

GEWEX Radiation Panel (GRP)

Reporting Period: November 2005 — October 2006

URL: <http://grp.giss.nasa.gov>

Chairman: William B. Rossow (2001–2007)

Objectives

The GEWEX Radiation Panel (GRP) focuses its work in three areas: (1) advancing understanding of the atmospheric radiative transfer process that is central to the global energy and water cycle; (2) advancing understanding of the radiation physics needed for improved analysis of remote sensing observations with particular attention to determinations of precipitation and land surface properties; and (3) compiling and analyzing a complete quantitative description of the weather-to-decadal scale variability of the global energy and water cycle.

Activities in each area are undertaken, respectively, by: (1) cooperation with the International Radiation Commission's 3D Radiative Transfer working group (3DRT) and their Intercomparison of Radiation Codes in Climate Models (ICRCCM) and the joint GRP-ARM Continuous Intercomparison of Radiation Codes (CIRC) working group; (2) the Working Group on Cloud and Aerosol Profiling (WGCAP) and a new Working Group of Precipitation Radar Networks (WGPRN); and (3) the Working Group on Data Management and Analysis (WGDMA). WGDMA is the combination of all the participants in the projects producing global data products that provide key missing elements of the energy and water cycle, namely clouds by the International Satellite Cloud Climatology Project (ISCCP), precipitation by the Global Precipitation Climatology Project (GPCP), surface radiation fluxes by the Surface Radiation Budget project (SRB) and the Baseline Surface Radiation Network (BSRN), aerosols by the Global Aerosol Climatology Project (GACP), ocean surface turbulent fluxes of heat and water by SeaFlux and a new project, to be called LandFlux, to provide land surface turbulent fluxes of heat and water.

Status

All of the global data products (except SeaFlux and LandFlux) are available through 2004, providing more than two decades of global determinations of clouds, precipitation, aerosols (ocean only) and surface and top-of-atmosphere radiation. Monthly mean global maps of all these and related data products are online at the GRP website for their respective time periods in a common map grid. Formal international assessments of the products from ISCCP, GPCP, GACP and SRB were started two years (the aerosol effort was re-started this year) to provide a critique of the reliability of these products, as well as any other available data products that provide similar long global records. The Precipitation assessment is complete and has issued a report that has been reviewed by outside colleagues. The Radiation and Clouds assessments have completed their second workshops in the past year and are now working to sharpen comparison results to produce reports. The Aerosol assessment will conduct its first workshop on 14-15 September 2006. Funding for the continuation of the global data projects appears to be in place for GPCP and BSRN, but not for the ISCCP Global Processing Center beyond 2007, or for SRB or GACP. Nevertheless, WGDMA began planning at its last meeting for a coordinated reprocessing of all the products to take place in 2007-2009. CIRC is nearly ready to release a Web site that will provide both synthetic and observation-based tests for any radiative transfer code calculating broadband fluxes (like those used in GCMs). After reviewing current activities, the GRP decided against starting GVAP (Global Water Vapor Project) because, with the exception of the development of microwave water vapor profile retrieval methods over land, sufficient activity is already underway that should produce new global products within the next few years. SeaFlux was re-activated with a workshop in held in March 2006. The GRP is planning a kick-off workshop for LandFlux in spring 2007. A workshop on development of snowfall algorithms was held in October 2005. A Precipitation Radar Network WG has been formed and planning for a first meeting is underway.

New Directions

The GEWEX SSG endorsed the goals of a GRP LandFlux activity to determine the global distribution of the land surface turbulent fluxes of heat and water and their space-time variations. To that end, the next tasks will include at least: (a) compilation of *in situ* validation datasets specifically for turbulent fluxes (CEOP may contribute to this), (b) evaluating the state of available satellite radiances that can be used to

measure relevant land surface properties, and (c) organizing workshops to evaluate remote sensing products, focusing on albedo and skin temperature but also assessing the state-of-the-art for near surface meteorology, soil wetness indicators and vegetation properties. Evaluation of data products should also include evaluation of the GSWP-2 models and their products.

The GEWEX SSG also endorsed a GRP plan of action to advance aerosol studies for climate: (a) the substantial disagreement between NASA aerosol products from different instruments flying on the same satellite should be resolved to understand current limitations of aerosol remote sensing; (b) the results of this investigation should be used to “calibrate” the longer AVHRR-based records produced by NASA and NOAA to arrive at the best climatology; (c) the BSRN network should move ahead with plans to add capabilities for aerosol and cloud measurements to radiative flux measurements; and (4) WGCAP should consider development of a measurement suite at ARM-like sites that may be able to examine the evolution of air parcels from clear, aerosol laden, conditions to cloudy conditions over long enough time periods to provide a more generalized understanding of how aerosol properties affect the evolution of clouds and precipitation. This plan was forwarded to the cognizant funding agencies to recommend their support.

Future

The major goal of the GRP for the next several years is to complete, analyze and refine the quantitative description of the global energy and water cycle. This goal involves several interdependent activities. The first is compilation of the current description from available data products, where the land surface turbulent fluxes must be taken from the model outputs produced by Global Soil Wetness Project–2. The second is the completion of the formal data product assessments to identify improvements in preparation for re-processing. The third is a set of focused activities to bring precipitation, aerosols, and ocean and land surface fluxes up to the same quality level as clouds and radiation. All of this activity is to culminate in a coordinated re-processing of all products to produce a more complete and improved description of the global energy and water cycle.

Next year should see further additions to the global Energy and Water data collection with some extensions of the common time period covered. Higher time resolution versions of these products will also be placed online on an active data server. Next year will see the completion of two more of global data product assessments (for radiation and clouds) and the continuation of the aerosols assessment. The activities to raise the quality level of precipitation and ocean and land surface fluxes include release by WGCAP of a test set of common products in conjunction with release of the first products from CloudSat and Calipso, the first meeting of the WG on Precipitation Radar Networks, the fourth SeaFlux workshop and the first meeting to launch LandFlux activities. CIRC will release its radiation code test web site and hold a workshop to encourage its use; a couple more workshops are planned to continue improving the radiative flux products. Finally, plans for the coordinated re-processing will also be completed.

Key Results

- (1) Monthly mean global maps in a common grid from all of the GEWEX and some related products are now available online at the GRP website.
- (2) GPCP extended its data record to 27 years and transitioned processing from HIRS-based to AIRS-based estimates at high latitudes.
- (3) ISCCP extended its data record to 22 years and released an analysis tool for classifying tropical atmospheric states using the joint cloud property histograms – this tool, when combined with the ISCCP Simulator can also be applied to weather-climate GCM output. A survey of convection penetrating into the stratosphere was also completed.
- (4) GACP extended its data record to 24 years and has demonstrated a combined AVHRR-SAGE analysis to separate stratospheric and tropospheric aerosol amounts.
- (5) SRB extended its data record to 21.5 years (soon to be 22 years) after several re-processing cycles to correct a number of problems in shortwave products.
- (6) BSRN supported a field experiment that demonstrated the accuracy of radiation code determinations of clear-sky diffuse shortwave fluxes when adequate information about surface albedo and aerosol is available and BSRN-recommended measurements standards are followed. The World Radiation Center Davos has accepted responsibility for maintaining an international IR calibration standard.

Issues

- (1) Funding for continuation of GACP and SRB is not confirmed. Proposals have been submitted to NASA, but short-falls in funding in the cognizant programs cast doubt on the outcome.
- (2) Funding for the ISCCP Global Processing Center must be extended beyond 2007. Two opportunities are present that could be taken. (a) With a funding extension and delay of the re-processing, the analysis could be switched to the 10-km-sampled radiances instead of the 30-km-sampled radiances making the ISCCP products more useful for cloud process studies and providing a better match to TRMM, CloudSat and Calipso. (b) With a modest increase in funding for 1-2 years, the processing software could be re-engineered to make ISCCP fully operational – something that GCOS has recommended (implicitly).
- (3) GEWEX needs to achieve a closer and real working relationship with CLIC for the evaluation of data products in polar climate regimes. Some of the CSE and CEOP participants could help.
- (4) GHP participants should focus attention on evaluating satellite precipitation analysis techniques when applied to mountainous areas.
- (5) The World Radiation Data Center has not been able to provide large quantities (long time series) of surface radiometer data available, although new funding has evidently been obtained.
- (6) The status of BSRN archives is still unresolved, although several other groups have now expressed interest in taking on this role.

Recommendations

- (1) The GEWEX SSG should write a letter to ESA expressing concern about support for EGPM.
- (2) BSRN should find a way to produce summary products (e.g., daily and monthly means) that are freely available. Staff at the BSRN archives must more clearly separate their own research products from those of the BSRN; all products produced by BSRN should be available with no restrictions on use.
- (3) China and the US should implement their planned Aerosol Network as this plan describes a more useful aerosol-radiation-cloud measurement set that is preferred by the GRP.
- (4) NOAA should develop its BSRN sites into full Surface Energy Budget sites. This evolution should also be considered by the CEOP sites and should be incorporated into the GCOS plan. GCOS should initiate international discussions to foster this evolution for the whole BSRN network.
- (5) GACP needs to formulate a plan to obtain some estimate of aerosol optical thicknesses over land areas.
- (6) GRP recommends that the NASA EOS instrument teams producing aerosol products join in the Aerosol Assessment to provide the needed “calibration” of the long-term GACP record.
- (7) GEO/GCOS should strongly urge the participating satellite agencies to develop a calibration satellite for the whole satellite constellation (both broad and narrowband radiances) and should urge participating operators of surface networks to develop network-wide calibration procedures.

Contributions to WCRP

GRP provided substantial input to WOAP on three topics: a proposal to unify the data policies and websites across WCRP activities, a proposal for enhanced calibration for the climate observing system including a special satellite designed to calibrate the whole constellation of satellites and a draft plan for re-processing global data products. GRP continues to lead efforts to define the primary characteristics of Climate Data Records. GRP also provided suggestions and recommendations to GCOS in formulating its approach to monitoring the radiation budget.

Summary

The GEWEX Radiation Panel (GRP) continues to make progress on advancing understanding of the processes causing variation of the global energy and water cycle. Four global data products (clouds, precipitation, aerosols and radiative fluxes) are available for a period > 20 years and are being formally assessed by international groups. Efforts are also underway to collect a complete observational description of the global energy and water cycle.

Key Publications

An article was published in the *GEWEX NEWS*, titled “Analyzing the Variations of the Global Energy and Water Cycle” to highlight the global data product collections now being assembled. A version of this article, with a more oceanic slant, is being prepared for submission to *CLIVAR Variations*.

Providing a list of all the scientific publications related to GRP activities requires too much effort but some key papers are mentioned in the project-specific reports.

Meetings, Workshops held in 2005-2006

03-06 Oct 05: 16th GRP Meeting, Paris, France
 10-14 Oct 05: 3rd I3RC Meeting, Kiel, Germany
 11-13 Oct 05: IPWG/GPM/GRP Workshop on Global Modeling and Retrieval of Snowfall, Madison, WI, USA
 14-17 Nov 05: 3rd WGDMA Meeting, Darmstadt, Germany
 22-24 Feb 06: 2nd Radiation Assessment Workshop, Williamsburg, VA, USA
 02-03 Mar 06: SeaFlux Workshop, Tallahassee, FL, USA
 29-02 Jun 06: BSRN Bi-annual Site Scientist Meeting, Lindenberg, Germany
 12-16 Jun 06: Joint SPARC-GCSS-GRP Workshop on Tropical Convection, Victoria, Canada
 6-7 Jul 06: 2nd Clouds Assessment Workshop, Madison, WI, USA
 28-31 Aug 06: 2nd WOAP Meeting, Milan, Italy

Planned Meetings, Workshops

14-15 Sep 06: 1st Aerosol Assessment Workshop, College Park, MD, USA
 04-10 Oct 06: 15th TOVS Study Conference, Maratea, Italy
 5-6 Oct 06: Meeting of GRP WG on Cloud-Aerosol Profiling
 9-13 Oct 06: 17th GRP Meeting, Frascati, Italy
 23-26 Oct 06: 3rd IPWG Workshop and 1st PEHRPP Results Meeting, Melbourne, Australia
 13-15 Nov 06: 4th WGDMA Meeting, Greenbelt, MD, USA
 ??-?? Apr 07: 1st LandFlux Workshop, Toulouse, France
 24-28 Sep 07: 4th SeaFlux Workshop, Amsterdam, Netherlands
 ??-?? Oct 07: 5th WGDMA Meeting
 ??-?? Oct 07: 18th GRP Meeting

Members

David Barber (University of Manitoba, Canada)	2006-2009 (new)
John J. Bates (NOAA NCDC, USA)	2003-2006 (ext)
Abderrahim Bentamy (IFREMER, France)	2004-2007
Francois-Marie Breon (CEA, France)	2006-2009 (new)
Tadahiro Hayasaka (Research Institute for Humanity & Nature, Japan)	2002-2007
Toshiro Iguchi (CRL, Japan)	2002-2007
Christian Kummerow (Colorado State University, USA)	2006-2009 (new)
Zhanqing Li (University of Maryland, USA)	2004-2007
Norm Loeb (NASA Langley Research Center, USA)	2005-2008
Ulrike Lohmann (ETH, Switzerland)	2004-2008
Luiz Machado (CPTEC, INPE, Brazil)	2005-2008
Catherine Prigent (Paris Observatory, France)	2003-2006 (ext)
Joerg Schulz (Deutscher Wetterdienst, Germany)	2006-2009 (new)
Fengsheng Zhao (China Meteorological Administration, China)	2006-2009 (new)

Project and Working Group Chairs

Thomas Ackerman (PNL/DOE, USA)	WG on Cloud-Aerosol Profiling
Robert Adler (NASA GSFC, USA)	GPCP
Robert Cahalan (NASA GSFC, USA)	IRC 3D WG
Carol Anne Clayson (Florida State U, USA)	SeaFlux
Robert Ellingson (Florida State U, USA)	IRC ICRCCM
Ellsworth Dutton (NOAA, USA)	BSRN
Tobias Fuchs (Deutscher Wetterdienst, Germany)	GPCC
Lazaros Oreopolus (NASA GSFC, USA)	CIRC
Vincenzo Levizzani (ISAC, Italy)	WG on Precipitation Radar Networks

Michael Mishchenko (NASA GISS, USA)	GACP
Jacqui Russell (Imperial College, UK)	Liaison to GERB
Paul Stackhouse (NASA LARC, USA)	SRB
Graeme Stephens (Colorado State U, USA)	Liaison to CloudSat
Bruce Wielicki (NASA LARC, USA)	Liaison to CERES
David Winker (NASA LARC, USA)	Liaison to Calipso