Colorado

The 2017 annual meeting of the GEWEX Data Assessments Panel (GDAP) was hosted by Kevin Trenberth at the NCAR Mesa Lab in Boulder. The meeting began with a special one day workshop to coordinate GEWEX and CLIVAR activities centering on documenting Earth's energy imbalance (EEI) with the CONCEPT-HEAT team. The main goals of the GDAP meeting that followed on Tuesday and Wednesday were to: (1) obtain updates on all GDAP-sponsored ground sites (e.g. GPCP and BSRN) and datasets (e.g. SRB, GPCP, SeaFlux, and LandFlux); (2) establish concrete plans for completing the currently open aerosol and cloud assessments; (3) re-scope the precipitation assessment; (4) discuss progress toward the GEWEX integrated data product; (5) initiate a new paradigm of integrated budget closure assessments; and (6) establish GDAP's role in supporting cross-cutting GEWEX activities like PROES. Discussions focused on defining new goals and directions for GDAP under the new leadership of Remy Roca (Laboratoire d'Etudes en Geophysique et Oceanographie Spatiales, LEGOS) and Tristan L'Ecuyer (University of Wisconsin-Madison). GDAP membership met on Thursday morning to discuss panel business including redefining the core objectives of GDAP, initiating an overhaul of the website, developing new a new 'best practices' guide for scientific data assessments, identifying suitable candidates for increasing GDAP membership, and planned activities in 2018.

Monday CONCEPT-HEAT Meeting

Monday's joint meeting between GDAP and CLIVAR's CONCEPT-HEAT working group led to a better understanding of perspectives of these different WCRP communities regarding the important topic of quantifying Earth's energy imbalance or EEI. All those in attendance agreed that EEI is the most fundamental driver of climate change and recognized the need for a coordinated effort to utilize the best available observational datasets to quantify global EEI and its regional and temporal variations. CONCEPT-HEAT, GDAP, and the sea level community have all made progress somewhat independently toward this goal. Kevin Trenberth, Graeme Stephens, and Detlef Stammer each provided updates of each group's activities. CONCEPT-HEAT efforts have centered on establishing best estimates of changes in global ocean heat content (OHC), establishing consistency between OHC and top of atmosphere radiation measurements, and mapping air-sea fluxes as a residual using atmospheric and oceanic reanalyses. GEWEX integrative EEI activities have advanced primarily through GDAP and, specifically, the new Integrated Product. For more than three decades, GDAP (formerly GRP), have supported atmospheric and surface flux datasets and assessed their accuracy and these activities are transitioning into fully-integrated energy and water cycle assessments. As an example, Seiji Kato provided an update on CERES EBAF version 4.0 suggesting that when biases are removed through a one-time correction, variability in TOA fluxes appears to track changes in GPCP precipitation over the CERES era. The CLIVAR-sponsored sea-level budget initiative is addressing the specific problem of improved estimation of changes in OHC through analogous budget approaches. Benoit Meyssignac and Steve Nerem presented encouraging results from an effort to combine surface altimetry (e.g. JASON), terrestrial water storage (GRACE), and in situ (Argo) observations to derive an integrated picture of the linkages between sea level change and EEI. These findings were supported by Lijing Cheng who provided a nice

summary of recent efforts to quantify uncertainty in OHC reanalyses.

The afternoon session focused on specific components of the EEI problem, methods of integrating information from diverse sources, and applications. Carol Anne Clayson and Mathias Hauser (with Isabel Trigo) provided updates on observational estimates of land and ocean heat and moisture fluxes and the remaining challenges in reducing structural uncertainties in these datasets. Keith Haines then represented the group from the University of Reading who have sought funding in the UK to apply variational techniques to blend gridded flux observations with transport constraints to yield new estimates of ocean basin-scale energy imbalances. A key question that emerged from the discussion that followed that is particularly germane to GDAP objectives concerned “*how do we move beyond using spreads between products as measures of uncertainty?*” An optimal blend of information from sensitivity studies, ground-validation, and product inter-comparisons supplemented with closure-based assessments is required.

This discussion was followed the three talks that that discussed the value of EEI and ocean-atmosphere heat exchange datasets in the context of improved climate prediction. Andrew Gettelman discussed energy balance in the CMIP5 models and suggested that many models still exhibit imbalances in top of atmosphere radiation of 2 Wm^{-2} or more raising the question of “*what accuracy new integrated EEI activities should be striving for?*”. Bill Frey provided additional motivation for quantifying regional EEI and ocean-atmosphere exchanges by noting that models suggest that ocean heat uptake at mid-latitudes may exert a strong buffer reducing the influence of cloud feedbacks on climate sensitivity. This raises yet another question that must be addressed by the EEI assessment activity: “*what spatial and temporal analysis scales are realistically supported by current datasets?*” The answer depends on which parameter is considered posing a challenge to integration efforts. Steve Yeager provided an interesting perspective on the decadal-scale prediction by demonstrating that CESM has significant skill in hindcasts of variations of upper ocean heat content. This further fueled the question: “*how good do we need to know EEI to improve predictability?*”

The late afternoon focused on addressing the question of ‘*where to go from here?*’ and, specifically, assessing support for writing another community paper taking stock of the current state of EEI knowledge and/or holding a joint workshop of relevant WCRP communities to work toward an integrated view of EEI. Given the existence of current literature documenting the importance of EEI, those in attendance were not in favor of drafting another review paper but rather supported organizing a more comprehensive assessment of methods for inferring EEI. There was strong support for including a targeted effort to build upon recent approaches for objectively integrating distinct estimates of top of atmosphere radiation, atmospheric and oceanic mass and heat transports, air-sea fluxes, direct and indirect ocean heat content analyses, and estimates of surface ice mass, heat content, and water storage in this activity. The other key outcome from the workshop was the consensus opinion that a joint CLIVAR-GEWEX EEI workshop is needed and it was suggested this workshop be held in Toulouse, France, in late 2018. The goal of this open 3.5-day workshop would be to foster collaboration between the communities in WCRP to work toward an integrated view of EEI. The workshop would include invited keynote speakers and time for discussion. Four session topics were proposed: (1) Coordinated assessment of global EEI and its components; (2) Regional EEI and transports; (3) Observational needs and prediction; and (4) Cross-WCRP interactions on EEI. A steering committee will be identified shortly composed of individuals representing CONCEPT-HEAT, CLIVAR, and GEWEX along with additional representation from CliC and the ocean reanalysis/modeling community.

Main GDAP Meeting

Remy Roca opened the core GDAP meeting on Tuesday October 10, 2017 with a review of GDAP activities from the past year. GDAP leadership officially transitioned from outgoing chairs Jörg Schultz and Matthew McCabe to Remy Roca and Tristan L'Ecuyer last December. In the nine months that followed, progress was made toward each of GDAP's core activities that include: (1) sponsoring production and analysis of several key energy and water cycle datasets from satellites (e.g. ISCCP, GPCP, SeaFlux, SRB); (2) sponsoring and overseeing assessments of these and other community datasets to improve uncertainty estimates; (3) sponsoring ground-based networks including BSRN and GPCC; (4) facilitating data access by scientific user communities; (5) acting as an interface between GEWEX activities and datasets (e.g. PROES, GAP, GASS, etc.); (6) representing GEWEX at WCRP meetings, WMO meetings, and others; and (7) reporting and responding to the GEWEX SSG.

Global energy and water cycle datasets continue to be refined. New versions of several (e.g. SRB v4.0 and SeaFlux v2.0) have either been released or are in final stages of evaluation. After a long process, the water vapor assessment report has been submitted and is under review. Progress was made toward an initial precipitation assessment though it was determined that its scope needs to be broadened. Alexander Gruber presented an update on the soil moisture assessment and Claudia Stubenrauch outlined a timeline for the updated cloud assessment. The aerosol assessment needs to be resurrected though some progress has been made by Stefan Kinne under the AeroCom project and a new MACv2 dataset is available. Addressing objective (4), good progress has been made on the GEWEX Integrated Dataset. One year of the complete 1 degree, 3-hourly product (Jan-Dec 2017) is now available for download at: ftp://rain.atmos.colostate.edu/ftp/pub/GEWEX_IP/pbrown/GEWEX_IP/2007/. Chris Kummerow presented examples that illustrate how the data can support examining water cycle closure at the ocean basin scale, consistent with the concept of closure-based assessments envisioned for GDAP.

Remy reported on GDAP activities to the GEWEX SSG in February, 2017. The water vapor assessment report was well-received but there was discussion of expanding the scope of the precipitation assessment. This is now underway engaging the IPWG and PMM communities. Another outcome of the SSG was a suggestion that there may be motivation to include land surface temperature (LST) and possibly fluorescence as GDAP variables. Tristan represented GDAP at the 2nd GEWEX Aerosol and Precipitation (GAP) workshop in Oxford. A primary outcome of that meeting was the need for metrics to evaluate aerosol influences on precipitation in global models and GDAP should play an advisory role in establishing these. Tristan also participated in the UTCC PROES meeting in New York where GEWEX cloud, radiation, and precipitation datasets are being used to study convection. Both Tristan and Remy participated in the joint GEWEX/CONCEPT-HEAT workshop prior to this GDAP meeting. GDAP will maintain close connections to the WDAC and Obs4MIPs groups in an advisory capacity.

Several of these core GDAP objectives and activities are now being reshaped to reflect new directions in satellite and climate science. While assessment of individual parameters will continue, some *focus is shifting toward integrated assessments* of global data projects that apply energy and water cycle closure constraints as an integrated measure of systematic errors in datasets. This effort, coupled with a renewed focus on defining application-centric uncertainties appropriate to specific time and space scales will help GDAP better serve the science

community. Prior assessments, new objective optimization approaches, and the GEWEX Global Integrated Product that bring together the separate “parameter-centric” products at the highest feasible space-time resolution for “global process” studies will play a key role in this activity. New global data products should continue to be focused on improving the “long-time-record” quality of the products so that they can be used more confidently for climate monitoring studies. This activity should now make plans for the long-term stewardship of these products, including continuing to lead efforts to convert research analyses to “climate operations”.

The morning session concluded with new member talks by Seiji Kato and Isabel Trigo. EBAF 4.0 has been released with some improvements to clouds and cloud forcing. The value of BSRN for calibrating surface fluxes was noted and a request was made that BSRN add 2m temperature and humidity to their standard measurements – *GDAP will recommend this at the upcoming BSRN meeting*. A more comprehensive set of accuracy standards for buoy sites was also requested and *GDAP could lead a survey of the community to establish suitable standards*.

Land surface temperature products have recently been the subject of substantial assessment efforts and quality, consistency, and spatial/temporal resolution is improving. The biggest source of uncertainty remains the surface emissivity although nighttime cloud screening is also an issue. The best path forward may be through methods that combine infrared and microwave LST. *GDAP may seek to incorporate global LST into its product suite as part of a proposed integrated land surface flux closure assessment activity*. Such an activity would explore the degree of consistency between LandFlux, soil moisture, LST, and SRB to identify structural errors in the component fluxes.

After these initial science presentations, the meeting shifted focus to datasets and assessments, starting with water parameters. A long-term soil moisture product supported by the ESA CCI program will be released by the end of 2017 that may support this new land surface activity. Alexander Gruber noted that there is no funding dedicated to future improvements and currently no plans for developing Version 2.0. It was suggested that *GDAP may recommend a formal soil moisture assessment* or even endorse this product as an official GEWEX global soil moisture product. *GDAP could also advocate for data quality standards to be implemented by the International Soil Moisture Network (ISMN) ground-reference data*. Hosting a soil moisture workshop or conducting a survey may be a first step toward this goal.

Andreas Becker provided an update that version 8 of the GPCC monthly monitoring product spanning 1901-2016 will be released by the end of the year. Version 2 of the daily GPCC product now includes 30,000 gauges and covers the period from 1980-2013. Bob Adler announced that the daily GPCP v2.3 is currently being generated through the NOAA CDR program. A prototype version 3 GPCP is being developed with a spatial resolution of 0.5 degrees that will include rain/snow discrimination and error bars that account for random/sampling errors in the component products. Bob raised the concern shared by several others that algorithm transfer to NOAA has not been smooth and there are concerns regarding future user support.

Tuesday afternoon and Wednesday morning of the meeting focused on ongoing GDAP assessments. The precipitation assessment has concentrated on comparing general climatologies and seasonal cycles of zonal means separated into land and ocean regions. Hiro Masunaga showed that, while integrated accumulations agree to ~10%, there are large differences in rainfall intensity PDFs between products indicative of structural differences between products. The question was raised as to whether any independent reference standard exists against which datasets could be compared. As noted previously, a more comprehensive assessment that

includes sampling errors, examines regime-dependent differences, addresses high latitude and orographic precipitation, and addresses the needs of specific applications is needed. One of the hallmarks of GDAP (and formerly GRP) is that it has pushed the envelope of uncertainty analyses and developed more sophisticated ways of characterizing structural errors through either regime stratification or autocorrelation methods. *GDAP will engage the IPWG and PMM communities to broaden the scope of this assessment activity.*

Alexander Gruber gave an update on soil moisture assessment activities on behalf of Wouter Rodrigo. An ongoing soil moisture product assessment led by European groups has garnered good community engagement including a workshop from which a 'best practice' document has emerged. A new triple-collocation approach has allowed uncertainties to be characterized according to different metrics of surface conditions and a web-based tool is being implemented by TU Wien to allow standardized validation of soil moisture products. Marc Schroder sent in an update on the GEWEX water vapor assessment (G-VAP). The water vapor assessment report has been submitted to GDAP and is under review. An archive of the component datasets has also been created and staged for the community at: www.gewex-vap.org Long-term water vapor records continue to exhibit large variance between trends, unphysical trends, and systematic shifts that coincide with changes in satellites and methodologies. Trends do not meet physical expectations. Radiance inter-calibration projects have likely removed much of the spurious noise at the measurement level so differences may be attributed to algorithm issues. *The next G-VAP meeting will take place at the University of Leicester, UK on Oct. 25-26, 2017.*

Chuck Long provided an update on BSRN. There are currently fifty-eight sites in the network, 23 of which supply complete surface radiation budget information. Eight new sites are coming online this year. Instrument stability is very good but establishing absolute calibration of fluxes is still an ongoing activity. Recent evidence suggests that downwelling longwave may be systematically low by up to 4 Wm^{-2} . The Infrared Working Group is actively tasked with assessing consistency between pyrgeometers and establishing the temperature and humidity dependence of biases. The Intercomparison of Infrared Radiation References campaign is planned for October-December of this year to address the need for a new SI traceable reference for longwave irradiance. Chris Cox is also leading an intercomparison in cold climates to assess uncertainties in polar regions. Chuck will be retiring in 2018 and GDAP will be involved in the succession plan. Chuck will make recommendations for a successor to be named at the 15th BSRN scientific review and workshop that will take place in Boulder, CO July 16-20, 2018. *Tristan will attend the meeting.* The idea of appointing or electing a deputy is also being discussed.

Three presentations followed that provided updates on flux products directly sponsored by GDAP. The LandFlux project is now completing its 10th year working to obtain the turbulent fluxes over land (and ice) surfaces. The original goals of LandFlux effort were to: (1) consolidating systematic data products (global, long-term) that describe basic properties of the land surface (albedo, emissivity, temperature, some vegetation indicator, possibly soil moisture information); and (2) applying several very different methods for estimating surface turbulent fluxes to develop long-term latent heating datasets and associated uncertainties. These goals have been met to some degree but significant shortfalls remain. The current LandFlux dataset spans 1984-2007 at 3-hourly resolution but Carlos Jimenez noted that there is still enormous spread between products using different methodologies and source datasets and the spread increases with aridity. There have been no recent updates and there are no plans for a Version 2

to be created despite clear evidence of the need for an updated product. Uncertainties stemming from input datasets, algorithm setup (distributions of vegetation), methodology (processes), and error characterization are all needed. Effort for this project under GDAP has waned in recent years and needs to be resurrected. *GDAP will consider whether this might best be addressed as an integrated assessment activity and identify a point of contact for such an effort.*

Carol Anne Clayson then described the latest SeaFlux efforts. The version 2 CDR is now available through NOAA spanning 1998-2017. SeaFlux includes a new method for representing diurnal and weather-scale variations of skin temperatures and has devoted substantial resources to assessing systematic and random errors in recent years. Errors correlate with wind speed and weather state suggesting some correlation between retrieval errors and the character of the intervening atmosphere. Results suggest that uncertainty in the exchange coefficient is not likely the dominant source of error except, perhaps, in the southern oceans. Elements of this project may be a good model for how assessments should be done. Unfortunately, however, the CDR does not currently include this uncertainty information (even though it is generated at the pixel-level as part of the offline product) due to issues implementing the product at NOAA.

Paul Stackhouse then reported on the status of SRB product. A new Version 4.0 SRB product has been generated for a short test period. Several changes have been implemented to cloud assumptions, surface temperature and emissivity, aerosol distributions (MAC v2), and the diurnal SST correction employed by SeaFlux. The algorithm is running but performance relative to CERES and BSRN has been degraded in some places owing to these changes. The cause of these issues is under investigation and will be resolved prior to releasing the product. One candidate is the cloud merging and phase algorithms that have undergone significant changes since the previous version. Once resolved, the product will be regenerated at 1° resolution for a 10 year test period (2000-2009). The product will then be updated to 0.5° resolution with full equal area sampling to generate the official V4 product.

Though not officially on the agenda, this presentation sparked a suggestion by Seiji Kato and Tristan L'Ecuyer that it may be worth updating the radiative flux assessment with a specific focus on vertically-resolved fluxes was also raised. This vertical flux and heating rate profile assessment could evolve through two phases: an initial assessment of broad layers representative of the boundary layer, lower troposphere, upper troposphere, TTL, and stratosphere; followed by a second assessment of high vertical resolution products from relatively new active sensors. *GDAP will seek to identify an individual or individuals outside its current core membership to define and lead such an activity.*

On Wednesday afternoon, Jim Mather presented a special briefing on the US Department of Energy ARM program. He noted that the currently operational long-term measurement sites in Oklahoma, Barrow and Atkasuk, Alaska reached milestones reporting 25 and 20 years of continuous measurements, respectively. There is a new Eastern North Atlantic ARM facility in the Azores and ARM now operates three mobile facilities and an aerial facility that are regularly deployed to varied locations. All platforms include active profiling sensors for clouds, aerosols and atmospheric properties, broadband and turbulent fluxes, and radiometers for temperature and humidity. Three major ground-based field programs are ongoing or planned for 2017 – AWARE took place in Antarctica, LASIC is ongoing on Ascension Island in the southeast Atlantic, and LAFE is a multi-component campaign including advanced lidars and UAS around the SGP site. Of particular relevance to GDAP is ARM's Best Estimate Dataset that merges many of the clouds and radiation products into a common product analogous to the GEWEX Integrated Product. Jim also noted that ARM is spinning up a comprehensive modeling program, initially focusing

on warm clouds at the SGP site but ultimately extended to all cloud regimes and other locations. ARM is also exploring options for replacing the G-1 aircraft and expanding their fleet of UAV and UAS. ARM is soliciting input from user communities like GDAP on ways it can better serve science objectives. *GDAP will continue to actively engage ARM in future assessments and may consider basing a land surface closure assessment around the SGP site.*

Contributing to the conversation about the future of LandFlux activities and a possible land surface closure study, Mathias Hauser presented an overview of a new activity centered on comparing current estimates of large-scale ground heat flux estimates. Trends from reanalyses diverge considerably over the modern era owing, in part, to a lack of observational constraints. Quality-controlled measurements could provide a useful integral constraint on regional land heat storage that would complement LST, radiation, water, and turbulent heat fluxes in a closure assessment.

There are two ongoing international global cloud assessment activities. Claudia Stubenrauch indicated that the GDAP cloud assessment is being updated to include new versions of several datasets and 6 additional data products that did not take part in the original assessment. It was noted that a well-defined Level-3 database of all products is key to a successful assessment and allows the contributing datasets to be staged for the community after the fact. The deadline for submitting new datasets to the updated cloud assessment is March 2018 and the analysis will be completed by the end of summer. This update will focus exclusively on reproducing previous results but it was suggested that future cloud assessments might include an analysis of biases stratified by cloud optical depth and separated by meteorological regime (e.g. weather state). It is also important to assess impacts of cloud biases on down-stream products like radiative fluxes.

Andy Heidinger then presented a possible vehicle for continuing cloud assessments into the future. The International Cloud Working Group (led by Mike Foster and Martin Stengel) is currently engaged in broad comparison of global cloud products. Activities include both standard inter-comparisons as well as creating libraries of convective events that can be used to track cloud evolution in time and assess estimates of glaciation rates, updraft speeds, anvil growth rates, and storm lifetime.

Finally, the important subject of the next steps in ensuring continuity of ISCCP was addressed. Bill Rossow noted that the current ISCCP will soon be hosted by NOAA but repeated the theme that it has been a challenging road. It was agreed that GDAP, Bill Rossow, and other interested parties will work to define an ISCCP Next-Gen project to bring the ISCCP forward and utilize new assets including future polar orbiting satellites and new high-temporal resolution geostationary satellites. A key to the success of this product will be international coordination and careful consideration of which channels to use, what algorithms to employ, what products to generate, and what ancillary datasets to use will be critical. *A future GDAP-sponsored workshop should be arranged to begin the scoping process.*

Wednesday concluded with updates on the role of GDAP in the UTCC PROES and new GAP initiative from Claudia Stubenrauch and Tristan L'Ecuyer, respectively. The take-away message from these presentations is that GEWEX data products and GDAP assessments play an integral role in many broader GEWEX initiatives including the PROES as well as the other three core GEWEX panels (GHP, GASS, and GLASS).

The final day of the meeting (Thursday) was primarily attended by GDAP core panel members and focused on reassessing GDAP's core mission, discussing open business, and setting new directions. The consensus GDAP assessment activities are evolving along more

integrated themes that seek tests of water cycle and energy balance closure and aim to establish consistency between datasets (e.g. between surface radiative fluxes and the aerosols, land surface temperature, and cloud fields used to generate them). This is viewed as a positive step toward meeting the evolving needs of the community and has triggered the suggestion that GDAP undergo a small name change to the GEWEX Data and Analysis Panel. We will seek approval for such a change in the coming weeks. GDAP will continue to support the ongoing set of assessment activities to their logical conclusion (submission of a formal report) and as part of this new vision, GDAP will also initiate several new integrated assessments leading to a more complete description of the weather-to-climate scale variations of the global energy and water cycle. GDAP will play an active role in organizing related sessions at the upcoming GEWEX science conference and continue to support ground-based networks like GPCC and BSRN. This will include direct participation in the upcoming BSRN meeting and defining a succession plan for Chuck Long.

The top priorities for completing ongoing assessments in the coming year include the following: completing the updated cloud assessment, re-scoping the precipitation assessment to better address the needs of the user community and be more inclusive of international precipitation communities, resurrect aerosol assessment and complete it (this includes acquiring the existing draft aerosol assessment report), and continuing dialogue regarding initiating a new radiative heating rate profile assessment. With these continuing activities as a foundation, more emphasis now need to be focused on integrated assessments to constrain atmosphere and oceanic transports of energy and water. It is envisioned that future re-processing of current global products will benefit from such information by increasing the physical consistency of the products and reducing spurious variations in the long-term record. Both are viewed as essential steps toward creating climate data record quality products. GDAP will also leverage the results of these integrated assessments to engage space agencies and other international stake holders to refine global climate observing systems and associated climate data records.

To stimulate these integrated assessments, three initial activities are being discussed. The first involves applying merged datasets like the GEWEX Integrated Product (which will be expanded to include more years and released to the community in the coming months) to test energy and water budget closure on regional and global scales. It is anticipated that this effort will provide independent evidence for regime-dependent structural errors in flux products that may ultimately lead to their improvement. This activity necessarily requires more deliberate interaction with general circulation modeling groups. To that end, the future membership of GDAP should include some representatives of modeling communities.

Through this integrated assessment effort, GDAP will also directly contribute to complementary CONCEPT-HEAT studies directed toward quantifying global and regional EEI and establishing consistency between top of atmosphere fluxes and ocean heat content. To foster this activity a representative from the ocean heat content or ocean reanalysis community may be added to GDAP in the future. A third application of integrated assessments may center on rescoping the LandFlux activity to include a more comprehensive assessment of land surface fluxes in the context of land surface temperature and ground water storage. Given recent departures from GDAP membership, we may seek to add someone with broad experience in land surface processes/fluxes to membership in the future.

This new vision of GDAP supporting global energy and water-related scientific investigations through integrated assessments warrants two additional activities. First, Roca and L'Ecuyer will initiate a revamping of the GDAP website to more accurately reflect its role in

supporting other GDAP panels, PROES, and broader scientific collaborations. This will include organizing people involved with GDAP into three groups: core members, project and assessment leads (PALS), and science and analysis leads (SALS). The second activity will be an effort to engage all of these groups in compiling a set of “General Guidelines for Scientific Assessments” that will summarize GDAP’s vision of best-practices for conducting assessments that maximize value to the scientific community. This report will integrate existing best practice documents from other WCRP groups but cover a much broader focus that includes initial scoping meetings, methods for framing assessments around science questions, identifying reviewers, disseminating reports, and engaging stakeholders including space agencies and government groups.

Finally, a number of additional programmatic recommendations were raised. GDAP strongly endorses the proposed creation of an ISCCP-NG product to utilize new geostationary and polar orbiting cloud information and coordinate efforts to inter-calibrate sensors. GDAP emphasizes the need for supporting comprehensive assessments of individual fluxes and integrated assessments of energy and water cycle closure on global to regional scales. GDAP recommends a review of current methods for transferring global data products to operational centers and the development of explicit succession plans for maintaining required expertise.

The GDAP meeting adjourned before lunch on Thursday, 12 October after a very successful three-and-a-half day workshop. The venue for the 2008 GDAP meeting was announced as Portugal, hosted by new GDAP member Isabel Trigo in the last week of November 2018. GDAP will also have a significant presence at the upcoming GEWEX open science conference in Canmore, Alberta in May 2018 (see Appendix A).

Appendix A: GDAP Sessions at GEWEX Open Conference

Energy Budget and Water Cycle Closure and Assessment

Session 9

Session conveners: Tristan L'Ecuyer, Karina von Schuckmann and Kevin Trenberth

Session categories: Global Data and Analysis Panel

The Earth's energy imbalance and its partitioning between atmospheric, ocean, cryosphere and land heat reservoirs govern the rate at which the global climate evolves. Regional energy and water imbalances drive heat transport, in part through ocean currents, evaporation, precipitation, and runoff. This session seeks contributions that synthesize multiple energy and water variables derived from observations (in situ, satellite), reanalyses, or climate models to examine energy and water cycle closure on regional through global scales. Studies of systematic or structural uncertainties using closure tests in flows of heat and water are also solicited. Approaches for utilizing top of atmosphere radiation, atmospheric and oceanic mass and heat transports, air-sea fluxes, direct and indirect ocean heat content analyses, and estimates of surface ice mass, heat content, and water storage to establish consistency between estimates of planetary heat balance and ocean heat storage are especially encouraged.

Short Summary: This session seeks contributions that synthesize multiple energy and water variables derived from observations (in situ, satellite), reanalyses, or climate models to examine energy and water cycle closure on regional through global scales.