GEWEX Radiation Panel

22nd Session of the GEWEX Data Panel Meeting

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Christian Kummerow
Colorado State University, Fort Collins, CO, USA

The 22nd Session of the GEWEX Radiation Panel (GRP) was held in Tokyo, Japan. The meeting was hosted by the Japanese Aerospace Exploration Agency (JAXA). Professor Hirohiko Masunaga from Nagoya University was the local host. The GRP meeting was chaired by Professor Christian Kummerow of Colorado State University.

The GEWEX Radiation Panel was originally formed to understand the short- and long-wave energy balance of the Earth System. The panel focus, however, has evolved over time to focus more on developing datasets of global water and energy variables consistent with the Global Water and Energy Experiment (GEWEX) mission. To that end, GRP expanded to foster global datasets of Surface Radiation (SRB), Clouds (ISCCP), and Precipitation (GPCP). Over time these were further expanded to complete the flux and forcing terms, including turbulent fluxes (SeaFlux and LandFlux), and Aerosols (GACP). These GEWEX reference products represent the legacy of the GEWEX Radiation Panel.

With independent products available for the radiative and flux terms of the Earth system, GRP is now focused on creating an "integrated" product in which the individual 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 inconsistencies in the assumptions. Reviewing the readiness of GEWEX reference products for this reprocessing with common assumptions was a key objective of this meeting. Once completed, GRP will undertake an assessment of the state of the Water and Energy Budgets based upon these new integrated GEWEX products. This assessment, which is intended to document the state of our observing system, is meant to be the first in a periodic reevaluation of the state of the Water and Energy Observing System. The assessment will consist of closure tests on the global scale; temporal variability in the fluxes and states; attribution of changes to observed forcings; and a maturity index of various components based upon ongoing assessments of individual components of the budget

Within the new focus of the GEWEX Radiation Panel, the panel revisited the key functions that such an international panel should perform. Four key roles were identified:

1. GEWEX Reference Products: While datasets now abound for many of the essential climate variables, the panel feels it is essential to construct and maintain a consistent long-term reference product of the global and regional water and energy variables. These reference products, referred to as the GEWEX products, are endorsed by the GEWEX radiation panel, must be open, readily accessible, validated and published so as to serve

as a benchmark for the community as it strives to improve products with more recent observations or new retrieval paradigms.

2. Product Assessments: While the panel has an important role in maintaining reference products, an important evolving role for international panels such as GRP is its experience in doing assessments of global datasets produced by the international community. These assessments include all global water and energy products as well as radiative transfer codes (activities such as CIRC) that form the basis of the retrievals as well as model simulations.

3. In-Situ Networks: Assessments commonly bring together a variety of in-situ measurements. Some of these are well coordinated and quality controlled while others exist largely in their own regional domains. The panel, therefore, sees its role as identifying such networks of in-situ observations and fostering the development of integrated global datasets that can be used to both construct and/or validate the global climate products.

4. Diagnostic and Process Studies: The Global Data Products lend themselves to verify not only model output, but also model processes. Successful examples have been the ISCCP simulator that allows models to compare their cloud fields directly to ISCCP and thus verify if the right clouds are being produced. Optimizing these interactions with the climate- and cloud-scale modeling groups within GEWEX is ongoing but should be strengthened.

These objectives, dealing now more with global datasets and assessments of data and radiative transfer codes, led the panel to discuss possible name changes. The panel agreed to consider a name change to GEWEX Data and Assessments Panel (GDAP). A name change is in its proposal stage. Action: **Chris Kummerow to check with entire team before the SSG and propose name change at the SSG meeting if appropriate.**

One new GRP panel member was welcomed to the panel. Dr. Tianjun Zhou from the State Key Laboratory of Numerical Modeling for Atmospheric Science and Geophysical Fluid Dynamics (LASG), of the Institute of Atmospheric Physics, Chinese Academy of Sciences, has expertise in numerical modeling. His contributions to the panel were immediately evident and were greatly appreciated by the panel members. At the end of the meeting, Dr. Andrew Heidinger from NOAA was suggested as a new GRP (GDAP) member. **Action: Formally nominate Andy Heidinger at the SSG meeting.**

The first half day of the meeting was set aside for a joint meeting with the WMO initiative Sustained Coordinated Processing of Environmental Satellite Data for Climate Monitoring (SCOPE-CM). This network of operational space agencies has expressed interest in the long-term production of climate datasets such as those produced by GRP. This is the second joint meeting of these two groups intended to exchange information on the two groups' views regarding the transition of historically PI-led projects into operations. The joint meetings are intended to lead to implementation strategies that are consistent with GRP's experiences in creating long-term climate data records while benefitting from the long-term continuity that only

operational systems can provide. As a starting point, SCOPE-CM looked at historical functions carried out by PIs within GRP. These functions and their prioritization by SCOPE-CM formed the basis for the ensuing discussion. The functions are:

- Monitor data exchanges and resolve problems.
- Radiance calibration: who is involved now and who should be involved? Calibration issues vary from minor issues that require no action to major calibration changes that require the data processing to wait until issues are resolved. Who makes those decisions in an operational environment?
- Ancillary data acquisition and evaluation—some products dependent on datasets that are not under our control and may have unsatisfactory aspects. Changes in these ancillary datasets must also be assessed by PIs.
- Review scientific developments for retrieval methods.
- Develop and evaluate analysis methods and revise products—operational agency responsibility?
- Assess data product quality—GRP assessments will be used by IPCC. How do we incorporate assessments into the routine processing of data?

The discussion centered largely upon the notion that the operational agencies needed to retain someone akin to the PI who could provide guidance with respect to most of the above issues. These PIs would ideally continue to improve the product and thus be intimately familiar with the product. If necessary, the PIs could occasionally be increased to small science teams to do assessments and or product improvements. 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. Generally, there was convergence on the implementation strategy that was presented at the meeting as long as PI and occasional Science Team involvement remained in the plans. The continued involvement by the science team was thought critical to ensure that proper science decisions are made on an ongoing basis while periodic assessments and reprocessing of data have the support of a broader scientific community.

The stand-alone portion of the GRP meting was opened by Prof. Teruyuki Nakajima from the U. of Tokyo who welcomed the panel members. As a member of WCRP's Joint Science Committee, Prof. Nakajima discussed the new WCRP Working Group on Climate Services, which (according to the JSC draft report) would serve as an information conduit, provide a single point of entry to WCRP, identify climate information needs, help coordinate and prioritize efforts across WCRP, and promote best practices. In terms of involvement with the end-user interface, the Working Group should play a role in defining and guiding the process but should not take ownership of it. The Group should be aware of all existing relationships with the user community (e.g., GEWEX, particularly water and hydrology). In addition the talk discussed that there will be more emphasis on Regional Climate Modeling and Information. Also, there will be new cross-cutting organizations—the Modeling Council and the Data Council. These two councils will be charged with coordinating their respective areas across the WCRP Working Groups.

The opening remarks were followed by a panel business discussion to address recent comments from the JSC Report. Specific issues and feedback from the GRP are included in Appendix 1.

This was followed by a JAXA presentation given by Dr. Riko Oki. Science and applications are both important to JAXA and are correlated with GEOSS earth observation plans. She began by reviewing the status of upcoming missions related to the panel:

- GCOM-W1 (JFY 2012) to measure hydrologic parameters including clouds, water vapor, precipitation, soil moisture, snow cover, as well as sea ice, surface temperatures.
- GPM/DPR, (JFY 2014) to measure precipitation.
- EarthCARE/CPR (JFY 2015) to radiation, cloud and aerosols.

Dr. Oki announced that the TRMM data record now extends from 1998 to 2010. A new TRMM Spectral Latent Heating (SLH) product (pixel level, grid and monthly data at 0.5-degree resolution) will be released in October 2011 that uses 3-D precipitation radar (PR) observations. The Global Monthly Accumulated Rain by TRMM/PR (estimated surface rain 1997/12 – 2010/05) shows the total decrease in PR surface rain. The decrease was estimated to be 5.90% on average in a global scale. In addition, JAXA is now distributing the Global Rainfall Map in near real time. This product consists of merged data from TRMM, AMSR-E, and other satellites. It is available 4-hours after observation, hourly updated hourly on a 0.1-degree grid.

Dr. Oki concluded that although NASDA/JAXA has been involved with GEWEX for over 20 years, the current JAXA managers are unfamiliar with GEWEX and unclear as to why they should attend GEWEX panel meetings. Ensuing panel discussion made it clear that it is generally true that agency representatives are less likely to come to panel meeting these days. **Action: Review this trend at SSG and chart a course.**

The JAXA presentation was followed by the new member presentation from Tianjun Zhou entitled " Numerical Modeling of Monsoon Changes During the Past Decades". In the talk, Dr. Zhou 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. In addition, he showed that the interannual variability of the Asian-Australian Monsoon is driven by the central and eastern Pacific, but the feedback of indo-western Pacific sea surface temperature anomaly is also evident. Air-sea interaction improves the rainfall simulation in the domain.

Dr. William Rossow then reviewed the status of the common ancillary datasets being prepared by the Working Group for Data Management (WGDMA) 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 common ancillary data products consist of:

- Map Grids (Equal-Area & Conversion to Equal-Angle; 0.10°, 0.25°, 0.5°, 1.0°, 2.0°, 2.5°)
- Land/water mask and topography (0.10° – 2.5°)
- Land cover
- Ozone (Daily, 1.0° -- 2.5°) NASA TOMS and OMI ozone used as standard—after cross comparing all available ozone datasets found them to be the best
- Aerosols (Monthly, 1.0°)
- Snow (weekly, 2°) and Sea Ice (Daily, 0.25° – 2.5°)

- Atmospheric Temperature and Humidity (3-hr, 1.0°)

The target for the integrated product is a 1.0°, 3 hourly product. Lower resolution ancillary data will be reproduced into these grids when necessary.

The WGDMA activity has finished the hierarchical map grids and topographic information (height and standard deviation of heights in 1° grid) that are self consistent from a resolution of 0.1° to 2.5°. Utilities to convert back and forth from equal area map grids to equal-angle projections are available. The mask includes 1 degree IGBP land cover product that includes the GLIMS glaciers database. The Ozone data will use a combination of TOMS/OMI and TOVS products to produce composite daily 1° to 2.5° time series. The AEROCOM product, described later by Stefan Kinne, will be used for aerosols to ensure a consistent dataset over land and ocean. Surface snow will be obtained from the NOAA CPC weekly snow cover analysis at 2° resolution while sea ice will be obtained from the Ocean Sea Ice SAF on a daily basis at 0.25° resolution. The most critical ancillary product consists of temperature and humidity profiles. Initial analysis of the new HIRS product at NCDC appears to be quite good but the number of satellites varies over time. The filling and interpolation routines are still being validated.

The WGDMA presentation was followed by the individual projects. Dr. Robert Adler began with the GPCP project update. The new version of the product, V2.2, is now available. The new version was necessitated by failure of the last SSM/I instrument in a "6am/6pm" orbital time slot (Sep. 2009). This loss required a change to SSMIS on F17 as the calibrating satellite. There are about nine months of overlap between SSM/I and SSMIS, which will allow robust testing of the product across the interface.

The GPCP V2 product processing will be transferred to NOAA NCDC for operational processing along the lines of the SCOPE-CM discussions. The transfer will begin with a three-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 be heavily involved to develop software requirements/standards and approaches. Some processing components will remain at home institutions (GPCC gauge analysis, input pentad precipitation analysis from NOAA/CPC).

The next version of GPCP, V3, will include the common ancillary products and assumptions. It is currently scheduled to begin production in April 2012. It will consist of

- Monthly—0.5° resolution, GPROF microwave algorithm applied to SSM/I, SSMIS data as satellite calibrator (1979-present)
- Daily—0.5° resolution (1998-present; possibility of extension back in time) [Pentad for whole 1979-present period]
- 3-hr—0.25° (1998-present) for Integrated GEWEX product

Dr. Adler summarized the current status of GPCP as a product that is intensely used by the community as measured by the many questions and complaints when they fell behind due to SSMIS issues. The product is referenced in over 1500 journal articles, including a recent study on the "Impact of polar ozone depletion on subtropical precipitation" article in *Science* in 2011.

GPCC represents the gridded gauge analysis that is merged with the satellite product to form the GPCP global product. An update was prepared for the meeting by Dr. Udo Schneider and delivered by Dr. Robert Adler. It was reported that Dr. Andreas Becker is the new head of GPCC. He is thought to be able to provide outstanding leadership to this group.

After reviewing the standard products being readied, the presentation focused on mean precipitation difference over China from the GPCC and GHRP gauge analyses. The GPCC gauge analysis team believes that the main reason for the differences (underestimation of rainfall over China in GPCC analyses) seems to be that over several time periods they have to fall back on the CPC "eve data", which in some cases significantly underestimates precipitation (sometimes by a factor of 2 or 3 or even more). This is leading to an overall underestimation. Since the GPCC has added a dataset for China consisting of more than 700 stations, they are confident that the new versions of the GPCC analyses will be significantly improved over China. and the underestimation problem will probably be solved. The planned new analysis products from GPCC include:

- New global precipitation climatology (ca 68000 stations)
- Monitoring Product (Version 4, since January 2007)
- Full Data Reanalysis (Version 6, 1901-2010)
- Homogenized Precipitation Analysis (HOMPRA) for 1951 - 2005 (replacing VASClimO V1.1)
- Analysis of daily precipitation will be restarted in 2012

The new Full Data Reanalysis V.6 (1901-2010) and the Monitoring Product (V.4) will be generated in Dec. 2011. It will be available for GPCP's new version 3 data.

Differences in analyzed rainfall over China between GPCC and GHRC/APHRODITE are of concern. This is not only an issue with data sources as described earlier, but also with the representation of extreme precipitation in analyzed fields. Dr. Robert Adler to follow up. Dr. Tianjun Zhou to help with some benchmarking using independent data.

An invited talk was given by Dr. Akiyo Yatagi on the “Asian Precipitation - Highly Resolved Observational Data Integration Towards Evaluation” APHRODITE rain gauge dataset. APHRODITE provides daily precipitation datasets for all of Asia. Data are collected from between 4,000 and 10,000 rain gauge stations (depending on the time of year). This product represents a significant effort by the PI to collect, quality control, and analyze gauge data that is not otherwise found in the GHCN and GPCC archives. The web site can be found at http://www.chikyu.ac.jp/precip/ .

The APHRODITE project has released a daily gridded precipitation product at 0.25° resolution for 1951-2007 (APHRO_V1003R1). A higher resolution version APHRO-JP (0.1°) has been released for 1900-2010 for the Japan area. The next version of the data is scheduled for release later in 2011. Version V1101 will cover the same time period as V1003R1 but will include a rain/snow flag as well as improved quality control. APHRO-JP is being enhanced to provide hourly rain/snow accumulations. Its release is scheduled for March 2012.

The ISCCP update was presented by Dr. William Rossow. He reported that the D-version of the data (gridded, 30 km data) are now complete from July 1983 – December 2009 (26.5 yr). The 10-km resolution data (B1) deliveries are up to date. The calibration has been finished through December 2009. Some revisions to the code have been implemented. The cloud detection algorithm has been updated for improved polar cloud detection. All revisions to the cloud retrieval algorithms have been finished and are being tested (except for aerosols and land reflectance).

The new common ancillary data is being incorporated. The following products will be released with Version 3. All gridded products are in netCDF:

- HXS: high-res, pixel (10 km), single-satellite (like old DX)
- HXG: high-res, pixel, global (global-DX reduced to common variables, in netCDF)
- HGS: high-res, gridded (1°), single-satellite (DS-plus)
- HGG: high-res, gridded, global (like old D1, merged DS)
- HGH: high-res, gridded, hourly-monthly mean (like old D2)
- HGM: high-res, gridded, monthly-mean (like old D3)
- FH Radiative Flux Products (INPUT, PROF, TOA, SRF, MON)

The remaining tasks include an IR calibration and/or revision of the spectral treatment in order to get surface temperature correct, testing the system end-to-end and finalizing the QC processes. Once complete, the reprocessing will begin in reverse chronological order, with the most recent data processed first.

Dr. Ells Dutton reported on the status of the Baseline Surface Radiation Network (BSRN). He began with a status report of the sites. Fifty-three sites have contributed solar and IR data thus far with over 6080 station-months data since 1992. Sixteen sites have contributed 2011 data already. Unfortunately, four of the current sites are gone or dormant while seven are delinquent in their data delivery. In addition, Canadian sites at "Alert", "Bratt's Lake", and "Eureka" are in significant danger of loosing funding due to cut backs in the measurement program. On the positive side, there are six pending new candidate sites. In the past, several "offered" sites have been rejected, primarily due to lack of appropriate instrumentation and maintenance plans.

Dr. Dutton reported that BSRN was invited by NDACC (Network for the Detection of Atmospheric Composition Change) as a coop network. This follows similar invitations from GAW and GCOS. The invitation was accepted as it leads to greater exposure of the datasets.

The utility of the BSRN data is clear from its contribution to the Radiative Flux Assessment now in preparation. In the assessment, BSRN had to address traditional theoretical error analysis vs. the practical reality of continuous, long-term, remote field measurements. The impacts of missing data, in particular, are an important problem that cannot be ignored. One of the key lessons in the RFA activity is that central QC needs to be applied at the archive level to ensure homogeneity. The report also emphasized the need for international calibration reference standards. Unless institutionally strengthened, these may not endure for the long term. The next BSRN meeting being planned around IRS is in Germany, early Aug 2012.

The Surface Radiation Budget (SRB) overview was presented by Dr. Paul Stackhouse. He began by reviewing the availability of SRB data. The main archive is located at the Atmospheric Science Data Center. All products are available in a binary format readable with FORTRAN read routines. The web site is *http://eosweb.larc.nasa.gov/PRODOCS/srb/table_srb.html*. In addition to the official server, "My NASA Data Live Access Server" hosts monthly products available in netCDF. This site (*http://mynasadata.larc.nasa.gov*) allows interactive subsetting and plotting. There is also data available at NCDC's THREDDS server but only older versions are currently available.

With respect to the current products, Dr. Stackhouse reported that Release 3 now had improved documentation available and that a paper describing the details of this version was ready for submission. Release 4, which is the version using the common ancillary data and procedures, will, aside from the ancillary products described in the WGDMA presentation, also use improved LW/SW radiative transfer code and cloud properties consistent with ISCCP. The current schedule looks to finalize the processing code for Version 4 production in the Sept – Dec. 2011 timeframe. Testing will occur in the January – March 2012 timeframe with production beginning in April 2012.

A discussion ensued regarding the values of 345-350 W/m^2 +/- 10 W/m^2 reported in the latest SRB product for surface downwelling-longwave radiation. This value is approximately 15 W/m^2 higher than the value quoted by Trenberth in the GEWEX Water and Energy budget diagram. A paper by Stephens et al., 2011 (accepted in the *J. of Climate*) addresses uncertainties in the LW global averaged downwelling fluxes. The current values of 345-350 W/m^2 are thought to be correct. In a separate discussion, the panel felt that the "QC" product, which is intended as a secondary or reference product, was causing confusion in the community that thought this was the quality controlled, and therefore superior product. **Action: Dr. Stackhouse will address – likely by reporting only the official SRB product and the flux difference between the SRB and reference product.**

The Integrated GEWEX product requires uniform aerosol assumptions across its product suite. While the GEWEX Aerosol Climatology Project (GACP) built a long-term climate record of aerosol optical depth, it is limited to ocean regions. In order to obtain coherent estimates of not only Aerosol Optical Depth but also Single Scattering Albedo and Asymmetry factor needed in the radiative transfer computations, the AEROCOM product is being adopted as the common aerosol input data. Dr. Stefan Kinne presented the AEROCOM details.

The AEROCOM product consists of monthly 1x1° climatology for mid-visible aerosol properties of AOD, SSA and Angstrom exponent (related to as the asymmetry factor). The product is constructed by starting with the median field of 15 models to eliminate extremes. This median field is then enhanced with AERONET data to bring the model fields in alignment with observations where these exist. Simulations are used to scale the product forward and backwards in time based upon source information and estimates. CALIPSO data is used to add vertical distribution of the aerosols. The net result is a spatially complete dataset over the 30 years covered by the GEWEX products. Dr. Kinne reminded everyone that this product should not be mistaken for direct observations. It is largely model based and it contains numerous assumptions.

The SeaFlux status report was presented by Dr. Carol Anne Clayson. SeaFlux collects data on atmospheric and oceanic surface conditions to produce high-resolution (0.25^o, 3 hourly) turbulent flux datasets. Dr. Clayson reported on the 5th Seaflux Workshop, which was held jointly with US CLIVAR WG on high latitude surface fluxes in Boulder, CO in March 2010. A workshop report is in EOS while papers will appear in a special issue of the *J. Climate*. The next SeaFlux workshop will be in July 2012 and will be a joint workshop with LandFlux, AMS Air-Sea and AMS Boundary Layer and Turbulence meetings.

SeaFlux Version 1.0 (1997-2006) is now available in beta release from the PI. Of interest is that the locations of largest surface heat flux tendency do not coincide with the largest uncertainties of the surface heat fluxes. Current best-guess efforts disagree more than the historical 10 Wm^{-2} standard. Using information on the seasonal cycle of the mixed layer temperature takes into account both the "signal" and the "sensitivity" in estimating the required accuracy. An accuracy of 10 Wm^{-2} is still a valid target over the Indo-Pacific warm pool; other areas can tolerate larger systematic errors to resolve the seasonal mixed layer temperature evolution.

SeaFlux Version 2.0 will include the common ancillary datasets and assumptions. During the next six months, the project will investigate impact of common atmospheric temperature/humidity profiles and SST. SeaFlux will decide on which brightness temperature dataset (RSS or CSU) to use to run the full-time series, whether to include microwave sounders and AIRS into neural net algorithm (or whether to wait until V3.0), and incorporate the WGDMA ice flags and land mask. These tasks should be completed in time for a summer 2012 production of SeaFlux V2.0.

The LandFlux product does not yet exist. It will be constructed later in 2011 or early 2012, most likely form existing data or combinations of existing modules. The LandFLux assessment, being headed by Drs. Carlos Jimenez and Sonia Seneviratne was, therefore, presented first. Dr. Jimenez presented the material. Details of the assessment can be found at www.iac.ethhz.ch/groups/seneviratne/research/LandFlux-EVAL. The main goals of the current activity is to (1) identify the regions/regimes with large differences between the existing land surface heat flux estimates, (2) understand the origin of the discrepancies, providing a forum for discussions about the improvement of the products, and (3) promoting analysis that can help select a specific methodology and a choice of drivers for the LandFlux product. As the number of global datasets of ET continues to grow, it is important to keep the LandFlux assessment as a framework to independently evaluate products and monitor progress.

Results from the assessment activity reveal that all assessed products captured the seasonality of the heat fluxes as well as the expected spatial distributions (major climatic regimes and geographical features). The products correlate well with each other in general, helped by the fact that some of the products use the same forcing data. There are, however, differences, with large evaporative fraction differences suggesting rather different partitioning of the radiative fluxes. The correlations are considerably lower when the seasonal component is removed from the fluxes (seasonal variability is largely responsible for the high correlations).

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. The main points may be summarized as:

- Global annual Qle uncertainties are in a range of ~15 W/m^2 for an ensemble average of ~45 W/m^2, a bit larger for Qh, with Rn in a range of ~25 W/m^2 for an ensemble average of ~85 W/m^2.
- Progress has been made (a growing number of global satellite-based estimates), but significant differences can still be observed between the different estimates.
- To attribute the flux differences to algorithms parameterizations, or to discrepancies in the observational datasets, a more complete assessment is needed whereby the remote sensing algorithms are run at different time and space scales using the same driving data and model protocols.

The LandFlux assessment talk was followed by progress in constructing the LandFlux product. LandFlux is focused on the development of a multi-decadal global land-based surface flux dataset. The talk was given by Dr. Matthew McCabe. The talk covered the state-of-the-art global ET and auxiliary datasets (radiation, precipitation, soil moisture, and ancillary data), the design of LandFlux-EVAL benchmarking database from existing global ET datasets, 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" datasets. None of the products use the same forcing. In addition, small differences in the formulations and issues related to physics that are left out also need to be addressed. Nonetheless, based upon the earlier meeting of the LandFlux working group in Vienna (April 2011), there was some 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 dataset is (to the possible extent) consistent with the other GRP products in order to allow a joint science analysis of the GRP suite of products (e.g., the radiation would likely be SRB, V4.0). One of the methods would be selected as a preliminary GEWEX land flux product. The choice may be somewhat arbitrary until more assessment activities and inter-comparisons with the other contributing products allow a firmer decision about the choice of methodology.

The final discussion of the "Integrated GEWEX Product" was presented by Dr. Ken Knapp of NCDC. He covered preparations for creating and hosting this dataset at NCDC. As per agreement, the Integrated GEWEX product would contain data at 1°, 3 hourly intervals. It will consist of the longest possible common record. To accommodate differences between products, there may be a family of products with common gridding and common temporal resolution (monthly; daily for some data as available). The datasets will be archived in netCDF and be CF compliant to help model validation.

Most of the discussion focused on the specifics of the fields that would be archived in the joint product. Generally speaking, the agreement was not to include all the diagnostic fields from

each of the products but include as many sorting parameters (e.g., terrain type, climate parameters) as possible. It was further decided that while each of the individual products was finalizing their own processing, the integrated product could move forward with some sample files using the existing products. This would allow the team to exercise the mechanics of the integrated product while waiting for the individual inputs to be finalized.

The remainder of the day was spent discussing various analyses that people had in mind for the Integrated GEWEX product and how those projects would inform the construction of the final data files. An important idea that emerged from these discussions was that we should freeze the gridding of the product as quickly as possible. This would allow individual PIs to create "sister" products that contained additional parameters that could be used with the Integrated GEWEX product**. Action: Starting with baseline parameter file generated by Dr. Knapp, all GRP members should examine the parameter list and edit as necessary. WGDMA to finalize variable set after comment period.**

The product discussions were followed, starting on the third day of the meeting, with overviews of the remaining GRP assessments currently underway. Dr. Paul Stackhouse presented the current status of the Radiative Flux Assessment (RFA). Its goal is to assess our understanding and capability to derive TOA and surface radiative fluxes from analysis of satellite observations. The activity includes 75 participants representing nearly all the space and weather agencies around the world.

The primary accomplishments of the RFA and next steps were summarized as:

- Significant progress towards producing a community assessment of TOA and surface radiation flux estimates from satellite and model analysis.
- New TOA solar irradiance measurements and discrepancies in computation of theoretical irradiance variability have been found and documented.
- Surface measurement uncertainty being documented for surface error context.
- Satellite-based radiative flux analysis being compared among algorithms and contrasted to reanalysis and model results. Large differences are being noted in time and space. These will form the basis of continuing work.
- GEWEX-RFA lead authors and contributors are editing sections and helping to assess radiative flux components.
- Reviews will be sought for all chapters in the next two months.
- Meeting planned in November with the goal of producing a community wide draft report for December 2011.

Overall, the GEWEX RFA report may be a useful reference for development of future climate system observation requirements for radiative fluxes as well as for understanding current data limitation and uncertainty needed for future IPCC reports. In order to provide a coherent set of reviews for the RFA, the panel assigned Drs. Sonia Seneviratne, Enio Pereira and Christian Kummerow to review the report once completed.

The CERES product report, used to verify TOA radiative fluxes, was also presented by Dr. Stackhouse on behalf of Dr. Norman Loeb. Overall, CERES instruments on Terra and Aqua are

performing nominally (except for SW channel on FM4, which failed in March 2005). Major science results consist of a paper refuting Trenberth's "Missing Energy" paper. The 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*. The next CERES science team meeting will be held on October 4-6, 2011, at Lawrence Livermore National Laboratory. CERES FM5 on NPP launch date is set for October 25, 2011. A special Aqua@10 Union session is planned for the Fall AGU meeting in December.

The Cloud Assessment activity has been led by Drs. Claudia Stubenrauch and Stefan Kinne. Dr. Kinne presented the results. The plan is to finish and publish the assessment report in 2011. The material is currently hosted at *http://climserv.ipsl.polytechnique.fr/gewexca*.

The key aspects of the report include homogenized documentation of the individual sensors, calibration methods, ancillary data, sampling, and self evaluation. This is followed by documentation of the strengths, limitations and suitable applications by exploring global averages, spatial patterns, regional-, interannual-, seasonal-, daily- variability, (joint) histograms, an long-term anomalies.

Some of the main findings of the assessment are that absolute values of cloud amount and especially high cloud amount depend mostly on the sensitivity of the instruments to thin cirrus, however, their geographical distributions and seasonality agree quite well. Distributions of physical and bulk microphysical properties are highly non-Gaussian, and differences may be understood by spectral spatial resolution differences in sensors. Retrieved bulk microphysical properties may be influenced by partial cloud cover or misidentification of ice and liquid, and more 'research' attention is needed. The major challenge of this activity was to build a database in a common format, including various cloud properties from twelve participating teams. The database will be released to the public together with the assessment report.

The conclusions from the activity may be summarized as:

- To produce a common database including monthly averages, variability and distributions of cloud properties is challenging (as an unfunded activity).
- Checking and resending of corrected data was an iterative process.
- Datasets were of different maturity and included differences of day-night, land-ocean, and multi-layer clouds. Simple averages are not always available. Assessments require scientific guidance to select appropriate metrics for a specific study.
- Cloud products are adequate for climate studies/model evaluation especially via geographical distribution and latitudinal and seasonal variations
- Cloud amount and properties have to be interpreted together; they are consistent for the subset of clouds that are detected.

The panel assigned Drs. Joerg Schulz, Mark Ringer and Carlos Jimenez to review the report once completed.

The Aerosol Assessment update was presented by Dr. Stefan Kinne on behalf of Drs. Jeff Reid and Sundar Christopher. The authors note that the aerosol field has recently grown exponentially,

with literally dozens of both 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 doing, a new version is released. There is confusion and some rancor in the community as to the actual efficacy and appropriate application of these datasets.

The assessment is therefore critical to bring some order to the field. Phase 1 consists of a comprehensive literature review and evaluation. The deliverable will be a report on the state-of-the science, the application of satellite aerosol data, the identification of shortcomings, and broad recommendations to the field for future development and verification needs. The report, nearing conclusion, is 100+ pages and growing. An important early conclusion is that AERONET and MPL-net are clearly the backbone networks for verification and their financial support is critical as a community resource.

Phase 2, consisting of detailed independent evaluation, will start when MODIS collection 6 and MISR Version 23 are officially released. Phase 2 will examine in detail specific issues in the generation of retrieval and gridded products.

Water vapor is the latest variable to join the assessment schedule. Dr. Joerg Schulz reported on the progress in this assessment based upon a dedicated meeting held in Frascati, Italy, on March 8-10, 2011. That workshop, sponsored by GEWEX and ESA DUE GlobVapour, attracted thirty-five participants from research and space agencies representing dataset producers, retrieval developers and experts on ground-based observations. The need for a new effort focused on water vapor, which is appropriate given the ISCCP, SRB and Sfc. Fluxes' requirements for 3-D temperature and humidity profiles. While it was noted that GEWEX did sponsor the NVAP project, much time has elapsed and many products, including the original NVAP product, have gone through dramatic improvements. This includes data assimilation efforts, which these days incorporate much of the water vapor observations and have complete profile information that have shown remarkable skill compared to the satellite retrievals. Significant activities in the recent past include:

- GSICS is tackling the calibration and intercalibration of current satellite data streams.
- Data stewardship at NOAA and EUMETSAT has gained traction for calibration and intercalibration of historical data.
- HIRS data is being reprocessed with uniform calibration.
- GEO water vapor channels will also be reprocessed and homogenized using HIRS.
- NVAP activity is again active under NASA MEASURES program.
- Reanalyses getting better but trends might still be artificial.

The workshop consensus 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 datasets such as derived from MSU/AMSU. Likewise, the assessment will not address SST/LST and 2 m temperature or

humidity unless these are integral parts of the vapor profile. The workshop resulted in a preliminary list of identified products and producers.

Two Phases of the assessment were identified. Phase 1 will begin with three years of recent data—where more satellite datasets and more validation datasets are available. Phase 2 then will look to longer datasets with less validation data. The timetable needed to have an impact on the GEWEX Radiation Panel objectives is to finish Phase 1 in 2-3 years. The workshop participants agreed to build up a validation database consisting of ground-based remote sensing data, quality controlled radiosondes, as well as BSRN and CERES radiation flux data. This validation dataset was thought to be useful for the water vapor community even beyond the assessment itself. Two leaders identified: Lei Shi (NOAA/NCDC) to lead the UTH and profile comparisons, and Marc Schröder (CMSAF, DWD) to lead the total column water vapor and to organize technical work such as databases.

The assessment talks were followed by a group discussion. The panel agreed to write an "Assessment Blue Book" in which it describes the lessons learned from one finalized, four ongoing, and two incipient assessment activities. **Action: Dr. Stefan Kinne to write the first draft of the blue book. Panel to edit and finalize. SCOPE-CM should get an early draft for comment. It should include an apparatus for determining the maturity of the products.**

The Panel discussion then turned to two of its special issues topics. Dr. Christian Kummerow reported on behalf of Dr. Susan van den Heever on "Clouds, Aerosols and Precipitation". This special topic consisted of a small group of team members and affiliates who try to identify specific avenues for the team to pursue in the overlap of these disciplines. This group formulated four questions that can be explored further with GEWEX datasets.

- Are aerosol responses different under different environments? What is the relative role of CAP interactions versus environment?
- Do precipitation responses to aerosol indirect forcing differ based on storm type?
- How does the raindrop size distribution vary as a function of aerosol concentration?
- Is there a dynamic response to aerosol indirect forcing?

There was significant discussion within the panel. Generally speaking, there was a sense that these questions, while all extremely relevant to the overall GRP objectives, would perhaps be better addressed after first addressing the aerosol direct effect on clouds and precipitation. Given that the Integrated GEWEX products will have most, if not all the main parameters needed to do a more detailed analysis of the impact of aerosol induced heating on atmospheric stability and thus clouds and precipitation, it would serve the panel to identify any key parameters that might be included in the Integrated GEWEX product to facilitate this line of research. The indirect effect questions will follow more naturally once the direct effect questions have been addressed. **Action item: Dr. van den Heever to review the Integrated GEWEX product variables with an eye towards exploring the impact of aerosol direct effects on clouds and precipitation.**

The second special topic was led by Dr. Axel Schweiger regarding polar priorities. This focus is meant to 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. The presentation suggested

that it is likely to be useful to separate different surface types and examine status and future activities separately.

- Ice Sheets (Greenland, Antarctica)
- Sea ice covered areas
- High Latitude Open Ocean
- High Latitude Land

Reprocessed ISCCP/SRB data should provide improved representation of clouds and radiation, particularly in the summer. Winter time cloud detection with AVHRR-only remains a challenge over ice sheets, sea ice and snow covered land. Potential biases introduced by changing surfaces (sea ice retreat) introduces significant uncertainties and potential biases in long-term variations. This suggests that the new ISCCP/SRB cloud properties should be re-validated over polar surfaces. ISCCP and SRB records should be examined carefully for potential biases due to sea ice/snow cover retreat. Beyond the short term, the panel should develop approaches using active sensors and defining required technology advances to properly address these regions in the future.

Precipitation products over the Polar Regions are known to be problematic. In the short term, there appear to be Russian NP stations, as well as IPY stations that may be added to the GPCC gauge record. In the longer term, the panel should try to integrate current efforts by Bennartz/Haddad using CloudSat and AMSU to improve light rain and solid precipitation. There are also alternate techniques that could be explored such as accumulation-based precipitation techniques that rely on IceSAT/Cryosat. Here too, the panel should actively identify and support technology developments.

Turbulent fluxes over the Polar Regions are still very immature or nonexistent. For now, this may need to rely on reanalyses. Connection with CLiC could be useful but benefit would likely be in the long term. Short-term benefits of greater interaction with CLiC could be in the area of sea-ice temperature, which is important for radiative fluxes.

With respect to the sea-ice concentration dataset needed for the Integrated GEWEX product, there are a number of very positive developments. A CLiC workshop in March 2100 on Ice Concentration noted the developments of a Sea Ice Climate Data Record (Jeff Key, PI). The sea-ice concentration is a combination of NASA Team and bootstrap algorithm (Walt Meier, NSIDC is leading this). OSI-SAF has reprocessed data (SMMR, SSM/I period, 1978-2009), with an RTM-based atmospheric correction, dynamic tie points, and a comprehensive error assessment. This product looks very promising.

ARM data constitutes an important validation dataset for the Cloud, Aerosol and Precipitation, as well as the Polar Initiatives. Dr. Kummerow reported on behalf of Dr. James Mather from the DOE ARM project. Key information for the panel consisted of:

- The Recovery Act project is nearly complete including deployment of 25 radars (including cm and mm wavelength, scanning and zenith pointing) and a variety of lidars (for optical extinction, water vapor, and clear air Doppler velocity) and other instruments. Recent

highlights include the installation of precipitation and cloud radars at the SGP, Barrow, and Manus sites; the 35-GHz radars upgraded at SGP, Darwin, Barrow, and Manus; High Spectral Resolution Lidars installed at Barrow and Steamboat Springs; a Raman lidar installed at Darwin (extinction and water vapor).

- With array of new instruments, focus of development is on streamlining data product development and data discovery/distribution.
- Recent field campaigns include one-month convective study over Oklahoma (MC3E), one-month aerosol process study in California (CARES), 18-month AMF deployment to the Azores, six-month AMF deployment to Storm Peak, CO.
- FY12 campaigns include mobile facility deployments to Ganges Valley, India and the Maldives (Indian Ocean).
- Next call for proposals for use of ARM facilities (mobile facilities, aircraft, or measurements at fixed sites expected in early 2012.

The Continual Intercomparison of Radiative Codes (CIRC) presentation was given by Dr. Williaml Rossow on behalf of Dr. Lazaros Oreopoulos. The project is intended to be the standard for documenting the performance of radiative transfer codes used in Large-Scale Models (LSMs). As such, CIRC provides benchmark, line-by-line results against which radiative transfer codes of GCMs (incl. IPCC) can assess. Phase 1 was launched on June 4, 2008. Based upon user feedback, phase "1a" was launched on January 19, 2010. Phase 1a includes 16 simpler variants of Phase 1 cases that allows more detailed testing. The web site is at http://circ.gsfc.nasa.gov.

Despite useful results from the activity, CIRC is now unfunded. An IRC letter was sent to IPCC WG1 co-chairmen about CIRC. The response advised CIRC to contact WGCM/WGNE. Since then, WGCM has invited CIRC to WGCM/WGNE October meeting in Boulder. Funding remains problematic despite usefulness of activity to those model codes that take advantage of the project. Support for this activity at the SSG level would be welcome.

The other radiative transfer assessment activity is a new activity being considered related to the assessment of satellite simulators. With the success of the ISCCP simulator, a number of new simulators has sprung up that can simulate both active and passive observations from the UV to the microwave. While it is believed that the radiative transfer codes themselves are probably robust, simulators themselves often require information that must be supplied by the model or be built into the simulator as an assumption. This can lead to significant differences in the simulated radiances or reflectivities. This sensitivity to internal assumptions could be a weakness of simulators if applied without care, but is also a potential strength when properly exploited since such sensitivity of simulated radiances to model internal physics such as microphysical schemes is useful for identifying the sources of model uncertainties that would be otherwise difficult to track down. General users, however, are currently not well informed of which simulator package is more useful than another for a particular application that the users are interested in. Different simulator packages are aimed at different sets of satellite instruments and equipped with a variety of user interfaces optimized to different needs. Dr. Hiro Masunaga will explore the level of interest in performing a comparison of these simulators. The assessment is intended to provide straightforward guidance to the modeling and diagnostics communities

regarding the strengths and weaknesses of each simulator relative to standard needs. The following simulators were identified as available and used by the community:

- COSP: CFMIP Observation Simulator Package containing RTTOV (Radiative Transfer Model for TOVS)
- CRTM: Community Radiative Transfer Model
- ECSIM: EarthCARE Simulator
- J-simulator: Joint Simulator for Satellite Sensors
- SDSU: Satellite Data Simulator Unit
- Goddard SDSU
- ISSARS: Instrument Simulator Suite for Atmospheric Remote Sensing

Action: Dr. Masunaga will explore interest among simulator developers and report at next panel meeting.

Before wrapping up, Dr. B. J. Sohn gave a short presentation on clear-sky dry biases and its implications in the cloud forcing determination. In his presentation, 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. He showed NICAM model simulations to illustrate the effect and show the magnitude of the bias.

The last presentation of the meeting was by Dr. Peter Bauer who commented on the activities from an SSG perspective. They are not reproduced here as they will be formalized at the SSG meeting. The only detail of note here is the value that Dr. Bauer ascribed to including model fields in the current assessments. He commented that this is very useful as it immediately provides the models with insight that are normally difficult to come by.

The wrap-up discussion reiterated many of the actions found in this report. In addition, panel agreed to make a short summary that lists data and funding sources for each of the products as well as a number of references. This information would be used to send to data providers and funding agencies as a reminder that their long-term support has a positive impact on the community. **Action: Finish by end of September**

The next meeting location is still under discussion. France was proposed. **Action: Dr. Kummerow to follow up.**

With regards to the WCRP request for important news at the Open Science Conference, the panel had to admit that the delay in the Integrated GEWEX product makes it premature to tout this product as a significant achievement at this meeting.

Summary of upcoming GRP meetings:

- 4-6 October 2011 – CERES Science Team Meeting at Lawrence Livermore National Laboratory
- November 2011 – Radiation Flux Assessment Meeting
- July 2012 – 6th SeaFlux Workshop (with LandFlux, AMS Air-Sea and AMS Boundary Layers and Turbulence meetings)
- August 2012 – BSRN meeting (planned around IRS in Germany)
- October 2012 – GRP (GDAP) meeting (location in planning phase)

APPENDIX 1

GRP Response to JSC Comments on GEWEX Imperatives

Text highlighted in blue pertains to GRP
GRP response is bolded

1. Overall, the JSC finds that the GEWEX 'imperatives' set forth a reasonable agenda for the future and map well onto the observations, modeling, and application crosscuts of the future WCRP. Consistent with past practice, the GEWEX attention to datasets, process understanding and model improvements has been a hallmark of GEWEX. On page 3 of the document it states that these are the final set of imperatives whereas on page 9 it states the imperatives will be finalized after presentation to the JSC. The JSC hopes it has not been presented with a *fait accompli*.

2. Given the *what* should be done, concern has been expressed with how to go about doing it. The document as written and the GEWEX presentation to the JSC appeared to be the result of discussions internal to GEWEX. Obviously, this is a logical way to begin. To what extent did CLIVAR, CliC, and SPARC have an opportunity to weigh in on these future directions, or for that matter WGCM and WGNE? The discussion on page 7 regarding FAME is problematic as there is no discussion or acknowledgement of potential overlap with WGNE. Similarly, the document does not address the overlapping areas of responsibility between GEWEX and CLIVAR (or SPARC). An example of which is the question of surface fluxes that came up at the JSC meeting, as they seem to be on everyone's wish list, but without a coordinated effort. Another example would be the GEWEX radiation budget effort in section 1 on datasets that are intended to gather data that is relevant to a variety of WCRP projects. From a trans-WCRP perspective, radiation fluxes are used to drive ocean models that are very much in the realm of CLIVAR, and they are equally relevant to stratospheric dynamics. However, CLIVAR and SPARC activities are not identified as partners in GEWEX dataset activities beyond a generic reference to WCRP projects. The participation of the GEWEX Chair at the recent CLIVAR SSG is a healthy step in this direction. Going into the OSC and at the subsequent JSC meeting it will prove important that each core project individually and collectively assess how the WCRP can improve; i.e., not just internal mid-course corrections but serious consideration of what should be the fundamental role of a core project within the larger WCRP.

   GRP response: GRP's experience is that coordination has always been very good at the working level. Given the difficulty in producing coordinated datasets and assessments, GRP suggests that excessive coordination before these activities are undertaken can stall and eventually kill such volunteer efforts. Instead, it makes more sense to begin activities at the working level, and to affect coordination of existing activities once they have begun. If parallel activities are identified, specific joint meetings can help send clear pictures of the similarities and differences between the project needs and avoid confusion at the funding management level.

3. While all the core projects have been struggling with whether or not to change their name, it is surprising and disappointing that the new structure for the WCRP is so nearly identical to the old structure that even the acronyms of many of the core projects may remain the same. While there is some 'brand recognition' that comes with "GEWEX" and a valid argument can be made for the "new" name (e.g., dropping Experiment makes a lot of sense) it does send a message, both within GEWEX and to the outside world, that nothing is changing, nor has changed in the past 20 years. Similarly, it is disappointing to see that the proposed structure for GEWEX is almost identical to the existing structure, with very few changes. As in the name, we realize that there is always resistance to disbanding existing panels and instituting new ones, but without some refreshing, the whole structure stagnates. In this regard, it was hard to see what the mapping is between the various panels and committees and the new imperatives.

   For example, the names of the panels do not reflect, in any rational way, the function they are to fulfill. This appears to be more a legacy of the past than anything. For example, the 'Dataset' imperative is to be pursued by the GEWEX Radiation Panel—a very narrow name for a very broad activity. The 'Analysis' imperative is to be pursued by the GEWEX Hydroclimatology Panel—again, a rather restrictive sounding name for a project that is supposed to represent WCRP research in the Atmosphere-Land domain. The 'processes' imperative is to be pursued by several panels and working groups within GEWEX, but with no obvious lead and no obvious mechanism for coordination. The same holds for the 'modelling' imperative. The 'Applications' imperative likewise has no identified lead. Despite the importance of extreme events in a changing climate, (e.g., evaluation of extremes in climate models, improving their representation in models, future projections of extreme events ...) there is little indication of connections to other WCRP activities involving extreme events (such as the ETCCDI) in CLIVAR and elsewhere. In the 'technology transfer' imperative, there is no indication of technology transfer (or exchange) between different parts of WCRP. For example, how, specifically, will improvements to process understanding and parameterizations be prioritized and communicated to the global climate modeling community (as represented by WGNE and WGCM for example) in a way that leads to real progress? In the past there has been a chasm here: process scientists work away on something in isolation from the modeling community and in the end often produce something that is unsuitable for implementation in a GCM. Is the concept of Climate Process Teams to be invoked here? This means there is an opportunity to improve the situation, and this is exactly the kind of role WCRP should play.

   GRP Response: We have struggled with a name that better represents the panel than GRP. As pointed out in the GRP meeting summary, we are considering a name change to GEWEX Data and Assessment Panel (GDAP). It moves the panel more in the direction of creating and assessing the W&E budget. In situ data sources will always require an international framework.

4. In summary, there is a general thread here: namely that there is little evidence of an effort to connect/interact with other WCRP core projects and working groups to 'repartition' some activities, merge some activities, split some activities, create synergies across core projects, etc. Perhaps this document in its current form should be viewed as a first step, in which the

GEWEX community has thought about its own activities, and in that context it is a good first step and GEWEX is to be congratulated. However, it is absolutely necessary that it now be followed by a second step in which there is some dialogue with the other core projects to redefine boundaries and overlaps and connections. The JSC cannot 'endorse' this document until a broader 'cross project' dialogue takes place and is reflected in a revised document.

GRP Response: GRP fully endorses coordination. It also notes that coordination is generally very good at the working level. Individuals often know each other and have similar goals and priorities. However, at the panel level at which products are coordinated and assessments are produced, coordination is best done over very specific matters rather than generalities. The JSC can help very much in ensuring that the overall scope of the coordination and differences in objectives among panels get clearly communicated.

Additional Comments

5. The document makes several references to water resources, water availability, drought, and hydrological processes. Yet, the role of groundwater is only mentioned in passing. To what extent is groundwater storage (cf Fig 1) and new remotely sensed inferences of such (i.e., GRACE) a priority area for GEWEX? How can GEWEX adequately deal with the science of drought if groundwater is not being considered? Consistent with the need to be open to change, just because groundwater storage was not part of the GEWEX of the past is not sufficient justification for neglecting it in the future.

GRP response: GRP has been successful because it did not make lists of all the variables that were related to the Global and Energy budget (it is difficult to find a parameter which is not) and monitored the progress in these. GRP has used the approach of focusing on a small set of variables, encouraging the production of global reference products, and then assessed these within the W&E budget framework. It recently added turbulent fluxes (SeaFlux and LandFlux) to assess the closure of the overall budgets. Soil moisture has been identified as the next most important parameter—and one that interacts directly with land turbulent fluxes. The panel is aware of the work with GRACE and this will undoubtedly come into play when soil moisture is incorporated into the W&E budgets. It would, however, be premature to focus on GRACE without focusing on independent methods to derive the soil moisture.

6. Early on one of the central tenets of the regional hydroclimate projects (RHPs and their continental scale predecessors) was the possible transferability of parameterizations and process understanding from region to region. For the most part this has not been realized and this document does not acknowledge the shortcomings in the past nor confront the challenge. The caption for Figure 2 alludes to the importance of placing the RHPs into a larger context but the document does not elaborate. Moreover, the document contains little mention of the governance involved with the various RHPs and what are the criteria for selection or endorsement.

7. Dataset generation has been a central component of GEWEX for over two decades. Yet, a valid argument can be made that external to GEWEX, the GEWEX datasets are not as visible and are not being accessed or utilized to the extent that they could or should be. The present document could be strengthened in this regard.

   GRP Response: We don't know what this comment was intended to convey. GPCP has been used and cited over 2,000 times in the peer-reviewed literature. We estimate that ISCCP has probably been used and referenced even more often. SRB has equally broad usage, including the solar power industry.

8. Although the first E in GEWEX stands for Energy and the largest contribution to the energy budget comes from solar radiation, given the GEWEX emphasis on space-based datasets it is surprising to note there is no mention of total solar irradiance data. Given the potential break in the total solar irradiance time series, who is the champion for these data within the WCRP? Is it SPARC or GEWEX? Or? Who is studying the use of spectral irradiance observations? Are TSIS, ACRIM, and SOLSTICE observations important to GEWEX?

   GRP response: GRP receives annual updates on the Total Solar Irradiance measurements and plans. It was very quick to send a letter to NOAA management making a scientific case for, and strongly endorsing continuous measurements of Total Solar Irradiance when these measurements were descoped from NPOESS. TSI observations form an entire chapter in the Radiative Flux Assessment report. Spectral irradiance, while certainly of interest to GRP, is viewed as important more from a process understanding perspective rather than long data records.

APPENDIX 2

2nd Joint GRP/SCOPE-CM meeting

Tuesday, 30 August 2011

8:30 – 8:45	GRP Welcome and logistics
8:45 – 9:00	SCOPE-CM Overview
9:00 – 12:00	Discussion

Sustained Coordinated Processing Of Environmental Satellite Data For Climate Monitoring (SCOPE-CM) – John Bates

SCOPE-CM is a network of operational space agencies that will eventually take over the generation of GRP data products. Current members of SCOPE-SM include operational agencies (NOAA, EUMETSAT, JMA, CMA and USGS). The goal of SCOPE-CM is to address the requirements of GCOS in a cost-effective, coordinated manner, capitalizing upon the existing expertise and infrastructures. The Project will provide continuous high-quality Essential Climate Variables (ECVs) satellite products (Climate Data Records; CDRs) on a global scale. The SCOPE-CM Network is based upon activities of existing initiatives (WIGOS, GCOS and GSICS); will build upon existing operational infrastructures; serve users and other organizations (e.g., WMO Regional Climate Centres RCC, National Weather Services); and assist in ongoing monitoring of climate variability on seasonal to interannual timescales.

SCOPE-CM is now in Phase II (2010-2012), where structures for sustainable generation of FCDRs and TCDR are being established, as well as the generation of first SCOPE-CM products. Phase II may also focus on the increased coverage of products in terms of ECVs, time and spatial dimension. The full deployment of the system product; products review and QC; and continuous product improvement will take place in Phase III (2012-2014).

As a starting point, SCOPE-CM looked at historical functions carried out by PIs within GRP. These functions and their prioritization by SCOPE-CM formed the basis for the ensuing discussion.

- Monitor data exchanges and resolve problems
- Radiance calibration: who is involved now and who should be involved? Calibration issues vary from minor issues that require no action to major calibration changes that require the data processing to wait until issues are resolved. Who makes those decisions in an operational environment?
- Ancillary data acquisition and evaluation--some products dependent on datasets that are not under our control and may have unsatisfactory aspects. Changes in these ancillary data sets must also be assessed by PIs.
- Review scientific developments for retrieval methods
- Develop and evaluate analysis methods and revise products – operational agency responsibility?
- Assess data product quality-- GRP assessments will be used by IPCC. How do we incorporate assessments into the routine processing of data?

The discussion centered largely upon the notion that the operational agencies needed to retain someone akin to the PI who could provide guidance with respect to most of the above issues. These PIs would ideally continue to improve the product and thus be intimately familiar with the product. If necessary, the PIs could occasionally be increased to small science teams to do assessments and or product improvements. 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. Generally, there is convergence on the implementation strategy that was presented at the meeting as long as PI and occasional Science Team involvement remained in the plans.

From the SCOPE-CM perspective, the next phase of implementation is viewed as consisting of two spheres:

Sustained Structures Sphere:

- Teams from operational agencies
- Working together on FCDRs, standards, inter-calibration, reprocessing methodologies, archive issues, data distribution, documentation…
- Permanent groups and resources (e.g. sustained funding, staff)
- Group by sensor/sensor types

Project side sphere (research and science):

- Teams from universities, research labs, space agencies
- Working together on algorithms, science, applications, initial CDR processing.
- Nonpermanent groups and resources (project funding)

SCOPE-CM then laid out an implementation process for getting new Climate Data Records into production.

CDR Generation Project (jointly led by PI and Operational partner)

- Proposals for a CDR project to be accepted by the SCOPE-CM Executive Panel
- CDR generation at Operational Facility
- Validation
- Review Processes
- Pre-”Release of a CDR with unique reference (DOI)
- Main outcome: CDR, Documentation (Validation Report, Product User Manual,..), Dissemination/Publication

CDR Assessment

- Independent assessment of Pre-released CDR (following internationally agreed assessment procedure supervised by GRP)
- Capturing user feedback and assessment of CDR impact in applications
- Main outcome: Assessment Report – (To be reviewed by e.g. GRP and/or GCOS panels AOPC, OOPC, TOPC)
- (Release) Endorsement? Confirmation or Rejection

APPENDIX 3

GEWEX Radiation Panel (GRP)
Tekko Building 1, Meeting Room D
1-8-2 Marunouchi Chiyoda-ku, Tokyo 100-0005

AGENDA

Tuesday, 30 August 2011

8:30 – 8:45 GRP Welcome and logistics
8:45 – 9:00 SCOPE-CM Welcome
9:00 – 12:00 Joint GRP/SCOPE-CM meeting. The format will be rather open but there are four topics (related to the issue of transferring climate data products to operational agencies) for which we we will provide input to SCOPE-CM. I hope you can be prepared to voice your views on the following topics:
(a) continued involvement of the science community to diagnose new problems as they arise
(b) periodic assessments and procedures to make sure the data are still relevant
(c) periodic research announcement for more formal product improvement efforts
(d) Tracking of progress in a quantifiable manner.

12:00-1:30	Lunch	
1:30 – 1:40	Teruyuki Nakajima:	Opening remarks and JSC perspective
1:40 – 2:00	Erlich:	IGPO Update and JSC Report
2:00 – 2:45	Kummerow:	Discussion on JSC Report and Feedback to SSG
2:45 – 3:00	Break	
3:00 – 3:30	R. Oki:	JAXA Activities
3:30 – 4:00	ZHOU Tianjun:	New member presentation
4:00 – 4:30	Rossow:	WGDMA common ancillary data status
4:30 – 5:00	Discussion	

Wednesday, 31 August 2011

Report from the Projects. Each project should specifically address status of incorporating the common ancillary data and schedule for reprocessing.

8:30 – 8:50	Adler:	GPCP and GPCC
8:50 – 9:20	Rossow:	ISCCP
9:20 – 10:00	Stackhouse/Dutton:	SRB/BSRN
10:00 – 10:30	Break	
10:30 – 10:50	Kinne:	Aerocom update
10:50 – 11:10	Clayson:	SeaFlux
11:10 – 11:30	Jimenez:	LandFlux Assessment
12:00– 1:30	Lunch	
1:30– 2:00	Akiyo Yatagai:	The Aphrodite data set
2:00 – 2:30	McCabe:	LandFlux product/Options

2:30 – 3:00	Knapp:	Processing/archiving and distribution of Joint Product
3:00 – 3:30	Break	
3:30 – 4:00	Open Discussion	
4:00 – 4:20	Duncan	Energy and Water Signatures of Cloud Cluster Precipitation Events
4:20 – 5:30		Presentation of Potential Joint Product Uses from GRP

Thursday, 01 September 2011

8:30 – 8:50	Stackhouse	Radiation Assessment
8:50 – 9:10	Stackhouse	CERES Products
9:10 – 9:30	Kinne	Cloud Assessment
9:30 – 9:50	Kinne	Aerosol Assessment
9:50 – 10:10	Schulz	Water Vapor Assessment
10:10 – 10:30	Break	
10:30 – 11:00	Kummerow	Cloud/Aerosols/Precipitation
11:00 – 11:30	Kummerow	Polar priorities
12:00 – 1:30	Lunch	
1:30 – 2:00	Mather ?	ARM update
2:00 – 2:20	Masunaga:	Potential of Simulator Assessments led by GRP?
2:20 – 2:40	Bauer:	Feedback from SSG
2:40 – 3:20	Kummerow:	Summary of Short term plans, action items and
3:20 -	Discussion and adjourn	

Note that in addition to thinking about the SCOPE-CM issues, there were two assignments – To look through the JSC comments and be prepared to join what I am sure will be a lively discussion, and prepare a very short outline describing a potential use of the Joint Product for their research. The latter will be used to help define the details of the joint product.

APPENDIX 4
GEWEX Radiation Panel
30 August – 1 September 2011
Tokyo, Japan

ATTENDEES

Christian Kummerow (Chair)
CSU
E-mail: kummerow@atmos.colostate.edu

Robert Adler
University of Maryland
E-mail: radler@umd.edu

John Bates
NOAA/NCDC
E-mail: John.J.Bates@noaa.gov

Peter Bauer
ECMWF
E-mail: peter.bauer@ecmwf.int

Carol Anne Clayson
WHOI
E-mail: cclayson@whoi.edu

David Duncan
CSU
E-mail: dduncan@atmos.colostate.edu

Ellsworth Dutton
NOAA/GMD
E-mail: ells.dutton@noaa.gov

Dawn Erlich
International GEWEX Project Office
E-mail: gewex@gewex.org

Maki Hirakata
JAXA/EORC
E-mail: Hirakata.maki@jaxa.jp

Carlos Jimenez
Paris Observatory
E-mail: carlos.jimenez@obspm.fr

Stefan Kinne
MPI-Met
E-mail: Stefan.kinne@zmaw.de

Ken Knapp
NOAA/NCDC
E-mail: Ken.Knapp@noaa.gov

Toshiyuki Kurino
JMA
E-mail: tkurino@met.kishou.go.jp

Nozomu Ohkawara
JMA
E-mail: ohkawara@met.kishou.go.jp

Riko Oki
JAXA/EORC
E-mail: oki.riko@jaxa.jp

Hiro Masunaga
Nagoya University
E-mail: masunaga@hyarc.nagoya-u.ac.jp

Matt McCabe
UNSW
E-mail: mmccabe@unsw.edu.au

Teruyuki Nakajima
UT/AOPI
E-mail: teruyuki@ccsr.u-tokyo.ac.jp

William Rossow
CCNY
E-mail: wbrossow@ccny.cuny.edu

Barbara Ryan
WMO
E-mail: bryan@wmo.int

Joerg Schulz
EUMETSAT
E-mail: joerg.schulz@eumetsat.int

B. J. Sohn
SNU
E-mail: sohn@snu.ac.kr

Paul Stackhouse
NASA/LaRC
E-mail: paul.w.stackhouse@nasa.gov

Yoshihiko Tahara
MSC/JMA
E-mail: y-tahara@met.kishou.go.jp

Kazuo Umezawa
JAXA/EORC
E-mail: Umezawa.kazuo@jaxa.jp

Akiyo Yatagai
University of Tsukuba
E-mail: akiyo@ies.life.tsukuba.ac.jp

Tianjun Zhou
IAP/Chinese Academy
E-mail: zhoutj@lasg.iap.ac.cn