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# WORLD CLIMATE RESEARCH PROGRAMME

**Report of the GRP Working Group on Data Management  
and Analysis (WGDMA)  
and the fifteenth session of the GEWEX Radiation Panel (GRP)  
(Kyoto, Japan, 18-22 October 2004)**

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## **Meetings of the GEWEX Radiation Panel (GRP) and the Working Group on Data Management and Analysis (WGDMA)**

The GRP meeting on 20-22 October 2004 was preceded on 18-19 October by a meeting of the GRP Working Group on Data Management and Analysis, the combined working groups for the global data projects. Both meetings were hosted by the Research Institute for Humanity and Nature in Kyoto, Japan.

### **Report of the GRP Working Group on Data Management and Analysis (WGDMA) 18-19 October 2004**

#### **I. Introduction**

The main topics of discussion at the WGDMA meeting were:

- Status of the data product assessment activities,
- Status of the data processing projects,
- The rationale and readiness of the projects to continue beyond 2005 as requested by the GEWEX Scientific Steering Group (SSG) and endorsed by the WCRP Joint Scientific Committee (JSC),
- Activities to produce integrated data products for the diagnosis of variations of the global energy and water cycle, and
- Plans for next year and the extended projects (if approved).

#### **II. Data Product Assessments**

Last year the GEWEX Radiation Panel (GRP) initiated four data product assessment activities covering the GEWEX data products for radiative fluxes [Surface Radiation Budget (SRB)/Baseline Surface Radiation Network (BSRN)] but including Earth Radiation Budget (ERB) projects, precipitation [Global Precipitation Climatology Project (GPCP)/Global Precipitation Climatology Centre (GPCC)], clouds [(International Satellite Cloud Climatology Project (ISCCP)) and aerosols [(Global Aerosol Climatology Project (GACP))]. Although the emphasis is on the evaluation of the usefulness of the GEWEX data products for studying annual to decadal variations, the assessments will also include comparisons with other available long-record data products, as well as with newer data products to investigate the causes of the variations shown in each data set. All four activities are now guided by working groups that have drafted study plans. The precipitation group held a planning workshop on 3-4 August 2004 in College Park, Maryland, and also discussed plans at the meeting of the International Precipitation Working Group on 24-28 October 2004 in Monterey, California. A second workshop to examine first results is planned for Spring 2005. The radiative flux group held a planning and first results workshop on 4-6 October 2004 in Zurich, Switzerland. The cloud group is conducting its first analyses after e-mail discussion and plans a first analysis workshop on 4-7 April 2005 in Madison, Wisconsin. The aerosol group has conducted e-mail discussions leading to an analysis plan. All of these assessments will be conducted by putting all of the main data products to be compared online at interlinked Web sites, together with the assessment plans, study approach and policies and data bibliographies. The coming year should see completion of the primary study tasks and drafting of initial reports on the results.

#### **III. Data Project Reports**

All the data projects reported continuation of routine data processing with no major problems; GVAP and SeaFlux were inactive during this past year. The GEWEX data projects are the Global Precipitation Climatology Project (GPCP) and the supporting Global Precipitation Climatology Center (GPCC), the International Satellite Cloud Climatology Project (ISCCP), the Global Aerosol Climatology Project (GACP), the Earth Radiation Budget projects (ERB), the Surface Radiation Budget project (SRB) and the supporting Baseline Surface Radiation Network

(BSRN), the Global Water Vapor Project (GVAP) and the ocean surface flux project (SEAFLUX).

### **A. Global Precipitation Climatology Project (GPCP)**

GPCP is moving forward routinely: data are being collected and precipitation products are being produced on schedule. Currently there are three products available from the National Oceanic and Atmospheric Administration's (NOAA's) National Climatic Data Center (NCDC): a monthly/2.5° and a 5-day/2.5° product covering the period 1979 to present and a daily/1° product from 1997 to present. The monthly data products were recently archived at the National Center for Atmospheric Research (NCAR) in netCDF format. Some progress has been made on identifying and separating solid precipitation and precipitation over complex terrains; several microwave snowfall detection algorithms are being studied. The GPCP noted plans to cosponsor with the International Precipitation Working Group a comparison of satellite algorithms for producing higher time resolution precipitation data products; these methodologies will be evaluated, in part, by comparison with daily-time-resolution gauge data sets. The following discussion highlighted the need to create a common version of the SSM/I, SSM/T1 and SSM/T2 microwave radiances that is uniform across all archives. GPCP plans no new versions of its products before 2006. Important improvements that could be incorporated if the project is extended beyond 2005 are: improve gauge datasets (higher time resolution, rain/snow separated, more collections accounting for complex terrain), update and improve the microwave algorithms anchored on Tropical Rainfall Measuring Mission (TRMM) results, switch to the denser ISCCP B1 infrared radiance data set to obtain 3-hr resolution further back in time, and modernize the merging procedure (e.g., using proposed objective analysis methods).

### **B. Global Precipitation Centre (GPCC)**

The GPCC (DWD, Offenbach) continues to collect rain gauge data from three sources to produce the monthly, merged, global monitoring precipitation product (available globally at 1° and 2.5° resolution for the period 1986 to present): monthly totals calculated at the GPCC from the SYNOP reports, monthly CLIMAT reports and monthly totals calculated at CPC/National Centers for Environmental Prediction (NCEP) from the SYNOP reports received at NCEP. The total number of SYNOP reports received has increased from about 6,000 to 7,000 since the 1980s. Nevertheless, the GPCC continues efforts to collect even more data: so far 173 countries have supplied additional data on a voluntary basis to bring the full database to more than 50,000 stations. This effort is being extended back in time from 1986; Version 1 of a 50-year data set based on 6,000 stations will be released at the end of 2004. Recently the GPCC became the Global Climate Observing System (GCOS) element for long-term monitoring of precipitation and is working on the separation of the monthly mean gauge data by precipitation type. The GPCC is also considering re-processing of the main gauge collection at higher time resolution.

### **C. International Satellite Cloud Climatology Project (ISCCP)**

All ISCCP data centers are operating routinely, except MSC in Canada, which is still revising its processing software to accommodate changes in the GOES satellite data content and format. Data production continues (nearly) routinely and all data exchanges are now conducted via the internet: the B3 radiance data have been delivered through 2003 but the cloud products beyond September 2001 are delayed to adjust for the new characteristics of the NOAA-16 AVHRR and ATOVS systems. Processing is expected to catch up to near-present by early 2005. All ISCCP products are archived at NOAA/NCDC and NASA/Langley Research Center. The ISCCP reported preparations are underway to bring new satellites online: METEOSAT-8 (MSG-1), FY-2C (recently launched) and MTSAT (when it is launched in 2005).

The Japanese Meteorological Agency (JMA) reported on the successful transfer of operations (temporarily) to GOES-9 until GMS-5 is replaced by the launch of MTSAT-1R in 2005. Also preparations for handling the larger volume, more complex MTSAT data and producing the ISCCP (and GPCP) products are well underway. Despite these major changes, data collection for ISCCP and GPCP was very nearly 100% complete.

EUMETSAT reported the completion of a METEOSAT data refurbishment effort, during which errors were cleaned up and image rectification made more accurate. Also a recalibration effort has now been completed; the results are now to be compared to the ISCCP calibration. The new generation of METEOSAT began full operations in January 2004 with delivery of ISCCP products from this satellite to commence in early 2005 (including all of the previous data). This data expands the METEOSAT radiance imaging from three to 12 spectral bands and from 30 min to 15 min intervals. EUMETSAT plans to continue the coverage by two satellites for the longitudinal sector from about 60° W to about 125 ° E. With the launch of METOP-1 at the end of 2005, EUMETSAT will take over providing the “morning” polar orbiter observations. EUMETSAT has now established several Satellite Application Facilities that will collect and process many products similar to those produced by the GEWEX projects, so they will become natural partners for GEWEX efforts to continue these data products.

Colorado State University (CSU) reported continuation of routine data processing from GOES-WEST and GOES-EAST as backup to the Meteorological Service of Canada (MSC). Recent analyses of the ISCCP cloud products produced from separate satellites showed that variations in calibration and viewing geometry have introduced some artifacts in the data, although pretty small ones. Nevertheless, the redundancy of the ISCCP products suggests that it may be possible by re-processing to reduce these artifacts achieving cloud cover accuracy (monthly global mean) of 1 percent.

NOAA reported the recurrence of the scan motor problem on the NOAA-16 AVHRR starting at the beginning of 2004 so they have called up the launch of NOAA-N in February 2005. Otherwise processing of B2 and BC data sets has been routine. The ISCCP Central Archives (NOAA/NCDC) completed a major refurbishment of the ISCCP B1 dataset (spatial sampling at 10 km) and its transformation into a uniform data product: prototypes are being tested now. This accomplishment makes possible an enhancement of the density of the ISCCP products during the planned reprocessing in 2007.

The Satellite Calibration Center continues cross-calibration of 3-4 spectral channels on all the geostationary satellites to the reference “afternoon” polar orbiter instruments. Two new satellites were added this past year, GOES-9 and GOES-12. Processing is routine and up-to-date.

The Global Processing Center (GPC) released two new data products during the past year, a global, radiative flux profile data set (five levels at 3-hr/2.5° resolution) and a mesoscale convective system life- cycle product. Four more products will be released next year: a cloud particle size climatology, a mid-latitude cyclone life-cycle product and tropical and mid-latitude meteorology classification time records. The GPC is investigating improvements in the treatment of the radiance angle dependence and the surface properties in the analysis and plans to obtain a more homogeneous atmospheric data set; after a complete examination of the dataset to identify and rectify small calibration and navigation errors, the whole collection of data products will be reprocessed starting in 2006.

#### ***D. Global Aerosol Climatology Project (GACP)***

The GACP has completed a revised climatology of monthly mean aerosol optical thickness and average particle size (Angstrom coefficient) covering the global oceans from 1981 to 2001 (this will be extended as the ISCCP products are completed). The revisions included improve visible-near-IR radiance calibrations and radiative transfer model. The results show no significant trends in periods between the two clearly indicated volcanic eruptions (El Chichon in 1982 and Pinatubo in 1991): the global average optical thickness (Angstrom coefficient) is 0.145 (0.75) with more aerosols in the northern than the southern hemisphere.

### ***E. ERB***

The Clouds and the Earth's Radiant Energy System (CERES) Project reported that the first advanced top-of-atmosphere flux products with improved angle models were released this past year and that the full atmospheric radiative flux profile and cloud products set should be released in 2005. Some problems being investigated involve improving the shortwave flux diurnal cycle and decreasing uncertainties in the global net energy budget. The former will be significantly advanced by comparison to the first results from GERB which makes broadband radiance measurements every 15 minutes. These early results already suggest important results to come from the study of very high time resolution radiative flux measurements. Investigation of the long-term ERBE non-scanner record, which indicates a decadal-scale variation of the net energy budget is larger than the current estimates of radiative forcing changes over this time period, is on-going employing all of the GEWEX data products.

### ***F. SRB***

The SRB reported completion of its global (at 3-hr, 1° resolution) surface and top-of-atmosphere radiative flux products for the period 1983-1995 (after a reprocessing of the longwave product to correct an error) and that it will complete extension of the time record beyond 1995 to 2004 using the newest NASA reanalysis (GEOS-4) by Fall 2005. As the GEOS-4 product is extended back in time, the whole SRB product will be consistently processed using this atmospheric product. Sample validation by comparison of the current products against BSRN data indicates mean differences of -5 and -3 W m<sup>2</sup> for downwelling shortwave and longwave fluxes, respectively. Comparison of top-of-atmosphere fluxes with ERBE non-scanner results showed mean differences + 6 and +2 Wm<sup>-2</sup> for upwelling shortwave and longwave fluxes, respectively. SRB is planning a complete re-processing in 2006 using new, improved aerosol data products.

SRB also developed a way to check the visible radiance calibration obtained by ISCCP by comparing the mean albedo of the coldest-topped clouds that are generally very optically thick convective towers for which the albedo should be near the theoretical limit. The results of this analysis confirmed the estimates of the uncertainty of the visible calibration but also suggested that these results could be used to improve the global and long-term homogeneity of the calibration further.

### ***G. Baseline Surface Radiation Network (BSRN)***

The BSRN continues routine data collection activities: currently there are 2788 station-months (1 - minute time resolution) of data in the database and there are 36 sites reporting with another 19 in various stages of development. Work by the BSRN site scientists has led to the adoption of the first world reference standard for thermal infrared irradiance measurements; work is underway to develop a world reference standard for diffuse solar measurements. In addition to surface radiation and surface/upper air meteorology, many of the BSRN sites are implementing complementary aerosol measurements. BSRN participants are also working to merge the BSRN and GEBA archives to produce much longer time records of surface solar insolation and to incorporate data sets reporting surface sensible and latent heat fluxes over land areas. To address the continuing lack of comprehensive surface radiative flux measurements over oceans, the BSRN has formed a working group to investigate availability and quality of ocean radiative flux datasets from various sources, including buoy networks and experimental ship deployments. In recognition of these accomplishments, BSRN has become the core radiation component of GCOS for long-term monitoring of surface radiation.

### ***H. GVAP and SeaFlux***

These two activities are currently inactive but there have been some relevant developments that were reported. IPCC-sponsored activities and the new US Climate initiative led to a workshop where it was recommended that all the available extensive (long-time record and/or global

coverage) temperature datasets be re-processed to obtain the most complete understanding of the 3-D structure of temperatures changes and that such an analysis include a re-analysis of water vapor as a key complement. So, re-analysis of global water vapor measurements for GEWEX may be superseded by other activities. The WCRP JSC has formed a working group to take up the subject of surface energy and water fluxes with an initial focus on ocean surface fluxes; however, this group does not yet have any specific plans to produce data products, so the GRP's SeaFlux activity probably needs to be re-activated.

### ***I. Discussion***

The discussion following the project reports considered the request by GEWEX/WCRP to extend all of the projects through 2010. All of the project participants indicated their willingness to do so. The rationale that was developed for this extension included three elements:

- (1) The opportunity to exploit more recent research and data products from advanced satellite instruments to make improvements in the analysis algorithms;
- (2) The opportunity to reprocess all of the data products to improve their long-term homogeneity and accuracy by developing improved calibrations and sampling based on recent research results and cross-calibrations among several long-term data products; and
- (3) The opportunity to work on transitioning more of these projects to operational agencies to sustain the climate record. The participants agreed that an important new concept, if the projects are approved for extension, would be to conduct a coordinated re-processing of all the products in the 2007-2009 period to improve their physical consistency and enhance their usefulness for studying variations of the global energy and water cycle.

### **IV. Integrated Energy and Water Cycle Data Sets**

In the meantime, activities are underway at NASA/Goddard Institute for Space Studies and NOAA/NCDC to foster more integrated studies using the current GEWEX data products by providing them all in one place and in some merged forms. The current plan is to:

- Include monthly mean versions of all the global products (including products from other sources besides the GEWEX projects) on one Web site (with links to all the project Web sites) and produce a common-format merged version for a common time period (likely 1989-2000 at first),
- Add the BSRN/GEBA and GPCP long-term products (with links to their web sites for access to more detailed versions), and
- Collect the full resolution versions of all the global products onto a single server with modern online analysis tools. This activity will be coordinated with the assessment activities, which will provide additional information about the accuracy of these data products and links to other available data products. The goal is to compile as complete a description of the components of the global energy and water cycle as possible. In future, this online collection will be extended to a merged version at higher time resolution (possibly daily).

### **V. Summary of Recommendations, Actions and Issues**

#### ***A. Recommendations***

- (1) Data product assessment co-chairs should compare their draft plans, exchange ideas about different ways to evaluate the datasets and revise their plans early in 2005. A common set of statistical analysis tools should also be defined for characterizing the variability exhibited by the GEWEX data products.

- (2) During the planned reprocessing of the ISCCP products, the redundancy of the cloud products from separate satellites should be exploited to reduce artifacts associated with remaining discontinuities in view geometry and radiance calibration. If feasible the new Stage B1 radiances should be used by GPCP to extend the higher time resolution products back to 1983 and by ISCCP during its reprocessing to enhance the statistical density of its products.

### **B. Actions**

- (1) The assessment co-chairs will work with the GRP chair to set up a coordinated set of web sites.
- (2) The GRP chair will establish an Assessment page on the GRP web site with an overview of the purposes and intentions of these studies by the end of this year.

### **C. Issues**

- Attention needs to be paid to the opportunity for early assessment results being published soon enough to be used in the next IPCC report.
- There is a great need to create a common version of the SSM/I, SSM/T1 and SSM/T2 microwave radiances that is uniform across all archives.
- Key difficulties with global precipitation measurements, particularly concerning precipitation in complex terrain and solid precipitation urgently need to be taken up by the larger Precipitation Cross-cut activity.
- More needs to be done to acquire high-quality surface radiation measurements over oceans; a collection similar to that compiled by SeaFlux may serve this purpose.

## **VI. Plans**

For next year, all the projects will prepare specific plans for the extended projects, including how the assessment results will be employed to support algorithm improvements and how to conduct a coordinated re-processing of all the data products. The next meeting will be held in Europe after the 2005 GRP meeting to review the assessment results and plan specific tasks.



## **Report of the fifteenth session of the GEWEX Radiation Panel (GRP) 20-22 October 2004**

### **I. Introduction**

In the opening Executive Session, the chairman suggested three topics for discussion:

- 1) planning future aerosol-clouds activities,
- 2) planning future radiation activities, SeaFlux and LandFlux, precipitation activities (precipitation cross-cut) and
- 3) the Global Water and Energy Budget Study (GWEBS).

Three additional topics were raised for discussion:

- 1) the need for an overall review of GRP plans and activities,
- 2) the connection between GRP activities and the Coordinated Enhanced Observing Period (CEOP), and
- 3) the need to re-assess data product requirements (probably require higher space-time resolutions).

The main topics of discussion at the GRP meeting were:

- A review of GEWEX/WCRP and earth-satellite agency activities
- Formulation of a more focused cloud-aerosol research plan
- A review of other radiation-related activities
- Plans for the next SeaFlux and LandFlux activities
- How GRP activities contribute to the Coordinated Observation and Prediction of the Earth System (COPES)
- How to advance use of the data products to understand the causes of the variations of the global energy and water cycle, including better interactions with other WCRP and GEWEX elements
- The proposed precipitation cross-cut and how it relates to other GRP precipitation activities
- Plans for 2005. Scattered through these discussions is a review of the data projects and assessment activities.

The discussion following a report on other GEWEX and WCRP activities and a summary of the preceding Working Group on Data Management and Analysis (WGDMA) Meeting (which most of the GRP members attended) identified two concerns. The first is that maintaining the funding support for existing data processing and analysis projects might be endangered by the attention devoted to numerous "observing system" planning activities currently going on. Not only is WCRP re-structuring its activities (see discussion of the COPES below); but there are equivalent planning activities underway by IGBP, GCOS, IGOS-P and GEO, all of which mention prominently the need for the very same data sets already being produced by the GRP projects. Moreover the instruments, researchers and funding sources are already "fully" committed so it is difficult to see how all these plans will be implemented. That these plans call for higher resolution versions than currently being produced does not take account of the fact that the current limitations are largely related to funding, so it is not obvious that these other planning efforts will get what they require. The second concern is that not enough attention is being paid within WCRP (and these other planning activities) to the direct use of data products (not raw measurements) for many of the applications that are said to be enhanced by improved prediction models.

### **II. Satellite Agency Reports**

Reports of activities relevant to GRP were presented by the Japan Aerospace Exploration Agency (JAXA), the Japanese Meteorological Agency (JMA), the Chinese Meteorological Agency (CMA), the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT),

and the U.S. National Oceanic and Atmospheric Administration (NOAA).

**JAXA** highlighted the imminent launch of ALOS, an advanced land surface observing satellite, and drew attention to continuing concern about U. S. National Aeronautics and Space Administration's (NASA's) announced plans to terminate the Tropical Rainfall Measuring Mission (TRMM), even though the spacecraft/instruments are still healthy (this termination has been temporarily delayed awaiting recommendations from the US National Science Academy). In particular, the combination of TMI and PR on TRMM and AMSR on the Advanced Earth Observation Satellite-II (ADEOS-II); now failed) and AQUA constitute a powerful new set of measurements of water in several forms. Three other missions are being planned: GOSAT (a greenhouse gas measurement mission including cloud observations) to be launched in 2008, GCOM (an ADEOS follow-on) to be launched in 2009, and the Global Precipitation Mission (GPM) the Japanese core satellite provides the anchoring dual-frequency precipitation radar for the passive microwave constellation) to be launched in 2010. Also proposed in collaboration with the European Space Agency (ESA) is the EarthCare mission, a combined radiation budget and precipitation measurement mission. A notable puzzle that should be the focus of intense research is that the tropical rate rates from GPCP and TRMM PR differ by 10 percent.

**JMA** described preparations for the first of a new series of geostationary weather satellites (MTSAT-1R) to be launched in 2005 with MTSAT-2 to be launched about one year later. The range of products now being produced operationally by JMA is of great interest to GRP but more interaction between JMA scientists and the GRP projects is needed.

**EUMETSAT** reported successfully putting METEOSAT-8 (MSG-1) into full operations at the beginning of 2004 and outlined its plans for continuing operations of two geostationary satellites over Europe/Africa and Asia if the launch of MSG-2 in 2005 is successful. Also noted was the approval to extend this new series of satellites to a fourth satellite. A highlight of the METEOSAT-8 mission is the Geostationary Earth Radiation Budget (GERB) instrument which measures broadband radiances (that can be converted to fluxes) at an unprecedented high time interval of 15 minutes. Planning has started for the third generation satellites. EUMETSAT also reported on three other significant developments: the completion of a re-calibration of the radiances from the METEOSAT 2-7 series, the development of a land surface albedo product working group and the beginning of activities by a number of Satellite Application Facilities to produce various data products of direct relevance to GRP studies.

The **NOAA** representative presented an overview of NOAA's new strategic plan and how climate work fits in, emphasizing more direct uses of observations to benefit society. He outlined planned launches of the last of the current polar orbiter and geostationary satellite series during the remainder of this decade and plans for the next generation instruments: Geostationary Operational Environmental Satellite-N (GOES-N) launch is scheduled for December 2004, but may be delayed by hurricane effects and NOAA-N is scheduled for launch in February 2005. Two particularly notable accomplishments are the complete recovery of the whole GOES image archives (these data will be placed on a dedicated server for much easier access later in 2005) and the refurbishment of the NEXRAD data collection. In describing NOAA's developing plans for Climate Data Stewardship, two important points relevant to GRP activities were highlighted: the need to generate authoritative long-term data records through validation of the calibration process, reprocessing, product generation and the blending of *in situ* and satellite measurements and the need for a well-understood procedure to transition research data processing to operational processing and services.

The **CMA** representative described the history of their developing weather satellite program: they have launched six weather satellites, two geostationary and four polar orbiting. Currently, FY-1D (polar) and FY-2B (geostationary) are functional, the latter with limited capability; but during the meeting FY-2C was successfully launched. Plans are for more polar orbiting and geostationary satellites to follow, each with increasing capability. If FY-2C successfully transitions to full operations, CMA may be ready to contribute its data to International Satellite Cloud Climatology Project (ISCCP) and Global Precipitation Climatology Project (GPCP) processing.

In the following discussion, it was emphasized that more needs to be done to obtain the involvement in the GRP projects of more of the national earth-satellite agencies (e.g., China, Brazil, Korea).

### **III. Aerosols**

After two science presentations by Drs T. Nakajima and Z. Li (new GRP member), the wide range of activities, field experiments and observing systems, concerning clouds and aerosols were reviewed (notably INDOEX, MEXT/JACCS, IGAC/ACE, JST/APEX, ABC). Of particular note is that there are now several "aerosol" networks (e.g., GAW, AERONET, SKYNET); but that these were set up for somewhat different purposes, do not coordinate or collect a common set of data products, and do not always make the combination of measurements needed to study aerosol radiative effects and aerosol-cloud interactions. Ocean aerosols have to be measured mainly by satellites but there may well be a cross-contamination between satellite aerosol and ocean color products, which are not produced in a coordinated, mutually consistent fashion. It was decided to find out more about the plans of these various networks and to join in discussion of the formation of a comprehensive aerosol network providing both the monitoring needed for climate observations as well as better supporting research needs. In particular, the GRP had already endorsed the plans of the Baseline Surface Radiation Network (BSRN) to add aerosol measurements to their surface radiative flux measurements, so it could become part of such a coordinated network. It was also noted that, with all this activity, a coherent collection of the various data sets is not available (as yet). In any case, although GAW is taking action to pull the various networks together, it is not yet clear whether this is being done to establish a reference measurement capability and to conduct research needed to advance measurement accuracy.

Based on the discussion, it was recommended that the Global Aerosol Climatology Project (GACP) continue but move to merging multiple sources of satellite aerosol measurements (e.g., AVHRR, TOMS and SAGE). Also, the Working Group on Column Atmospheric Profiling (formerly CPROF) should move aggressively to develop common cloud products because a network of such long-term sites, if suitably enhanced to include cloud, aerosol, water vapor and wind profiling, could serve as the keystone for study of cloud-aerosol interactions. No current network is designed to measure aerosol, cloud and radiative fluxes. Development of such new measurement capabilities is also needed to support new directions in GCSS modeling studies that focus on cloud microphysics (including aerosol effects).

### **IV. Clouds and Radiation**

Four other scientific presentations by Drs H. Okamoto, T. Hayasaka (GRP member), H. Barker (GRP member) and R. Cahalan were interspersed with reports and discussions of other radiation related activities. The first two talks highlighted the urgent need for organizing comprehensive radar/lidar (plus other instruments) measurements of the properties of ice clouds from the collection of sites participating in WGCAP (formerly CPROF) to supplement the forthcoming CloudSat/Calipso missions (PARASOL, a French polarimeter mission will also be in orbit). These talks also raised the question of the status of the World Radiation Data Center and its data holdings, access to which has been very difficult of late: this question will be investigated.

A merger of the GRP ICRCCM (comparison of model calculations to baseline cases) and the ARM BBHRP activities (closure tests) has produced a plan for a Continuous Intercomparison of Radiation Codes (CIRC) activity to set up a online facility (supported by the U.S. Department of Energy (DOE) Atmospheric Radiation Measurement (ARM) Program for both radiative transfer model tests and radiation closure experiments. A working group has been formed and plans have been drafted to create this web-based resource. This activity is especially crucial because there have been significant advances in the sophistication (physics included) of GCM radiation codes as reported to the GRP (third talk and report from Ramaswamy). The latter survey of current GCM radiative transfer (RT) code capabilities is being prepared for publication.

With the recent advent of a whole range of active and passive instruments operating at microwave frequencies, the GRP plans to review the status of microwave RT codes, especially at higher frequencies: this is crucial to fostering a thorough "all-instrument" analysis of the TRMM measurements and of the properties of land surfaces, including vegetation and water. The value of the EarthCare Simulator as a facility for testing satellite retrieval methods based on physical RT was highlighted and will be investigated further.

In the report from the 3DWG (fourth talk), it was particularly noted that recent advances in 3D radiative transfer modeling make possible many new remote sensing possibilities but that funding for developing such capabilities is lacking. Exciting results are beginning to come in from Solar Radiation and Climate Experiment (SORCE) but one thing that these results make clear is the importance of minimizing a potential gap in solar monitoring that may occur later this decade.

## **V. Ocean and Land Surface Fluxes**

Dr A. Bentamy (new GRP member) presented an overview of the status of determining ocean surface sensible/latent heat and momentum fluxes from satellite measurements showing that there have been improvements, that the results exhibit good agreement with *in situ* measurements and that there is definite value in a more systematic production of such products for ocean-related research. He also reported on the initial ideas for the new JSC Working Group on Surface Fluxes; with an early focus on ocean surface fluxes, the WG identified four tasks:

- (1) ongoing compilation, evaluation and intercomparisons of existing satellite estimates,
- (2) characterization of uncertainties of data products and development of metadata for these products,
- (3) further improvement of models and parameterizations used in satellite processing and
- (4) developing methods for merging and combining satellite/satellite/*in situ* and/or satellite/NWP flux estimates. The WG plans to focus on task 3.

In the following discussion, it was noted that SeaFlux had undertaken the first three tasks; the most notable unfinished items concerned developing better methods to estimate ocean surface skin temperatures (diurnally resolved) and near-surface atmospheric temperature and humidity. Based on this review, the GRP concluded that SeaFlux activities should continue to finish the comparison of newly produced data products leading to development of improved products with higher time resolution. It should also be noted that recent input from CLIVAR to planning that began under the JSC Working Group on Satellite Matters for coordinated re-processing of satellite products identifies most of the same quantities that SeaFlux had identified for improvement. C. Clayson has agreed to take over as chair of SeaFlux.

A report on activities to determine the sensible/latent heat fluxes at land surfaces identified new analysis possibilities by combining observations from many kinds of satellite instruments (solar, infrared, passive and active microwave) and highlighted the current focus on obtaining high-time-resolution, all-weather land skin temperatures and elucidating the complex relationship between satellite observations and soil moisture and vegetation properties. The GRP projects plan to provide satellite data products as part of joint [with the Global Soil Wetness Project (GSWP)/Global Land-Atmosphere System Study (GLASS) and International Satellite Land-Surface Climatology Project (ISLSCP)] evaluation of the second version of the GSWP products. An ISLSCP workshop in Spring 2005 to evaluate the new ISLSCP Initiative II data collection will set the stage for a more tightly coordinated evaluation of the GSWP-2 products later in 2005. These workshops should prepare for a re-processing of the data that is better coordinated among the various GEWEX components to close this part of the energy and water cycle. The GRP discussed possible activities for a continuing ISLSCP and recommended that, if its goals are to produce/analyze/improve/advance land surface property data products (e.g., albedo, skin temperature), then it should become a project under GRP. Otherwise GRP needs to organize activity in this area to complete the global energy and water cycle observations (see Section VII).

## **VI. Discussion of COPEs**

Discussion of COPEs/ Working Group on Observations and Assimilation (WGOA) plans highlighted four conclusions:

- Although all of the COPEs priorities should involve observations, all of them are described in “model-driven” terms except one;
- GRP activities already constitute the core of the need observational activities, especially given the activities in support of the GWEBS cross-cut involving more coordinated processing and analysis of the data products;
- Two GRP activities, BSRN and Global Precipitation Climatology Centre (GPCC), have already become key elements of Global Climate Observing System (GCOS); and
- GRP needs to articulate a more direct use of data products for the applications targeted by WCRP/COPEs as a complement to the “assimilation-prediction model” approach.

With regard to the last point, the current idea for the WGOA is to focus on how to make the best use of observations for improving modeling and prediction of climate, but the GRP members felt that this was much too “model-centric” and that “understanding the climate” was a better scientific goal. Connected with this topic, the GRP was informed that the JSC Working Group on Satellite Matters had formulated a plan for a comprehensive and coordinated re-processing of global satellite data products, that GCOS had agreed to join in this proposal and that the proposal would be submitted to Committee on Earth Observation Satellites (CEOS) to obtain agreement of the satellite agencies to support this activity.

## **VII. GWEBS**

There was further discussion of several inter-related topics. The GRP had already planned activities to produce merged data products to foster diagnosis of the variations of the global energy and water cycle; but now, in the context of the proposed GWEBS cross-cut, this activity takes on even more importance. A number of conclusions and actions were identified. The importance of the assessment activities has increased because we need to know how physically consistent these data products are in order to use them in an analysis of the global energy and water cycle. Moreover, this activity sets the stage for a coordinated re-processing of all the data products, if the projects are extended through the end of this decade. It was decided to capture Coordinated Enhanced Observing Period (CEOP) site subsets of the GRP data products as part of the global data product merger activity to provide a better connection under the GWEBS activity between GRP global analyses and the regional studies of GHP. Recent events in several other projects lead to the conclusion that GRP should await developments in other programs that might produce the needed water vapor data products: discussions at the ITWG meeting and at a joint UK-US workshop on measuring temperature trends have led to the recommendation that the basic temperature and humidity data sets be reprocessed together to obtain the most reliable information about the long-term changes of these two basic climate state variables. Completing the energy and water cycle observations also means that SeaFlux must be activated (with better connections established to CLIVAR), that land remote sensing needs to be advanced more aggressively (either by a new working group or project under GRP or by a continued ISLSCP and by a closer working relationship with GSWP), and that much more work is needed in the cryosphere (in collaboration with CLIC).

## **VIII. Precipitation Cross-Cutting Activity**

The precipitation cross-cutting activity was also discussed. Although a very small working group has been formed, it was emphasized that this activity still needs to involve researchers actually working on the problem. In particular, scientists working with GEWEX Hydrometeorology Panel (GHP) projects need to use and evaluate the usefulness of the global precipitation

(and other GRP) data products for achieving their goals. Particularly important issues concern the effects of space-time resolution on the value of these products, whether they can be used in high terrain and snow studies (the latter in collaboration with CLIC) and whether the global products are useful in evaluating process models [e.g., GEWEX Cloud System Study (GCSS), GLASS and GCMs (Working Group on Numerical Experimentation)]. Consideration of the resolution issue led to the recommendation that GRP (possibly under the precipitation cross-cutting activity) form an international working group to coordinate and foster the systematic analysis of data from surface precipitation radar networks at the highest space-time resolution available.

## **IX. Summary of Recommendations, Actions and Issues**

### **A. Recommendations**

- (1) The new JSC WGOA should initially take up the tasks to formulate a complete analysis strategy, including coordinated re-processing of global datasets, and to articulate the opportunities for more direct use of comprehensive data products for applications. Completion of these tasks should lead to specific lists of what needs to be done and who is doing (some of) them; a similar list should be obtained from all the other climate observing planning activities.
- (2) GPCP needs to increase efforts, possibly through the planned precipitation algorithm workshop, to develop better determinations of snowfall.
- (3) GRP welcomed efforts at the GPCC to separate precipitation types and increase the time resolution of its products.
- (4) GRP endorsed the activity of GPCC to expand its data products to encompass many more stations for longer time periods.
- (5) ISCCP should release the gridded but separated-by-satellite cloud products.
- (6) A review of the current satellite processing assignments for NOAA satellites is needed.
- (7) GRP endorsed the proposal that the next re-processing of the ISCCP products be based on the Stage B1 data set.
- (8) BSRN should continue actions to acquire aerosol-measuring capabilities and to coordinate with efforts to plan a more coherent aerosol observing network.
- (9) GRP endorsed the efforts of BSRN to combine its data products with the older radiation data archives, particularly GEBA, to develop longer time records from more sites.
- (10) GRP decided to proceed with a land remote sensing activity to close the global energy and water budgets; if a continued ISLSCP is given this task, then it should become a project under GRP for better coordination.
- (11) The Working Group on Clouds, Aerosols Profiling (WGCAP) is urged to move forward more aggressively to test out solutions to the "common format issue" so that they are ready for the Cloudsat/Calypso period and can begin thinking about how to address cloud-aerosol interactions.
- (12) GHP projects need to identify people who are or will actually work with the GRP data products to study land-atmosphere energy and water exchanges in regional basins.
- (13) Both cloud resolving modelers and GCMers need to be more active in the precipitation cross-cutting activity so GCSS and WGNE need to identify researchers who can participate in this activity.

**B. Actions**

- (1) The GRP chairman will distribute to the GRP members the GRP plan proposed a few years ago for their review (actually it is posted on the GRP web site).
- (2) The GRP chairman and J. Bates will draft a statement of concern about project funding threats and direct use of data products to be forwarded to the WGOA.
- (3) The JMA representative will suggest to the GRP chairman the names of scientists involved in producing its data products to participate in the GRP data product assessment activity. In fact all satellite agency representatives were asked to identify people in their organizations responsible for producing data products similar to those produced by the GRP projects and send their names to the GRP chairman: these people will be requested to participate in the data products assessments and in the activities of WGDMA.
- (4) One or more representatives of the new EUMETSAT Satellite Application Facilities will be invited to the next meeting to discuss closer cooperation.
- (5) The NOAA representative requested that GRP members suggest ways to exploit the refurbished full-resolution GOES imaging data.
- (6) The BSRN manager and GRP chair will collect information about currently operating aerosol networks to be distributed to the GRP members and investigate whether a subset of SkyNet sites can participate in BSRN.
- (7) A GAW representative will be invited to the next GRP meeting to brief the members on their activities regarding aerosol observations.
- (8) T. Hayasaka and P. Stackhouse will investigate to find out who might have surface radiative flux measurements from Chinese and Russian stations.
- (9) The GRP members should review the CIRC plan and send comments to this working group.
- (10) R. Cahalan to draft letter for GRP to send to research agencies to support development of new remote sensing analyses exploiting 3D effects and another letter to the space agencies raising the issue of continuity of solar monitoring.
- (11) W. Rossow and H. Barker will investigate the status of the EarthCare Simulator being developed at KNMI and A. Gruber will ask about interest in this for developing precipitation retrieval methods at the forthcoming IPWG meeting.
- (12) The GRP chair and several members (J. Bates, A. Gruber, T. Iguchi) will investigate the value of organizing a working group for precipitation radar networks, similar to WGCAP, to foster dissemination and use of broad-area, high-resolution precipitation measurements.
- (13) The GRP chair is to draft a letter for WMO to request the extension of the GRP data projects through 2010; three key tasks in the letter will be fuller exploitation of new satellite and field datasets, a coordinated re-processing of all the datasets and working to transition research-based data processing to operations.

**C. Issues**

- (1) The GRP name does not reflect its activities; it should be named the GEWEX Satellite Observation Panel. The GEWEX Panels may need some re-organization to align better with GEWEX Phase II goals.
- (2) Interactions between GRP projects and the rest of GEWEX activities are still not adequate.

- (3) Funding of existing projects may be endangered by myriad planning activities.
- (4) Although all of the COPES priorities should involve observations, all of them are described in "model-driven" terms except one.
- (5) Concern was expressed as to the status of the World Radiation Data Center which appears to be inoperative.

## **X. Plans**

Plans for next year include a review of the GRP strategic plan (considering all of the above topics), particularly with regard to defining its role in cloud-aerosol research activities, a review of plans for CIRC, WGCAP, SeaFlux and land activities (in collaboration with GSWP and CLIC), and evaluation of the results of data product assessments. A key emphasis of the revision of the GRP strategic plan will be to identify specific collaborations with several other GEWEX and WCRP groups that will be needed to advance the goals. Two members are retiring this year, Drs H. Barker and J. Ceballos.

The next meeting of the GRP will be in the fall of 2005 in Paris, hosted by the Paris Observatory. A review of this year's meeting format (joint meeting of WGDMA and GRP) led to the decision to have two separate and longer meetings next year. The WGDMA meeting will occur shortly after the GRP meeting at place yet to be determined.



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**Final Agenda for the WGDMA meeting**

18 October 2004, Monday

0830-0900: GEWEX Radiation Panel Report [Rossow]  
0900-0940: Radiation Assessment Report [Stackhouse/Wielicki]  
0940-1000: Aerosol Assessment Report [Haywood/Zhao]  
1000-1030: Break  
1030-1110: Precipitation Assessment Report [Gruber/Levizzani]  
1110-1130: Cloud Assessment Report [Campbell/Baum]  
1130-1200: Discussion of Assessment Plans [All]  
1200-1330: Lunch  
1330-1500: GPCP Center Reports  
[Overviews - Adler, Gruber, GMDC - Adler]  
1500-1530: Break  
1530-1700: GPCP Center Reports  
[GMWDC - Chiu, GIRDC - Gruber, GPCC - Schneider]  
1700: Adjourn

19 October 2004, Tuesday

0830-0930: ISCCP Center Reports  
[Overview, GPC and SCC - Rossow, also GACP]  
0930-1000: ISCCP Center Reports [JMA - Hasegawa]  
1000-1030: Break  
1030-1200: ISCCP Center Reports  
[EUM - Holmlund, CSU - Campbell, NOA - Bates]  
1200: Lunch  
1330-1400: ISCCP Center Reports [ICA - Bates]  
1400-1500: Project Reports [SRB - Stackhouse]  
1500-1530: Break  
1530-1630: Project Reports [BSRN - Dutton]  
1630-1730: Discussion of Revised and Merged Data Products  
1730: Adjourn  
1830: Reception at Restaurant Fable Table

## Final Agenda for the GRP-15 meeting

20 October 2004, Wednesday

0830-1000: Executive Session (GRP Members only)  
 1000-1030: Break  
 1030-1115: GEWEX Report [Sommeria]  
 1115-1200: WGDMA Report [Rossow - Projects' Status, Data Products, Assessments]  
 1200-1330: Lunch  
 1330-1500: Satellite Agency Reports  
 [JAXA - Tanaka, JMA - Hasagawa/Miyaoka, CMA-Liu]  
 1500-1530: Break  
 1530-1630: Satellite Agency Reports  
 [EUMETSAT - Tjemkes, NOAA - Bates]  
 1630-1700: Report on WGSW/WGOA [Sommeria/Rossow]  
 1700: Adjourn

21 October 2004, Thursday

0830-0915: Science Presentations [Li]  
 0915-1000: Discussion of Aerosol Research Plan [Haywood]  
 1000-1030: Break  
 1030-1115: Science Presentation [Bentamy]  
 1115-1200: Discussion of Ocean/Land/Ice Surface Remote Sensing Plans [including SeaFlux - Prigent/Bentamy/Rossow]  
 1200-1330: Lunch  
 1330-1500: Science Presentations [T. Nakajima, H. Okamoto, T. Hayasaka]  
 1500-1530: Break  
 1530-1600: Project Report [ICRCCM - Barker]  
 1600-1700: Discussion of Science Presentations and ICRCCM plans  
 1700: Adjourn

22 October 2004, Friday

0830-0900: Science Presentation [Barker]  
 0900-1000: Project Reports [3DWG & SORCE - Cahalan, CPROF - Rossow]  
 1000-1030: Break  
 1030-1115: Discussion of Data Product Assessments  
 1115-1200: Discussion of GWEBS and Precipitation Cross-Cut  
 1200-1330: Lunch  
 1330-1415: Wrap-Up – Action Items  
 1415-1500: Executive Session (GRP Members only)  
 1500: Adjourn