

# TABLE OF CONTENTS

	<u>Page No.</u>
List of acronyms	
1. GENERAL TOPICS	1
1.1 GEWEX Strategy and Goals relevant to GRP	1
1.2 GEWEX/GRP links to Agencies	2
1.3 Management of Global Data Products under GRP auspices	3
1.4 Joint diagnostic studies	4
1.5 Exploitation of new satellite data sets	5
1.6 Plans to address issues of feedbacks in the climate system	5
2. SPECIFIC PROJECT TOPICS	5
2.1 Intercomparison of Radiation Codes used in Climate Models (ICRCCM) and of 3-D Radiation Codes (I3RC)	5
2.2 GEWEX Global Precipitation Climatology Project (GPCP)	7
2.3 GEWEX Water Vapor Project (GVaP)	8
2.4 Column Profiling (CPROF) Working Group Proposal	8
2.5 GEWEX Aerosol Climatology Project (GACP)	9
2.6 International Satellite Cloud Climatology Project (ISCCP)	9
2.7 Surface Radiation Budget (SRB)	9
2.8 Baseline Surface Radiation Network (BSRN)	10
2.9 SeaFlux Initiative	10
3. NEXT MEETING	10
APPENDIX : List of participants	

## LIST OF ACRONYMS

ARM	-	Atmospheric Radiation Measurement
BSRN	-	Baseline Surface Radiation Network
CEOP	-	GEWEX Coordinated Enhanced Observing Period
CGMS	-	Coordinating Group for Meteorological Satellites
CSE	-	GEWEX Continental-Scale Experiment
EOS	-	Earth Observing System
ESA	-	European Space Agency
GABLS	-	GEWEX Atmospheric Boundary Layer Study
GCSS	-	GEWEX Cloud System Study
GEWEX	-	Global Energy and Water Cycle Experiment
GHP	-	GEWEX Hydrometeorology Panel
GLASS	-	Global Land/Atmosphere System Study
GMPP	-	GEWEX Modelling and Prediction Panel
GOES	-	Geostationary Operational Environmental Satellite
GPCP	-	Global Precipitation Climatology Project
GRAS	-	Global navigation satellite system Receiver for Atmospheric Sounding
GRP	-	GEWEX Radiation Panel
ICRCCM	-	Intercomparison of Radiation Codes used in Climate Models
ISCCP	-	International Satellite Cloud Climatology Project
MSG	-	Meteosat Second Generation
NASA	-	National Aeronautics and Space Administration
NASDA	-	National Space Development Agency of Japan
NOAA	-	National Oceanic and Atmospheric Administration
NPOESS	-	National Polar Orbiting Operational Environmental Satellite System
SAF	-	Satellite Application Facilities
SCOR	-	Scientific Committee on Oceanic Research
SPARC	-	Stratospheric Processes and their Role in Climate
SSG	-	Scientific Steering Group
SRB	-	Surface Radiation Budget
TRMM	-	Tropical Rainfall Measuring Mission
WCRP	-	World Climate Research Programme
WGCM	-	Working Group on Climate Modelling
WGNE	-	Working Group on Numerical Experimentation
WRAP	-	Water Resources Applications Project

## 1. GENERAL TOPICS

### 1.1 GEWEX Strategy and Goals relevant to GRP

ISSUE/DISCUSSION: The GRP was informed by the SSG Chair and the Director of the International GEWEX Project Office (IGPO) that the main components of the GEWEX strategy going forward that are relevant to the work of GRP are related to:

- (i) completing long time period (twenty year) data sets,
- (ii) following through with and initiating new diagnostic studies utilizing GEWEX data sets,
- (iii) exploiting "products" from new satellite systems in specific diagnostic studies,
- (iv) making specific progress on diagnostic studies related to understanding joint (forcing and feedback) variability in climate processes.

ACTIONS/RECOMMENDATIONS: Because of the contribution to development of specialized GEWEX data sets expected from the GEWEX Coordinated Enhanced Observing Period (CEOP) initiative it will be important to maintain links between the work being undertaken in GRP and the implementation of CEOP. **Rossov** has the initial **action (A1)** in the development of the GRP/CEOP interactions to ensure that the GRP/ISCCP Internet pages are linked.

In the broader context, GRP connections to the GEWEX Hydrometeorology Panel (GHP) must be strengthened. **Rossov** has the **action (A2)** to investigate with the Chair of GHP, joint initiatives in studies that GHP has undertaken in closing regional water and energy budgets (WEBS) and in developing connections to the water resources management community (WRAP).

Rossov will work through the GEWEX SSG to enhance these connections and especially to work at the interface with the water resources management community to emphasize the inherent large-scale aspects of the surface water budget variability under investigation in GEWEX and the impacts of these scale issues on improved prediction of the variability, and recommend that the GHP promote, within the GEWEX Continental-scale Experiments (CSE's) and as part of CEOP, the development of data sets that exceed the resolution of, but are similar in content to, those already being produced and planned for production under the auspices of GRP. Other specific plans were discussed and actions related to inter-panel cooperation identified (see items 1.3, 1.4 and 1.5).

ISSUE/DISCUSSION: A presentation by Dr Stephens emphasized the points that GRP should:

- (i) continue to reach out to the climate modeling community especially in the further development and application of global data sets in model studies;
- (ii) interact with funding agencies to encourage continued support for development of long time series global data sets necessary for climate research, especially those already under production under the auspices of GEWEX/GRP;
- (iii) be aggressive in development of connections to international data collection and processing groups and related science communities doing research on the radiative aspects of the climate system and
- (iv) reaffirm its commitment to GEWEX framework with regard to its work toward meeting the following milestones associated with radiative fluxes;
- (v) Understand and determine net radiative fluxes in the atmosphere and at the Earth surfaces and the variation of the these fluxes to an accuracy of:
  - $F \sim 20 \text{ W/m}^2$  by the year 2000 to support improved weather forecasting (i.e., 1 day, 100 km resolution),
  - $F \sim 15 \text{ W/m}^2$  by the year 2005 to support prediction of climate anomalies like ENSO (i.e., 5 day, 200 km resolution),
  - $F \sim 5 \text{ W/m}^2$  by the year 2010 to support prediction of climate change (i.e., monthly, 200 km resolution).

ACTIONS/RECOMMENDATIONS: **GRP** endorsed these points and agreed that it would especially continue to **review and revise the science foci as necessary** to make an appropriate contribution to the global objectives of WCRP/GEWEX.

ISSUE/DISCUSSION: In concert with the necessity for continued review and revision of the main goals and foci of GRP it was agreed that there was a need for establishment of a baseline position on the state of the field of atmospheric radiation research, which GRP has responsibility for within GEWEX.

ACTIONS/RECOMMENDATIONS: **Wielicki** has the **action (A3)** with support from **Rossow, Curry, Ramaswamy, Barker and Stackhouse** to formulate the contents of an article summarizing accomplishments in understanding atmospheric radiation during the past decade with an emphasis on contributions made by GRP. The process should include solicitation of comments of current and former GRP members and the addition of co-authors as required. The article should be prepared for submission, by mid-2002 to the Bulletin of the American Meteorological Society (BAMS) or similar publication.

**Rossow** has the **action (A4)** with the support of members of the GRP to use the framework of the BAMS-type article to solicit review articles to be submitted by the end of 2002 as a set of material that highlights accomplishments in understanding atmospheric radiation during the past decade with an emphasis on contributions by GRP. This set of articles will be organized for submission to the Journal of Climate or another suitable publication.

## 1.2 GEWEX/GRP links to Agencies

ISSUE/DISCUSSION: Following the arguments presented by GEWEX to space agencies, significant steps have been made by space agencies to meet GEWEX needs for satellite data necessary to advance global climate studies in line with WCRP/GEWEX objectives. The operational satellites are also of critical importance to on-going and planned GEWEX initiatives.

ACTIONS/RECOMMENDATIONS: The Panel, therefore, **recommended** that the **GEWEX SSG** and **WCRP** again **emphasize the importance of the continuity of the measurements from the suite of operational geostationary and polar orbiting satellites**. Furthermore, the GRP emphasized the need for funding Agencies to provide the on-going support required for the operational services to assist with free and open access of these measurements to the research community including funding for the collection, formatting and distribution of the data to meet specific research requirements such as those embodied in the GEWEX global climatology projects (ISCCP, GPCP, GACP, SRB, etc.). There was recognition that the operational satellites together with the earth observing missions currently planned by NASA, ESA, NASDA and other national and international space agencies and climate research institutes, will provide the framework for the main thrust of the second phase of GEWEX and, simultaneously, will fulfill several of the main requirements of WCRP as a whole.

ISSUE/DISCUSSION: The Panel was informed about the NOAA satellite status and plans. The currently operating NOAA satellites are NOAA-16 and GOES-8 and GOES-10. GOES M was launched in July 2001 and became GOES-12 in August 2001 and will become operational in December 2001. GOES-12 has different capabilities including changes in the imager that provides for:

- (i) 6.7 micron wavelength channel resolution changed from 8 km to 4 km,
- (ii) 12.0 micron wavelength channel (4 km) replaced by 13.3 micron wavelength channel (8km) adding improved cloud height accuracy for cloud motion vectors.
- (iii) Plans for GOES O and P, to be launched in April 2004 and April 2006, respectively, with the 13.3 micron channel resolution improved to 4 km.

Beginning with GOES-R in 2010, NOAA plans to add both an Advanced Baseline Imager (ABI) and an Advanced Baseline Sounder (ABS). Because these plans are just entering the proposal stage it is possible to impact their final configuration. The Panel was, therefore, asked to comment on the proposed changes, which include issues related to:

- (i) On-board visible calibration that could be available in real-time and checked with vicarious calibration;
- (ii) Including 3 visible bands (not just the 0.6  $\mu\text{m}$ );
- (iii) Support the 14-channel imager;
- (iv) Have 0.5 km resolution for all 3 visible bands (not just the 0.6  $\mu\text{m}$ );
- (v) Providing 5 minute Full Disk scans, (versus 15 minutes with 5 minute CONUS scans) for the ABI and
- (vi) 4 vs. 10 km IGFOV resolutions to provide for better "cloud-clearing", moisture flux calculations and hurricane eye soundings as well as;
- (vii) the need for a low-light (visible) sensor for the ABS.

**ACTIONS/RECOMMENDATIONS:** The Panel agreed to provide NOAA with a formal response as to the value of the changes made in GOES-M through Q and the proposed changes associated with the configuration of the new ABI and ABS instrumentation on the NOAA spacecraft beyond NOAA-R. **All Panel members** should **provide their inputs to Rossow** by 31 December 2001. **Rossow** has the **action (A5)** to draft a letter that summarizes the Panel's position on the GOES planning. It will be determined, at the GEWEX SSG meeting (29 January to 1 February 2002, Reading, UK) whether or not a final version of the letter should be reviewed for possible signature and distribution by the Director of WCRP or the Chairman of the SSG.

**ISSUE/DISCUSSION:** Dr S. Tjemkes reported on the continued development of operational monitoring of climate and the detection of climate change, which has been added to EUMETSAT's primary objective of operating weather satellites. Currently, EUMETSAT is operating three geostationary satellites, METEOSAT-5, 6 and 7. METEOSAT-7 is the primary (METEOSAT-6 is backup) satellite viewing Europe and Africa; METEOSAT-5 views the Asian/Indian Ocean sector. A new service has been introduced, Rapid Scan, which can be used for cloud-tracked winds. In support of ERA-40, a re-processing of all older METEOSAT data to determine winds is underway. In concert with this new directive and as part of the Meteosat Second Generation (MSG) launch, planned for mid-2002, a new distributed ground segment has continued to evolve based on a series of Satellite Application Facilities (SAFs) which are being implemented as centres of excellence in various host countries to concentrate on collection, archiving and analysis of specific data sets and the advancement of specialized operational and research techniques. These include Nowcasting, Ocean Sea Ice, Ozone, NWP, Climate Monitoring, Land Surface Analysis and for the Global navigation satellite system Receiver for Atmospheric Sounding (GRAS). More information on the SAF system can be gleaned from the EUMETSAT home page at [www.eumetsat.de](http://www.eumetsat.de) under the heading of "Programmes Under Development".

**ACTIONS/RECOMMENDATIONS:** Dr Tjemkes asked the Panel to consider the possibility of a more formal interaction between the GRP satellite projects and the EUMETSAT SAF Project. The **members of the Panel** were asked to take the **action (A6)** to review the SAF concept and learn more about specific SAF goals and objectives that may align with work being undertaken by GRP for GEWEX. Any **comments** related to the operation of the SAF's as it might pertain to GRP should be **provided to Rossow** by 15 January 2002. The value of interaction with the SAF Project and possible mechanisms for a formal process of interfacing with specific SAF's will be taken up at the January/February session of the **GEWEX SSG**. **Rossow will report on the results** of this discussion to the GRP members, in due course, prior to the next GRP meeting.

**ISSUE/DISCUSSION:** The GRP must ensure that it has open lines of communication with all Agencies/Organizations actively involved in GRP related initiatives these include the Canadian Space Agency/MSC, NASDA/JMA, NASA/NOAA, ESA/EUMETSAT, the Colorado State University, and other similar facilities. Moreover, contacts should now be made with similar agencies in other countries operating or soon to operate relevant satellites (e.g., Russia, China, Brazil).

**ACTIONS/RECOMMENDATIONS:** All members are asked to **(action A7) advise Rossow** of Web Pages associated with any agencies/institutes/organizations that they interact with or represent that are involved with actively advancing the GRP goals. An initial input should be provided to Rossow by mid-January 2002, but this action should be an on-going effort, whereby, all members keep Rossow informed of any changes, additions or deletions to the list of relevant links. **Rossow** has agreed to **(action A8)** add the links to the GRP Web site and maintain the site with appropriate associations noted and active, as part of an on-going process for maintaining a viable GRP presence on the Internet.

### 1.3 Management of Global Data Products under GRP auspices

**ISSUE/DISCUSSION:** Notwithstanding the success of WCRP, all research programs require a long series of comprehensive observations with an integrated analysis of the datasets. To date the ISCCP, GACP and SRB data sets are the ones approaching the goal of obtaining a 20-year data record. The other GRP data projects, GPCP and GVAP, depend on the availability of satellite microwave measurements, which limits their current data record to about 14-years.

**ACTIONS/RECOMMENDATIONS:** It was **recommended**, therefore, that since current plans for the satellite and surface observing systems do not dictate a change of analysis schemes in the near future, ISCCP and the other GEWEX data projects, including GPCP, SRB, GACP, GVAP and SeaFlux, should continue.

Rossow has the **action (A8)** to advise the GEWEX SSG, the Director of WCRP and the WCRP Joint Scientific Committee (JSC) to undertake to ensure that requests for support are made to the major space agencies to secure funding of the current GEWEX global climate information projects well into the first decade of the 21<sup>st</sup> Century. It will only be at that time that resources may become available that will make it possible to add value to the new earth observation system retrieval processes by organizing intercomparisons, applying merged data techniques and participating in unified algorithm development ventures. This exploitation requires not only that the participating GEWEX International data centers collect, analyze and disseminate their data products, but also that they calibrate, quality check, adapt processing software to changing operational systems, and validate their products. Therefore, the request to agencies for a renewal of their commitments to these projects must include the need for minimum funding levels to be established which are sufficient to support all of these tasks. The European (ESA/EUMETSAT), Asian (NASDA/JMA, CMA), Canada (Canadian Space Agency/MSC) and USA (NASA/NOAA) Agencies and other relevant institutes, and organizations must all be made aware of this need for continued support of these projects.

A specific action is for Wielicki, Rossow and Stackhouse, to draft a letter for review and signature by the GEWEX SSG Chairman, on behalf of GRP, to NASA describing the value added to new NASA data products by having a substantial (greater than one year) overlap with other GEWEX data sets evolving under GRP auspices. The letter would specifically identify and support the work needed to understand relationships among these data sets. The letter would note, as a specific example of this value added concept, the potential of constructing a long (greater than 20-years) time series earth radiation budget data set from data collected on multiple spacecraft (i.e. NIMBUS-7, ERBE, ScaRaB and CERES) and would further comment on the forthcoming gap (between EOS-Aqua and NPOESS) in top-of-atmosphere measurements and opportunities to fly existing CERES instruments.

#### 1.4 Joint diagnostic studies

ISSUE/DISCUSSION: Although the main points in the implementation of GEWEX to achieve the required scientific progress have remained the same, the research in the individual elements has been focused on specific scientific issues that have been developed to unify their efforts in meeting the higher-level global scale objectives. In the context of this emphasis on "inter-panel" co-operation, the GEWEX SSG has recommended that the three panels (GHP, GRP and GMPP) develop further specific co-operative/co-ordinated activities whose progress can be tracked and jointly reported at subsequent SSG meetings.

ACTIONS/RECOMMENDATIONS: The concept of the need for specific steps to be taken toward co-operation in the collection of data for the existing GEWEX data sets was endorsed as a means of furthering the advancement of unified global objectives in GEWEX. It was recommended that steps be taken, including joint meetings of the collection and processing teams for the climatological data projects under GRP auspices, to address commonality of collection and production of these products, leading to preparation of a common global data set (same grid and time resolution, i.e. monthly mean and daily) with supportive ancillary information that can facilitate joint diagnostic studies dealing with variability of the global energy and water cycles. This work should focus on GRP initially but with the intention of encompassing work in GMPP (GCSS, GLASS and GABLS), and in GHP (CEOP).

**Bates**, with assistance from **Rossow**, has the **action (A9)** to organize a discussion of common dataset format (initially by way of email correspondence) and to collect suggestions from **all GRP members** for a short list of standard statistical analyses that should be applied (separately at first) to all GRP (eventually all GEWEX) data sets and which will be designed to lead to more advanced joint analyses.

In the ensuing discussion two specific focused interactions, between elements of GEWEX, were discussed that **Rossow** agreed to (**action A10**) carry forward to the GEWEX SSG meeting in early 2002 for consideration as potential new GEWEX Panel sub-projects. The SSG will be asked to consider:

- (i) Directing GRP, GHP/ISLSCP and GMPP/GLASS to work together to organize a "LandFlux" project that uses the experience gained in the, GRP initiated, SeaFlux (see Item 2.11 below), including the adoption of the goals and strategy that parallel those undertaken by SeaFlux, but which relies primarily on data from the GHP CSE's and CEOP and;

- (ii) Directing GRP and GMPP to work together to develop a strategy for advancing knowledge of 3-Dimensional radiation coupling to the cloudy boundary layer turbulence and to the land surface, including the possible organization of a focused workshop to establish such a strategy.

#### 1.5 Exploitation of new satellite data sets

ISSUE/DISCUSSION: Data have begun to arrive from the first of the new series of earth system satellites (e.g., TERRA, TRMM, AQUA, ENVISAT, ADEOS II, Cloudsat and CALIPSO, etc.), and with the success of the projects developed within Phase I, GEWEX is moving into Phase II. The framework will build upon new global descriptions of the earth's environment, upgraded model representations on which to base predictions, new local and regional descriptions of key processes, and an increasing focus on water resource applications. A main component of the strategy for Phase II are global products and data sets that extend our current base of knowledge and evolve from the exploitation of new sensors.

ACTIONS/RECOMMENDATIONS: The **lead for each of the GEWEX data projects, evolving under the auspices of GRP, including GPCP, SRB, ISCCP, GACP, GVaP and SeaFlux**, has the **action(A11)** to report at next GRP meeting (August 2002) on their strategy/plans for exploiting new satellite products/data sets available or planned over the next decade.

#### 1.6 Plans to address issues of feedbacks in the climate system

ISSUE/DISCUSSION: To support efforts by the GRP to implement a consistent strategy of assessment and thereby to advance knowledge of radiative feedbacks and responses in the climate system, it had earlier been recommended that a workshop on radiative feedbacks in the climate system be organized. The workshop would be sponsored by WCRP/GEWEX and would be undertaken by GRP in coordination with the other main components of GEWEX (GMPP/WGNE and GHP). The workshop would also take into consideration issues under review by the Working Group on Coupled Modeling (WGCM).

ACTIONS/RECOMMENDATIONS: Further discussion of the idea has shifted the focus for now in two ways. First, a consideration of what is entailed in determining cloud-radiative feedback suggests that it would be more appropriate to consider cloud-climate feedback in terms of the joint variability of the energy and water cycles since clouds couple these two. This makes use of merged global datasets for understanding climate feedbacks imperative. Second, the complexity of the problem suggests the need to develop better, more advanced analysis methods to be applied both to observations and to climate model output.

**Rossow and Curry** have the **action (A18)** to contact appropriate GEWEX representatives to be part of the organizing committee and to advance planning on the Workshop including finalizing the purpose statement, goals and objectives, developing a list of potential participants and selecting a candidate time and venue for the meeting. The list of participants should include scientists from WCRP/GEWEX but should also have expertise from climate modelers, statisticians, control theorists and diagnosticians. The GRP Chair will present the draft plan as noted above for comment to the GEWEX SSG at their meeting at the end of January 2002 so that an announcement for the Workshop could be forthcoming by early 2002 for a Workshop that would take place by the end of 2002.

**All GRP members** have the **action (A19)** to provide names of possible participants at the workshop who are working with new feedback analysis approaches and concepts.

## 2. **SPECIFIC PROJECT TOPICS**

### 2.1 Intercomparison of Radiation Codes used in Climate Models (ICRCCM) framework

ISSUE/DISCUSSION: At its previous meeting, the Panel had endorsed the need for additional model-observation comparisons within the Intercomparison of Radiation Codes used in Climate Models (ICRCCM) framework in both clear-and-cloudy conditions. The **recommendation** was to give priority to extending the clear-sky comparisons to water vapor conditions more typical of tropical and Arctic conditions. At that time, action was accepted by Stephens, Ellingson and Ramaswamy to develop goals of an ICRCCM-III effort. At the current meeting, the Panel was presented with a draft implementation plan for this activity, by the co-chairs of ICRCCM, Ellingson and Barker.

The elements of the project were identified to be provision of profiles of cloud and atmospheric properties; calculations of up- and down-welling fluxes at all levels and heating rate profiles; and comparisons of results with each other and with *Monte Carlo* benchmark calculations. (The model atmospheres provided in the study are to include clear-sky references, homogeneous overcast clouds and cloud-resolving model (CRM) fields). Establishment of the benchmark fluxes for the calculations will follow the process earlier established for the SW activity, of using line-by-line radiative transfer model (LBLRTM) code for the 1-D clear and overcast cases. The *Monte Carlo* models will be compared with the LBLRTM as required. Whether they will work well for a full set of 3-D LW benchmarks for all the CRMs remains to be determined. Details of the SW process can be found on the Internet at <http://reef.atmos.colostate.edu/icrccm/>.

**ACTIONS/RECOMMENDATIONS:** The overall purpose, of ICRCCM-III, to assess how well 1D-radiation codes used in NWP models and GCMs interpret and handle unresolved clouds, was endorsed. The basic approach was also accepted. It was acknowledged that Ellingson and Barker would carry the process forward. The Panel went on record, however, with the **recommendation** that efforts should first be made to prepare and publish, either on the Internet or on other easily distributed media, such as CD-ROMs, case study inputs and LBLRTM and 3-D RT model flux results that could be used for new (in the LW case) or additional (in the SW case) radiative transfer code comparisons but not to undertake any actual (inter)comparisons in either case. In addition in every case it was recommended the published comparison packages include determinations of Jacobians of results to address uncertainties in sensitivities of results.

The specific recommendation for the ICRCCM-LW initiative was to prepare and publish (on the Internet or CD-ROM) the standard case study inputs and LBLRTM flux results for further RT code intercomparisons. Include in the package determinations of Jacobians of results to address uncertainties in sensitivities. Do not, however, actually conduct the comparisons.

The specific recommendations for the ICRCCM-SW activity included:

- (i) To **prepare and publish** (Internet, CD-ROM, etc.) the standard case study inputs and 3-D RT model flux results. Include with those items determinations of Jacobians of results to address uncertainties in sensitivities of results so that the entire package could be used for further SW radiative transfer code comparisons, similar to those already completed.
- (ii) To **prepare and publish** (Internet, CD-ROM, etc.) the standard case study inputs and LBLRTM flux results associated with absorption by water vapor and include with the package determinations of Jacobians of results to address uncertainties in sensitivities. The published "package" should allow for further RT code comparisons, but **it is not recommended to actually undertake any comparisons**.
- (iii) Discussions should be taken up with the Chairpersons of the GEWEX Cloud System Study (GCSS) Cirrus Cloud Working Group (WG2) and the GCSS Polar Cloud Working Group (WG5) respectively, to **settle on plans for conducting joint case studies** that focus on comparisons of model formulations of SW radiative transfer through ice clouds to determine which parameterizations work most effectively under those conditions. These discussions should take place by the time of the next GCSS meeting in May 2002.

**Barker and Hayasaka** have the **action (A12)** to prepare an "agenda" for these talks that addresses the topics of greatest importance in designing a methodology to evaluate formulations in models associated with the "treatment" of radiative transfer in ice clouds.

**ISSUE/DISCUSSION:** I3RC, unlike ICRCCM, has the goal of assessing the accuracy and speed of 3-D radiative transfer codes and making such codes more widely available through an "open source" initiative. Results of Phases 1 and 2 have been published on the web at <http://i3rc.gsfc.nasa.gov> and can be viewed there via an interactive plotting routine. I3RC is now developing an open source 3-D code, which will be the main focus of the November 2002 workshop. Follow-on activities of I3RC will occur as part of a standing 3-D Working Group of the International Radiation Panel, as approved at their July 2001 meeting in Innsbruck.



**ACTIONS/RECOMMENDATIONS:** The panel recommended that discussions begin between the leaders of I3RC and ICRCM and the GCSS, the GEWEX Atmospheric Boundary Layer Study (GABLS) and the GEWEX Land-Atmosphere System Study (GLASS) that will result in plans for specific case studies that examine the importance of 3-D radiative effects on the coupling of radiation to (cloudy and clear) boundary layer turbulence and to land surfaces. One forum for such discussions is the I3RC workshops, as well as future meetings of the 3-D Working Group of the IRC.

Other actions/recommendations related to the generalized discussions and recommendations in this part of the meeting included:

- (i) **Ramaswamy** accepted the **action (A13)** to undertake to compile as complete a list as possible of recent upgrades to the physics formulations in GCM radiative transfer codes. **All GRP members should provide inputs to this process.**
- (ii) **Cebellos** will (**action A14**) prepare a proposal of how possible case study data could be used for additional radiative transfer code comparisons, which would incorporate measurements of top-of-atmosphere and surface radiative fluxes, together with accurate and complete specifications of the surface, atmosphere and cloud properties. This proposal should be ready for discussion by the time of the next GRP session (August 2002).

## 2.2 GEWEX Global Precipitation Climatology Project (GPCP)

**ISSUE/DISCUSSION:** Earlier results from analyses of the ISCCP cloud products and connections between ISCCP and GPCP had confirmed the underlying principle that ISCCP and GPCP address distinctly different cloud populations and thus that there was possibly justification for their use of different sampling strategies. It had, therefore, previously been recommended that GPCP continue to follow its current strategy toward multi-spectral retrievals and that the Managers of the two Projects continue to seek ways to converge toward a more consistent satellite data collection procedure.

The GRP was informed of the goals, organizational structure, products and future plans of GPCP. GPCP data are available electronically from NCDC/WDCM at: <http://wrf.ncdc.noaa.gov/oa/wmo/wdcamet-ncdc.html>. Three new data sets have been added to the GPCP suite of products: a globally complete monthly 2.5°x 2.5° latitude/longitude data set beginning in 1979 and continuing, a daily 1°x 1° data set beginning in 1997 and continuing, and a 2.5°x 2.5° pentad data set beginning in 1979 and updated through December, 2000. These complement the standard GPCP, 14-year (1987-2001) data set that continues to be up dated and available for analysis.

The formation of an International Precipitation Working Group (IPWG) under the Auspices of the CGMS was described. The newly formed IPWG was explained to have been formed in order to focus the scientific community on operational and research satellite based quantitative precipitation measurement issues and challenges. It is expected to provide a forum for operational and research users to exchange information on: development of better methods for measuring precipitation; improvement of their utilization; improvement of their utilization; improvement of scientific understanding and development of international partnerships. Drs Gruber and Levizzani have been designated as Co-chairs and the initial meeting of the Group has been planned for mid-2002 in Spain.

Also reviewed was a proposal for a GEWEX workshop to review objective analysis procedures for merging various estimates of precipitation.

**ACTIONS/RECOMMENDATIONS:** The effort by the contributors to GPCP to continue the availability of the standard GPCP products and to add new complementary data sets in response to requirements from the science community was commended. It was **recommended**, however, that the **GPCP develop and implement a snow product** as its next highest priority initiative, with the underlying methodologies to be to focus on separating land gauge data into rain and snow and testing of available microwave snowfall schemes for an over ocean snow estimation product.

The formation of the IPWG was endorsed, but it was recommended that to be most effective the IPWG must address issues related to precipitation dynamics and to focus its interactions between international operations and research communities on topics that relate to the analysis and understanding of the dynamical aspects precipitation in the climate system.

It was recommended that **Gruber** take **action (A15)** to hold the proposed workshop on methods for objective analysis procedures, however, although the main focus may be on precipitation comparisons, the scope of the **workshop should be broadened to include more general topics of importance to GEWEX data analyses, such as the comparison of gridded data sets with differing space-time resolutions.** **Gruber** should work on the plans for the workshop with these more general issues in mind and carry the final concept forward for discussion at the GEWEX SSG meeting in early 2002.

### 2.3 GEWEX Water Vapor Project (GVaP)

ISSUE/DISCUSSION: The initial GVaP pilot phase ended in 1997 after having provided the development and distribution of global water vapor data sets for use by the WCRP research community. Based on these results the project was approved by the GEWEX SSG to enter an implementation phase through 2004. Earlier accomplishments and current efforts and plans include release of the GVaP Integrated Observing Systems Test (IOST) data sets, readiness for release of a full 10 year pilot data set, access to a 20 year operational product, National and International commitments to expand data collection and processing, coordination with the SPARC Water Vapor Assessment initiative related to an international inter-comparison and assessment of upper and lower tropospheric water vapor observations and modeling results, and support for the use of the Water Vapour Sensing System (WVSS) for expansion of observations using commercial aircraft as the data collection platform. Dr Tom Vonder Haar's interest in stepping down as Chairman of GVaP has been acknowledged and his work on GVaP has been commended. Dr Brian Soden has undertaken leadership of GVaP.

ACTIONS/RECOMMENDATIONS: An earlier recommendation to convene an on-going GVaP science and implementation advisory panel was reconfirmed. **Soden** has the **action (A16)** to follow-up with this recommendation to ensure a broad scientific and user oriented approach can be maintained in the development of appropriate water vapor data products.

In connection to the earlier successful interaction with the SPARC Water Vapor Assessment (WAVAS) initiative, it was **recommended** that GVaP initially focus on an extension of this type of activity by organizing and conducting evaluation of tropospheric water vapor datasets including some review of new retrieval methods being developed for soon-to-fly infrared spectrometers and for microwave humidity sounders. GVaP should investigate on the national level whether or not this type of study could be undertaken within the DOE ARM framework and internationally under the auspices of the Committee for Geostationary Meteorological Satellites (CGMS).

### 2.4 Column Profiling (CPROF) Working Group Proposal

ISSUE/DISCUSSION: A new study project had earlier been discussed that would be undertaken under the auspices of the GRP. The proposal is that this new activity would be related to the tropospheric profiling of clouds, precipitation, water vapor and other radiatively important constituents, such as aerosols. The concept is to create an international working group of experts, some of who are already associated with the CloudSat Project Science team. By building on work already begun by the CloudSat team a set of standards could be developed for processing and archiving of radar and lidar data to make them more useful to the scientific community at large especially the NWP/GCM modeling groups. The new GEWEX Working Group would also develop strategies for coordinated periods of data acquisition that would consider the differences in system operating modes. A common data protocol and linked database structure would also be devised for *in situ* data acquired simultaneously with the remotely sensed data. Such data, both ground-based and aircraft based, would be valuable in the development of processing algorithms. Algorithm intercomparisons would then be possible as an additional aspect of this new function.

Organization of a new Column Profiling (CPROF) Working Group was endorsed. **Ackerman** has the **action (A17)** to lead the development of this group with a mandate to organize and conduct analyses that emphasize those sites that collect data routinely (if not continuously) from cloud radar and lidar instrumentation and to expand the work where possible to sites that also operate water vapor profilers (e.g., Raman or DIAL lidar) and wind profilers. Further definition and scoping of the details necessary to implement this proposal should be carried forward as an on-going action whose progress can routinely be reported to the GRP Chairman leading up to an expanded review at the next GRP meeting (August 2002). The GEWEX SSG should also be informed of the inception of the effort within GRP.

## 2.5 GEWEX Aerosol Climatology Project (GACP)

ISSUE/DISCUSSION: GACP was established in 1998 as part of the NASA Radiation Sciences Program and GEWEX. Detailed information about the project can be found at the GACP web site <http://gacp.giss.nasa.gov>. The Goddard Institute for Space Sciences (GISS) component of GACP has developed a new, two-wavelength (0.6 and 0.9 microns), aerosol retrieval algorithm (ocean-only). The algorithm has been applied to the ISCCP pixel-level data set (DX data), with a refined cloud-clearing method. A monthly-mean aerosol optical thickness and Angstrom coefficient data set has been produced for an 11-year period (July 1983 to June 1994). The results are posted at <http://gacp.giss.nasa.gov/retrievals> for the whole period covered by NOAA-7, 9 and 11. By early 2002 an aerosol climatology for the period September 1981 - December 2000 should be available.

ACTIONS/RECOMMENDATIONS: The processing and release of aerosol data sets within the GACP framework was commended and plans for the continuation of this work were endorsed. The **recommendations for GACP** were to undertake: (i) implementation of an algorithm for aerosol over land as a very high priority in the data set development process, (ii) collaboration with SPARC in an attempt to refine the assessment of separate radiative forcing effects by volcanic and tropospheric aerosols during El Chicon & Pinatubo episodes by combining analysis of SAGE and AVHRR data.

## 2.6 International Satellite Cloud Climatology Project (ISCCP)

ISSUE/DISCUSSION: The status of ISCCP data delivery was provided. The archive now includes: Stage B3: July 83 - December 99 (16.5 years), Stage TV: July 83 - December 99 (16.5 years), Stage SI: July 83 - December 99 (16.5 years), Stage D: July 83 - December 98 (15.5 years). More details about ISCCP, including access to the available data sets can be found at <http://ISCCP.giss.nasa.gov>.

ACTIONS/RECOMMENDATIONS: The work related to the development of the ISCCP data sets by way of cooperative international framework was commended and plans for immediate delivery of the full 18-year data set by the end of 2002 were endorsed.

## 2.7 Surface Radiation Budget (SRB)

ISSUE/DISCUSSION: A new longwave code has been developed so that the SRB analyses now produce both surface and top-of-atmosphere shortwave and longwave fluxes every three hours. Data processing has been switched to using a version of the ISCCP DX data re-gridded to 100 km resolution. The main near term goal of the project is release and validation of a 12 year SRB data set. To date, all data have been processed for two test years (1986 and 1992), using ISCCP for clouds and the NASA DAO reanalysis for the atmosphere. Full processing is expected to lead to release of the 12-year (July 1983 to October 1995) data set by mid-2002. Other milestones include implementation of important intercomparisons with products from Clouds and Earth's Radiant Energy System-Surface Atmospheric Radiation Budget (CERES-SARB) and the latest version of the NASA Data Assimilation Office (DAO) Goddard Earth Observing System (GEOS) reanalysis. Intense checking and evaluation, especially exploiting newly released datasets from BSRN, is also underway. Because the SRB products must be validated, and quality checked, data are processed through the GEWEX SW, SW Quality Check (QC) and longwave QC flux algorithms. Changes to the SW QC algorithm have taken place recently and a new updated/corrected Langley Parameterized Shortwave Algorithm (LPSA) is now being used in the quality check processing. More information about the SRB Project can be found at <http://www.gewex.com/srb.html> and through the NASA Langley Research Center, Atmospheric Sciences Data Center (ASDC) at [http://eosweb.larc.nasa.gov/HPDOCS/proj\\_sup.html](http://eosweb.larc.nasa.gov/HPDOCS/proj_sup.html). Data can be accessed by way of the ASDC at [http://eosweb.larc.nasa.gov/PRODOCS/srb/table\\_srb.html](http://eosweb.larc.nasa.gov/PRODOCS/srb/table_srb.html).

ACTIONS/RECOMMENDATIONS: To retain the integrity of the validation and quality control process of the SRB data sets it will be necessary to fully explain in the data product documentation the necessity for and description of the changes to the alternative QC algorithms. **Gupta and Stackhouse** have the **action (A20)** to ensure the documentation covers this topic.

Exploitation of other newer data sets is necessary in the SRB processing and plans should be made and presented at the next GRP meeting for extending processing of the data beyond 1995 through the end of 2001, that applies new atmospheric results including those from GACP and continues more detailed interaction with results from CERES.

## 2.8 Baseline Surface Radiation Network (BSRN)

ISSUES/DISCUSSION: Currently there are 33 sites actively archiving data with another 9 sites pending/proposed to come on-line in due course. Over 1200 station-months of data have been submitted (from 32 sites) to the archives. The archival function at the Swiss Federal Technical Institute in Zurich (ETHZ) has remained the focal point of the organization, although computer and personnel problems during 2000 required a temporary cessation of data inflow and export. Recovery of the archive operations is being achieved and the BSRN web page <http://bsrn.ethz.ch/> has begun to reflect the current status of the BSRN database. In addition to the data collection and archival activities, BSRN continues to press for improvement in calibration and measurement capabilities. Specific examples include work on new specifications for aerosol optical depth with standardization of optical depth observing procedures, and a review of albedo measurements, requirements, and specifications. As a result of discussions fostered by the GRP other improvements include establishment of thermal IR irradiance calibration standards while further improving routine IR measurements and enhancements in the measurement and validation of solar diffuse irradiance.

ACTIONS/RECOMMENDATIONS: The value of BSRN data from specific climatic regions was addressed. It was recommended that a rationale for "key" sites should be developed. **Dutton** has the **action (A21)** to set up criteria and to determine which locations meet the necessary scientific requirements but do not have BSRN stations associated with them. The GRP wants to be informed of where these gaps exist and what obstacles are being encountered in establishing the correspondent BSRN sites. An initial step in this process will be for **Rossow (action A22)** to request through the GEWEX SSG to the WCRP JSC that contact be made with Asian and South American authorities to determine what steps can be taken to have additional BSRN stations established in those regions.

The collocation of research quality measurement instruments, sites and networks is necessary to reduce redundancy and increase efficient use of limited physical and intellectual resources. **Rossow** will **recommend** that the GEWEX SSG take action to establish connections with organizations developing/enhancing new and existing surface climate monitoring sites (e.g. IGOS, GCOS, etc.) to ensure plans and strategies call for collocation, wherever possible, of surface radiative flux monitoring with surface meteorological and water flux monitoring. **Dutton** will (**action A23**) draft a letter, for review and possible signature by the GEWEX SSG Chairman or the Director of WCRP, to Agencies that recommends consideration be given to collocation with BSRN sites of any new national/international measurement networks they establish. A specific example, which will be cited in the letter is the AERONET network under development by NASA.

## 2.9 Ocean Surface Turbulent Fluxes SeaFlux Initiative (SeaFlux)

ISSUE/DISCUSSION: The need for high-resolution, accurate surface turbulent fluxes (heat, water vapor, momentum) over the global ocean has been articulated by numerous groups within the global climate community. In August 1999, the GEWEX Radiation Panel sponsored a workshop to review the analysis methods and data sets currently available and organize an intercomparison activity, designated SeaFlux, that includes *in situ* data, flux algorithms, satellite-derived input parameters and fluxes, and NWP products. An overview of the SeaFlux study can be found at <http://paos.colorado.edu/~curryja/ocean/>. SeaFlux is coordinating with the JSC/SCOR Working Group on Air/Sea Fluxes.

ACTIONS/RECOMMENDATIONS: An important expansion of available data for the SeaFlux effort could come from the ARM Program. **Curry** has the **action (A24)** to contact appropriate ARM researchers (i.e. Long/Reynolds) for information/access to data of potential applicability to SeaFlux (e.g. buoy surface radiative fluxes) from the ARM Oceans (surface flux) project.

As part of a combined GEWEX/GRP data set activity, **Curry** has the **action (A25)** to provide links in the SeaFlux data set development strategy for the merger of SeaFlux data sets with those from GPCP and SRB (see Item 1.4). These plans should be reviewed at SeaFlux planning meetings and presented at the next GRP meeting.

## 3. **NEXT MEETING**

ISSUE/DISCUSSION: The next meeting is tentatively scheduled for the period 31 July to 2 August 2002. Plans are to hold the meeting at the Swiss Federal Technical Institute in Zurich (ETHZ), Switzerland. The meeting will be hosted by Dr Atsumu Ohmura.

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