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REPORT OF THE WORLD CLIMATE RESEARCH PROGRAMME (WCRP)
GLOBAL ENERGY AND WATER CYCLE EXPERIMENT (GEWEX)
SCIENTIFIC STEERING GROUP (SSG)
THIRTEENTH SESSION, BARCELONA, SPAIN
29 JANUARY-2 FEBRUARY 2001

1. SUMMARY OF PROGRESS AND MAIN DEVELOPMENTS

The existing projects and sub-activities in GEWEX continue to be grouped under three main scientific thrusts namely Hydrometeorology, Atmospheric Radiation Processes and, Modelling and Prediction. A list of participants can be found in Appendix A and a summary of the main actions and recommendations from the meeting are summarized in Appendix B.

The GEWEX Hydrometeorology Panel (GHP) is continuing the development of plans for the five GEWEX Continental Scale Experiments (CSE's) to participate in a Co-ordinated Enhanced Observing Period (CEOP). Emphasis was placed on defining a strategy, coupled to the implementation of CEOP, which would result in the delivery of unique datasets, on appropriate media, for use in climate model development and related climate research. Progress is being made in the Water and Energy Balance Study (WEBS) and the Water Resources Applications Project (WRAP).

Under the auspices of the GEWEX Radiation Panel (GRP), the reduction of the uncertainties in climate forcing and feedback required to make progress toward improved climate predictions is receiving high priority. Activities are being undertaken in collaboration with the Working Group on Coupled Modelling (WGCM). A workshop and a journal article are planned to synthesize progress associated with both the observational and model based assessments being undertaken within the GRP sub-projects. The GEWEX SSG agreed to a change in the Chairperson for GRP. The Joint Scientific Committee (JSC) for WCRP endorsed this step. Dr Graeme Stephens has requested to step down as GRP Chair and Dr William Rossow has taken his place. Other relevant actions associated with the GRP are the GEWEX Global Aerosol Climatology Project (GACP), the next phase of the GEWEX Global Water Vapour Project (GVaP), Global Precipitation Climatology Project (GPCP) enhanced datasets, efforts to build and launch international GEWEX multi-sensor cloud/radiation/aerosol missions, and continuation, beyond 2000, of the International Satellite Cloud Climatology Project (ISCCP) and other GEWEX global data projects. Dr Rossow has indicated that as chairperson, he would want to consider renaming the GRP to be the GEWEX Flux Panel (GFP) and to place special emphasis on satellite datasets for global climate studies, during Phase II of GEWEX. This focus will require consideration of possible changes in responsibility in the interaction with the International Satellite Land-Surface Climatology Project (ISLSCP).

The GEWEX Modelling and Prediction Panel (GMPP) is working in association with the Working Group on Numerical Experimentation (WGNE) in the improvement of cloud and land-surface parameterizations for use in General Circulation Models (GCMs). The GEWEX SSG accepted and welcomed the plans to move forward with a GEWEX Global Atmospheric Boundary Layer Study (GABLS) to be led by Dr Bert Holtslag of the University of Wageningen, the Netherlands. This activity will complement the Global Land Atmosphere System Study (GLASS), and the GEWEX Cloud System Study (GCSS), which are also in operation under GMPP. A change in the Chairperson for GCSS is noted. Following Dr Dave Randall's request to step down as GCSS Chair, Dr Steve Krueger has undertaken the GCSS leadership. Dr Randall remains the Chair of GMPP.

2. GEWEX GLOBAL OBSERVATION SCIENTIFIC REQUIREMENTS

The scientific issues of greatest relevance to GEWEX had earlier been stated to include:

- All flux components of a Precision Atmospheric Radiation Transfer Scheme
- Specific quantitative knowledge of Cloud Microphysical Properties and Dynamics
- Constituents of the Ageostrophic Atmospheric Circulation
- Soil moisture and other parameters that could come from a focused Land-Surface Project

The foregoing incorporates the parameters identified earlier namely: global 3-dimensional distribution of clouds, precipitation, radiation and aerosols; global soil moisture (upper 5-10cm); and global 3-dimensional distribution of tropospheric wind, which are of importance to GEWEX but which up to now had been notably missing from prevailing earth observation plans. The large scale modelling community also needs high quality data of these types, all of which are critical for extending accurate predictions. Following the arguments presented by GEWEX to space agencies, significant steps to meet the requirements have

now been taken and the operational satellites together with the 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 fulfil several of the main requirements of WCRP as a whole. WCRP will take further action to contact these agencies to acknowledge progress on missions that are responding to some of these requirements, including winds, and precipitation, cloud, radiation and aerosol measurements.

The initial success of the Tropical Rainfall Measuring Mission (TRMM) was identified as an example of the type of international effort, which must be supported. TRMM is providing unprecedented coverage of the horizontal and vertical structure of tropical rain systems and these data are already being exploited as a valuable resource for parameterization and assimilation studies. The SSG emphasized the importance of continuity of these measurements and asked to continue to be advised of new precipitation measurement missions including proposals such as the Global Precipitation Mission (GPM).

These examples of domestic and international partnerships being applied toward answering major climate-related scientific questions, when grouped together with the other Earth Observing Platforms, offer exciting prospects for an improved understanding of the dynamics and energetics of Earth's atmosphere. The efforts by space agencies to meet the main cloud/radiation/aerosol scientific foci related to GEWEX contributions to WCRP are to be commended - but efforts need to be sustained to achieve further success. In this context, the SSG has requested that the JSC consider steps that may be necessary to ensure WCRP more fully engages other agencies and institutions around the globe, which can influence development of all types of observing and computational networks and systems that can support the advancement of relevant research.

3. GEWEX STRATEGIC PLANNING PROCESS

GEWEX undertook, a strategic planning process to discuss the changes in objectives, primary science questions, and major activities that may be needed during the move to GEWEX Phase II.

The main research issues supported by WCRP were reiterated to be associated with determining the extent to which climate is predictable at seasonal and decadal time scales, and investigating the magnitude and extent to which humans impact climate change.

A primary objective of GEWEX, undertaken as a contribution to the global objectives of WCRP, is to determine the hydrological cycle by collecting global measurements, modeling the hydrological cycle and its effects, predicting responses to environmental change, and improving observing techniques and data assimilation systems. Examples of impacts and accomplishments from Phase I of GEWEX include measurements of upstream soil moisture, which have demonstrated a regional effect on continental land processes; data sets, which show evidence that suggests hydrological global recycling; and research that has subsequently addressed the global importance of the intensification of these recycling rates. End-to-end impact assessments are also showing cost-benefits regarding the use of ensembles and forecast uncertainty.

Particular emphasis needs to be placed on the importance of global-scale precipitation measurements as a key hydrological issue to improve the accuracy of modeling the hydrological cycle and it’s effects. The difficulties in monitoring precipitation on a global scale were noted and examples of current research were discussed that demonstrate the importance of accurate precipitation estimates/measurements for improvements in hydrological modeling. In particular, emphasis was placed on the implications of model accuracy in regard to hydrologic forecasting and water resources management issues.

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 PICASSO, etc.,), and with the success of the projects developed within Phase I, GEWEX is moving into Phase II building 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. The strategy for Phase I with its focus on the energy and water cycle and its processes was to retain a parameter oriented focus and produce the best possible descriptions of the elements (and processes) of the energy and water cycle on a global basis; close the energy and water budgets on the continental-scale; couple the hydrology/land/atmosphere at the mesoscale; model and predict globally with the highest resolution upgraded models; and apply results to water resources at the local scale. A strategic planning process for Phase II modifies the current approach. The process was initiated by the convening of a strategy meeting where three working sessions were organized to consider Global Products/Data Sets -- Exploitation of New Sensors (co-chaired by G. Stephens and W. Rossow), Model Development -- Regional to Global (co-chaired

by D. Randall and J. Polcher), and, Regional CSEs, CEOP, and Applications to Water Resources (co-chaired by R. Lawford and R. Stewart).

3.1 Objectives and Primary Science Questions

The overall objectives established for GEWEX, were reaffirmed. Attention was on defining the primary science questions that will be the focus for the GEWEX Phase II strategy namely:

(i) Are the Earth's energy budget and water cycle changing? Is the water cycle accelerating?

(ii) Can these changes be predicted for up to seasonal and interannual timeframes?

(iii) How do global energy and water cycle processes contribute to climate feedbacks and the causes of natural climate variability?

It was noted that the answer to this question will help determine the nature of the current climate, since feedbacks also define the equilibrium state, and its sensitivity to anthropogenic climate change forcing, and the answer will also help to determine whether and on what time scales climate is predictable.

(iv) What is the impact of the variability in the global energy budget and water cycle on water resources?

At issue in the answer to this question is an evaluation of the causes and predictability of water supply variations.

3.2 Strategy

Emphasis is shifting, toward more analysis and diagnostics of the processes driving the energy budget and water cycle. The goal is an integration of the GEWEX global data into a more complete description of the processes along with developing the related model improvements necessary to enable improved representations of these processes and their prediction. The focus will be more on wet processes, greater exploitation of satellite data, and expanded efforts related to water resource applications.

The more specific guiding strategy elements planned for GEWEX Phase II were determined to include an evaluation of GEWEX Phase I accomplishments; a broadening of international participation in GEWEX activities and a seeking of greater consensus for activities as well as continuing selected Phase I data sets to provide overlap and context for the new series of satellites; providing greater diagnostics and intercomparisons of data sets, especially with those from the new series of satellites; focusing on the development of integrated data sets that show the joint variability of parameters and processes, and also defining the internal processes and their errors.

Other elements of the strategy were selected to be to establish the global transferability of the coupled land-atmospheric and cloud parameterization schemes; focus on greater exploitation of satellite data within local and regional data collection, analysis and process development activities to provide for improved global applications of results. The continued planning and execution of CEOP as a natural extension of GEWEX shifting from Phase I to Phase II strategy by integrating the above philosophy into the CEOP planning, was added to the strategic plan along with efforts to continue the current planning for GCSS, GLASS and GABLS with the focus continuing on global NWP and coupled land-atmosphere model improvement.

Providing a new focus on the analysis and development of new representations of the planetary boundary layer within all scales of models and increasing the focus on water resource applications, cooperating with other associated international organizations and activities were also included as guiding elements of the strategy for Phase II of GEWEX.

These main strategic principles are providing the basis for a series of specific Phase II activities to be developed around the evolving framework of science panels and projects that have been successful in guiding GEWEX Phase I activities.

3.3 Initial Near Term Phase II Related Activities

The GEWEX framework of panels and projects will continue to evolve as required to meet the goals of the strategy established for GEWEX Phase II. Specific Phase II activities will be developed within this evolving framework. During the current transition period GEWEX will increase the participation of the international scientific community and will collectively join with the other components of WCRP, especially the Climate Variability and Predictability (CLIVAR), Stratospheric Process and their Role in Climate (SPARC) and the Climate in the Cryosphere (CliC) Projects along with the Working Group on Numerical Experimentation (WGNE) and the Working Group on Coupled Modelling (WGCM), to increase knowledge of the Earth system processes. Examples of some specific initial activities related to the GEWEX Phase II strategy that will get underway in next two-year period are listed here (lead action groups in parentheses):

(i) Take the lead in developing a Water Cycle Theme under IGOS-P that will include the IGBP and IHDP as cosponsors (WCRP/SSG/IGPO).

(ii) Organize the 4th International Global Energy and Water Cycle (GEWEX) Scientific Conference to be held in Paris in September 2001, hosted by Institute Pierre-Simon Laplace (IPSL) a Federation of laboratories including LMD, LODYC and LMCE (IPSL/IGPO/WCRP).

(iv) Initiate a new activity, Global Atmospheric Boundary Layer Study (GABLS), designed to analyse and improve the representations of the boundary layer in models at all scales (GMPP).

(v) Develop an evaluation document for GEWEX Phase I, addressing what we have accomplished and defining where more work is needed, reflecting on the contributions of other WCRP components and setting the stage for Phase II (IGPO).

(vi) Define a new series of structured intercomparison studies for exploiting/evaluating the new satellite data and addressing joint variability, designed to support diagnostic themes of cloud and precipitation processes and heat / water transport (GRP).

(vii) Propose an integrated global data set for energy budget and water cycle processes that includes error definition for each internal process covering 1-2 decades (GRP).

(viii) Participate in and further support such activities as the ECMWF Cloud and Precipitation 4DDA Workshop (GMPP).

(ix) Continue with CEOP planning emphasizing the integrated goals, exploitation of existing satellite data, and deliverable data sets (GHP/CEOP).

(x) Continue to develop surface flux activities (renaming the Global Soil Wetness project) and giving GSWP the land energy and water flux responsibility (GRP/GMPP/ISLSCP).

(xi) Provide improved interactions and cross membership in water resource and carbon cycle international and interagency groups (IGPO/GHP/GLASS/ISLSCP).

(xii) Foster the development of further interactions between the modelling and process oriented climate groups (e.g., GRP and WGCM) (GRP/GHP/GMPP).

3.4 Conclusions and Recommendations for GEWEX Phase II Strategic Plan

The focus on a set of reformulated science questions, the newly developed strategic framework and the establishment of a series of specific near-term, Phase II related activities, were all accepted by the members of the GEWEX SSG. The SSG recommended that these components, which had been proposed for comment during an out-of-cycle approval process, should now be considered as the basis for moving ahead with full implementation of GEWEX Phase II. Full discussion and consideration of the SSG's recommendation was addressed and endorsed by the JSC.

4. MANAGEMENT OF GEWEX GLOBAL PRODUCTS AND PLANS FOR EXPLOITATION OF NEW DATA

GEWEX has taken responsibility for consolidating WCRP global climatological data projects based on merging satellite data with current atmospheric and (land/ocean) surface measurements. This role includes interacting with space agencies to track the status of global environmental observing systems, providing scientific overview of the retrieval procedures and data quality, organizing data archiving and

distribution on appropriate media and assisting, through conferences, workshops, symposia, and data management meetings, with the international co-ordination of these projects.

Attention is now being given to the collection and management of data during the GEWEX phase II time period when the exploitation of observations from the new earth observing system platforms will be a high priority. The set of observations required to close the global water and energy cycles and the availability of this set of measurements (past and future) will be assessed. Using this assessment, it should be possible to evaluate whether the new satellite observing systems to be launched during Phase 2 and the new data products provided meet the requirements or whether new analysis techniques will be necessary. This entails continued analysis of data by the current global data projects, and evaluation of the utility of new satellite data. It is necessary, therefore, that research funding sources, operational services and space agencies continue adequate support of the GEWEX global data projects and that they provide additional funding to enable the evaluation of the existing datasets against new satellite and ground-based observing system results. This process will indicate whether the existing datasets need to continue to be produced to achieve GEWEX objectives.

Notwithstanding the success of WCRP, all research programs require a long series of comprehensive observations with an integrated analysis of the datasets. 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 should continue at least, through the end of 2005. The Director of WCRP has taken the action to ensure that letters were sent to the major space agencies to secure support of the current GEWEX global climate information projects including ISCCP GPCP, SRB and GACP well into the first decade of the 21st 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 centres collect, analyse 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 included the need for minimum funding levels to be established which are sufficient to support all of these tasks.

The European (EUMETSAT), Asian (NASDA/JMA), Canadian (Canadian Space Agency) and the USA (NASA/NOAA) have all responded positively to this request for continued support of these projects through 2005.

5. OVERALL GEWEX CO-ORDINATION

As noted in the opening section of this document, GEWEX activities have been organized into three thrusts, each with specific and quantifiable scientific foci designed to contribute to the main global objectives of WCRP/GEWEX. The GEWEX Hydrometeorology Panel (GHP-see Item 5.) is undertaking the integration of large-scale experiments to demonstrate skill for predicting processes including precipitation, and changes in water resources and soil moisture over continental regions, as elements of seasonal-to-interannual climate predictability. These tasks are linked to efforts by the GEWEX Radiation Panel (GRP-see Item 6.) to determine the radiation budget and fluxes in the atmosphere and at the surface, as an element of seasonal-to-interannual climate variability, and the response of the climate system on decadal-to-centennial time scales to changes in anthropogenic forcing. The GEWEX Modelling and Prediction Panel (GMPP-see Item 7.) has the target of developing accurate model formulations of the water budget and transport and the energy budget and radiation transfer in the climate system and, thereby, provide the basis for demonstrating the extended predictions highlighted in the goals of the radiation and hydrometeorology initiatives.

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 SSG 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. New actions will take place as a result of recommendations made at the meeting in relation to the GEWEX Phase II strategic planning process (see Item 3.). Some progress is expected to be made on a recommendation raised at the meeting, which relates to GHP, GRP and GMPP organising the collection/processing of high resolution satellite datasets/products (Pre-CEOP), over each of the GEWEX Continental-Scale Experiments (CSEs) and for the GEWEX Cloud System Study (GCSS) and other modelling and analysis elements of GMPP and GHP to exploit these high resolution datasets for their case studies, supplemented by their own field measurements. These Pre-CEOP data sets are crucial for verifying that a credible data collection and management scheme

is in place prior to the start of CEOP. The Director of the International GEWEX Project Office (IGPO) has agreed to assist in the coordination of this work between the GEWEX Panels.

The Chairs of the GEWEX Panels before the next meeting must give reports on the outcome of work on these tasks in a timely manner to the GEWEX SSG Chairman so that progress can be assessed. In this context the SSG recommended that the SSG Chair call a mid-cycle meeting of the Panel Chairs with additional supporting experts to review progress in meeting these important, unifying milestones. An additional need for specific steps to be taken toward co-operation in the collection of data for the existing GEWEX datasets was called for. The SSG, has tasked the Chair of GRP to ensure that progress is made in this arena and to report on steps that are to be initiated, including joint meetings of the collection and processing teams for these data sets that will address commonality of collection and production of these products, especially GPCP and ISSCP, but with the intention of encompassing work in GMPP (GCSS, GLASS and GABLS), and in GHP (CEOP).

6. HYDROMETEOROLOGY

The GHP was formed to improve the collective contribution, to the global requirements of GEWEX, of the five most comprehensive GEWEX Continental-Scale Experiments (CSEs) namely, GCIP (Mississippi River Basin), BALTEX (Baltic Sea region), MAGS (Canadian Mackenzie River Basin), LBA (Amazon region) and GAME (Asian monsoon region). The goals for the sixth meeting of the Panel included taking specific action to advance progress on the GHP scientific focus, which relates to assisting GEWEX to demonstrate skill in predicting variability in water resources and soil moisture on time scales up to seasonal and annual as an element of WCRP's prediction goals for the climate system. In September 2000, GHP held its 6th annual meeting at Angra dos Reis, in Brazil. The developments reported during and after that meeting are included here. Specifically, breakout sessions were established to determine the steps necessary for GHP to achieve, by 2005, significant improvement in the simulation of water and energy fluxes and reservoirs over land on diurnal to annual temporal scales as well as the prediction of these on temporal scales up to seasonal and better understand their physical transport mechanisms and their possible physical connections and to document the seasonal advance of the monsoon system.

The SSG was provided with a series of technical presentations on topics, which covered research of relevance to the global hydrological issues being promoted by WCRP/GEWEX. Updates were given on the status of the GHP, Water and Energy Budget Study (WEBS), and additional time was given to the status of the GHP Water Resources Application Project (WRAP). The implementation status of each CSE was provided and progress on the plans for the GHP/GEWEX Co-ordinated Enhanced Observing Period (CEOP) was reported. Discussions were also undertaken to refine further actions required to ensure a successful CEOP process. Contributions to GHP/GEWEX by the International Satellite Land-Surface Climatology Project (ISLSCP) and the work of the GHP Working Group on Data Management were also reviewed.

The main science and implementation questions for GHP where characterized in terms of the key uncertainties facing GEWEX and the broader WCRP climate research community as noted in Item 3 above. These questions include whether the global hydrological cycle is accelerating, the extent to which models can reproduce extreme events such as floods and droughts, the ability of models to describe the diurnal cycle (e.g. of precipitation), the process for evaluations that go from the global scale down to the regional scale, especially how downscaling to smaller grid scales can be adapted to with current parameterization formulations and how these factors impact the process and need for GHP to close the water and energy budgets over the CSE regions.

Milestones, which the SSG concurred should be set for GHP, that should be attainable in the context of the next phase of GEWEX, included sufficient point measurements necessary for model validations at local scales within each CSE, establishment of basin budgets from large scale diagnostics (monthly/annual) that would lead to a characterization of diagnostic water and energy budgets for each CSE, assessment of model capabilities to simulate water and energy budget variables at all relevant space and time scales for each CSE and the application of GEWEX deliverables to evaluate reanalysis products, confirm the Water Energy Budget Study (WEBS) results including, with the support of the GEWEX Radiation Panel (GRP), the quantification of fluxes to within 10 W/m^2. The action was also accepted to document these plans in an article suitable for publication in the Bulletin of American Meteorology (BAMS) or similar journal in 2001.

It was also confirmed that the central challenge for the second phase of GEWEX is the exploitation of the new and more diverse measurements of the new Earth Observing System platforms and the application of an improved understanding of regional processes derived from the GEWEX Continental-scale Experiments (CSEs) to the global applications needed to improve climate prediction capabilities. It is also necessary for GHP to take the lead in promoting the participation of the hydrological modelling community

and supporting operational environmental services in their efforts to develop improved and more accurate hydrometeorological predictions.

As part of its outreach effort GHP has established a Home Page at http://www.msc-smc.ec.gc.ca/GEWEX/GHP/ghp.html. In addition, more information about the status of actions and contributions associated with WEBS and WRAP and CEOP can be found at http://www.wmo.ch/web/wcrp/documents/ghp6rpt.doc. The document at that location is the Report of the Sixth GEWEX Hydrometeorology Panel Meeting (Angra dos Reis, Brazil, 11-15 September 2000). Examples of specific accomplishments by each CSE have been summarized from the GHP Report and placed in Appendix C.

Carrying out the overall strategy for GHP has led to the establishment of specific overarching projects and other relevant ones are being considered. The main projects that have been developed are summarized below.

Water and Energy Balance Study (WEBS)

WEBS aims to quantify and characterize the water and energy fluxes and reservoirs over the GHP continental-scale experiments as well as other regions. Two workshops have been held so far, synthesis studies from the continental scale experiments are being prepared, and an overall synthesis is being planned.

Water Resources Applications Project (WRAP)

WRAP is designed to structure the dialogue between the users of hydrometeorological information, forecasts, and the researchers within GHP who are involved in the development of datasets and models on a global basis. A successful initial workshop has been held and appropriate linkages have been started to better apply the ongoing GHP and GEWEX progress. Two additional meetings are being planned to facilitate this dialogue.

The WEBS and WRAP initiatives, which began under GHP, should be developing in a more formal way to include other elements of GEWEX. To meet their objectives these activities will need to gain support and involvement by both GMPP and GRP. The Chairs of GHP, GMPP and GRP have been tasked to meet to discuss these initiatives and other related activities, which require support by each GEWEX Panel to succeed. In specific each CSE representative on GHP is being asked to provide a point of contact for interactions with GRP and GMPP for cloud, precipitation and radiation research issues. A joint presentation by the GEWEX Panel Chairs on such matters will be required at the planned mid-year GEWEX status meeting.

Data Management Working Group

This group is concerned with improving the access to and distribution of various datasets. For example, each of the continental-scale experiments has produced a variety of special datasets. To help improve the use of these, this working group has summarized the various data listings and access guidelines of participating groups within GHP and it is currently addressing data management issues for CEOP.

Coordinated Enhanced Observing Period (CEOP)

CEOP has been endorsed by IGOS/CEOS. It will occur during the period July 2001 to October 2003 and will complement a number of the other GHP studies. A September 2000 CEOP planning workshop was held in conjunction with the GHP annual meeting. Participation also included representatives from GMPP as well as from CLIVAR/VAMOS. It was decided to focus on two scientific issues, an ad-hoc organizational structure was adopted, and a timetable of needed actions was established. A draft Science Plan has been produced. Its objectives are, firstly, to improve capabilities to account for water and energy fluxes and reservoirs over land areas and, secondly, to better document and understand the seasonal march of monsoon systems over different regions. A draft Implementation Plan is nearing completion. It aims to specifically identify the needed steps to carry out a successful effort. It considers a host of issues including observations from a series of reference sites around the world, updated information on operational and experimental satellite validation and use, and the models being used for global and regional studies. A crucial February 27 - March 1 CEOP workshop was held in Washington, D.C. to clarify the remaining details associated with CEOP. The outcome of the workshop and the latest status of CEOP can be found at http://www.msc-smc.ec.gc.ca/GEWEX/GHP/ceop.html.

A series of actions and recommendations for GHP, which came out of the SSG review of this component of GEWEX are given below.

Endorsement of a New GHP Chair and a Science and Implementation Leader for the Coordinated Enhanced Observing Period (CEOP)

The SSG acted on the recommendation, by a majority of GHP points of contact (POC's), that since a complete rotation of GEWEX Continental Scale Experiment (CSE) representatives acting as GHP Chair had taken place, (a different Chair each year for the previous five years) a "permanent" GHP Chair should be named. The SSG also addressed the need for continuity of responsibility for CEOP implementation. Dr Ron Stewart, who had been acting as GHP Senior Scientist, was appointed, by the SSG Chair, after consultation with a majority of CSE representatives at the meeting, to undertake the first, non-rotating, GHP Chair position, for an initial three year term. The position of GHP Senior Scientist is dissolved. The nomination of Dr Toshio Koike as Lead Scientist and Director of Implementation of the GHP Coordinated Enhanced Observing Period (CEOP) was accepted. Dr Koike agreed to undertake the CEOP leadership role and has presented his plans for organizing and managing CEOP science and implementation tasks as reflected in current CEOP documentation both the SSG and the JSC.

The main points of the newly endorsed CEOP organizational structure include a small Scientific Steering Committee (SSC) with representatives from each of the major components of WCRP, an Advisory Panel Co-chaired by a representative from NASDA and one from NASA, a Coordination Function/Office provided for jointly by Japan and the USA, and four CEOP Working Groups focused on Simulation and Prediction, Monsoon Mechanisms, Satellite Data Applications and over all Data Management tasks.

GHP/GEWEX Contribution to the WCRP Carbon Cycle Focus

The GHP agreed to form a working group to consider issues related to the role of the Carbon Cycle in GEWEX relevant research. Dr Carlos Nobre agreed to assist in the organization of this working group until a permanent Chair can be found. Each CSE agreed to nominate a representative to support the work of the group. Terms of reference for this working group are in work and a recommendation for further development of this action in concert with GRP and GMPP is being formed.

The issue of the WCRP contributions to improved understanding of the role of the Carbon Cycle in the global Climate System extends beyond GHP and requires close coordination within WCRP and among other international frameworks, such as the International Geosphere/Biosphere Programme (IGBP). The SSG acknowledged the effort by Dr Moustafa Chahine, to coordinate the inclusion of the GEWEX possible contributions to the WCRP Global Carbon Study document commissioned by the JSC. It was agreed that the main points of the document reflected the overall framework in which WCRP may be able to advance science in this arena.

The GHP Chair agreed to work with the new GHP Working Group on the Carbon Cycle to ensure that the GHP aspect of the GEWEX contribution could be better articulated and to further assist in development of a consolidated presentation of the role GEWEX may play in the overall WCRP Global Carbon Study. This action will be undertaken within the context of the GEWEX material presented in the document prepared by Dr Chahine and in concert with inputs from the Chairs of GRP and GMPP.

GHP Connection to La Plata Basin Study

A presentation on a new regional scale project in the La Plata River basin in south-eastern Amazonia has been made. This effort may be undertaken as a joint GEWEX/CLIVAR experiment. The SSG appreciated being advised of the initial steps underway in relation to plans for a possible experiment in the La Plata Basin. The fact that these plans needed further development resulted in the recommendation that a more focused science study team be established continuing under joint leadership between GEWEX and CLIVAR. From the GEWEX perspective, the goal is to a have a more formal proposal for this study that can be addressed in 2001 by the GHP and brought forward to the SSG for final review and action at the 2002 SSG meeting.

CATCH as a GEWEX Continental Scale Affiliate (CSA) Experiment

As had been noted in recent past years a special Continental-Scale Affiliate (CSA) experiment status was established for the Couplage de l'Atmosphère Tropicale et du Cycle Hydrologique (CATCH) initiative. This designation acknowledges that CATCH will make an important contribution to GHP/GEWEX global objectives, but recognizes the difficulty CATCH will have in fully meeting all of the CSE criteria. The main issue associated with CATCH was the recommendation that action be taken to endorse the CATCH

proposal, which has been made for funding from the Global Environmental Fund (GEF). The proposal for support to CATCH from GEF was made in early 2000 and no response has been given to its disposition within the GEF funding process. It is necessary to determine the status of the proposal and to determine what, if any action can be taken to ensure that any open issues that could be blocking support for CATCH in GEF are asserted and appropriately addressed.

Response to WMO Hydrology and Water Resources (HWR) Expectations/Requirement List

GHP will take action to investigate ways to interact with the WMO HWR Department. The main connections should be made through the GHP Water Resources Application Project (WRAP), but other areas of mutual interest should also be investigated. How to manage risk associated with water resources management was identified as a topic where GEWEX and HWR may be able to collaborate to improve understanding of risk assessment techniques associated with water resources management. The SSG will want to know more about the GHP/HWR interactions at the next SSG meeting.

Development of CEOP-like Data Sets

It has been recommend that the GHP develop standardized data sets (format/variables) across each CSE, of the type that are being planned for CEOP, but using retrospective data to enable longer time series. The GHP Chair agreed to take action to work with the CSE points of contact and the Science and Implementation Leader of CEOP to encourage the development of pre-CEOP data sets for release on appropriate media prior to the completion of CEOP. This effort will be carried out in concert with work in other parts of GEWEX that are dealing with the collection and formatting of GEWEX data sets including the Assistance for Land-surface Modelling Activities (ALMA), and the Data Integration for Model Evaluation (DIME) effort, both being established in the GEWEX Modelling and Prediction Panel (GMPP). The Director of the International GEWEX Project Office (IGPO) agreed to help coordinate action to ensure that plans for these data sets are developed in a timely manner.

7. RADIATION

The components of GRP including the International Satellite Cloud Climatology Project (ISCCP), The GEWEX Water Vapour Project (GVaP), the Global Precipitation Climatology Project (GPCP), the Global Aerosol Climatology Project (GACP), the Sea Surface Flux Study (SeaFlux) and the Baseline Surface Radiation Network (BSRN) are largely based on the use of global satellite data. These activities have been integrated to undertake implementation of a strategic approach whose goals are the determination of how the long- and short-wave fluxes are distributed in space and how they vary in time, and the improved understanding of the factors that determine these distributions.

The plan is to develop a quantitative understanding of the links between the radiation budget at the surface, in the atmosphere and at the top of the atmosphere (TOA) and the properties of the atmosphere and surface that define this budget. The goal, stated in quantitative terms, is to determine the net radiative fluxes in the atmosphere and at the surface of the earth and the variation of these fluxes to an accuracy of:

- F~20 W/m^2 by the year 2000 to support improved weather forecasting (i.e., 1 day, mesoscale resolution),
- F~15 W/m^2 by the year 2005 to support prediction of climate anomalies like ENSO (i.e., 5 day, 200 km resolution),
- F~5 W/m^2 by the year 2010 to support prediction of climate change (i.e., monthly, 200 km resolution).

These goals intimately link to the topics of climate forcing and climate feedback. The need to identify gaps and reduce the uncertainties associated with these phenomena is critical to making significant progress toward improved climate predictions. The strategy for undertaking this work is being developed along two tracks the first is by way of applying integrated observations from all available sources to define the state of the atmosphere and determine the fluxes the second is to improve the appropriate formulations in models (radiative transfer and related parameterizations in process models, enhancement of Cloud Resolving Models and better representations in NWP and GCMs). The integration of the improved models with the best available observations should result in reduction in uncertainties in results to meet the stated goals.

The accomplishments of the individual projects are provided below. A number of project meetings were conducted during the year, including workshops of the BSRN, SeaFlux and GACP. A workshop on cloud profiling was held in Japan in 2000 and a working group was formed to maintain this effort internationally. The working group is composed of key individuals involved in space initiatives for cloud radar

and lidar as well as representatives of major groups involved in surface profiling measurements. It has been proposed that this working group be constituted under the auspices of the GRP. A second workshop is planned for 2001 and will coincide with the fall science team meeting for the USA Cloud Radar Mission (CloudSat). The CloudSat mission was successfully confirmed and launch is planned for May 2003.

Dr Graeme Stephens, the current chairman of the GRP, had informed the WCRP of his intention to step down in 2001. Action in this matter is noted below. The SSG acknowledged Dr Stephens' wish to step down and commended him for the milestones reached during his tenure. These accomplishments included setting unifying and quantifiable goals for the components of GRP; developing a science focus for the GRP centering on climate feedback and forcing; encouraging the establishment of GACP, SeaFlux, and a third Intercomparison of Radiation Codes used in Climate Models (ICRCCM-III); working to bring the GRP component data sets into common space-time grids to promote use of data in cross-cutting scientific studies; consolidating the SRB project; and leading a successful initiative in development of a space-borne radar to provide global observations of clouds and precipitation.

Baseline Surface Radiation Network (BSRN)

The BSRN remains the most viable international coalition of scientists interested in acquiring the most accurate possible *in situ* surface radiation measurements for application to climate research. A total of 24 observing sites spread around the world are currently collecting irradiance data, at least a portion of which has been submitted to the BSRN central archive in Zurich. An additional 13 sites either are under development or are in the process of preparing to submit their first data to the archive. Sixteen countries are contributing to BSRN. The BSRN data have been used in satellite validation, GCM comparisons, analysis of trends and variability, energy budget studies, and radiative transfer comparisons. The BSRN data archive at the Swiss Federal Technical Institute in Zurich (ETHZ) and associated staff have remained the focal point of the organization, although computer and personnel problems at the archive last year required a temporary cessation of data inflow and export. Full recovery of the archive operations, which had been continuous since 1992, is underway and is expected to be complete by mid-2001. Interruption of these activities also has resulted in the BSRN web page http://bsrn.ethz.ch/ not accurately reflecting the activities of the organization as a whole. The accumulated database contains approximately 1200 station months of surface radiation data from globally diverse sites meeting the criteria of the BSRN protocols and specifications. In addition to the data collection and archival activities, BSRN continues to press for improvement in calibration and measurement capabilities. Specific improvements include establishment of thermal IR irradiance calibration standards while further improving routine IR measurements, enhancements in the measurement and validation of solar diffuse irradiance, and standardization of aerosol optical depth observing procedures.

Global Precipitation Climatology Project (GPCP)

The GPCP is currently producing several global and quasi -global precipitation products. The primary data sets are the blended or merged satellite and gauge products. These include monthly mean precipitation estimates at 2.5 x 2.5 degree grids for the globe from 1979 and continuing (Figure 1); daily 1 x 1 degree estimates beginning in 1997 and continuing and pentad, 2.5 x 2.5 degree precipitation estimates also beginning in 1979. The monthly mean precipitation estimates at 2.5 x 2.5 degree grids for the globe from 1979, will replace an earlier version identified as Version 1 that began in July 1987 and was not globally complete. Also, these data sets are available online from World Data Center-A (DC-A) at http://www.ncdc.noaa.gov/wdcamet.html. The precipitation components of the merged analyses are also available. These include the geostationary precipitation index (GPI) based on infrared observations and an infrared polar orbiting version, microwave emission and scattering estimates from the Special Sensor Microwave Imager (SSM/I), and a gridded gauge analysis prepared by the Global Precipitation Climatology Centre (GPCC), at Deutcher Wetterdienst, Offenbach, Germany. High-density surface reference data sets are available for comparisons and validation from the Surface Reference Data Center (SRDC), at the Environmental Verification and Analysis Center at the University of Oklahoma. Geostationary satellite data collection is done at 1x1 degree, 3 hourly and has been globally complete since Meteosat 5 was relocated over the Indian Ocean Sector. Additionally GPCP has been obtaining INSAT geostationary data since 1999. These data come via the Indian/US Cooperative Agreement in satellite activities. There are some issues with regard to navigation, calibration and zenith angle correction that are still being analyzed. Work has also been undertaken cooperatively with the GEWEX Surface Radiation Budget Project to obtain GPI estimates from ISCCP DX data. DX is the high resolution sampled data and represents a source of geostationary data for the period from 1983 to 1986. The goal is to use the data to improve estimates of precipitation during this time, a period for which geostationary IR data was not collected, since the GPCP initiated operations in 1986.

An important development was endorsement of the recommendation that GPCP act as a central component for the development of an International Working Group on Precipitation being organized under the auspices of the WMO Committee on Geostationary Meteorological Satellites (CGMS). The GPCP Manager has the action to move this process forward and to report on its status at the next SSG meeting.

International Satellite Cloud Climatology Project (ISCCP)

ISCCP completed its 17th year of data collection on 30 June 2000. Radiances from all operating meteorological satellites, with the exception of INSAT, are being routinely collected by the cognisant Sector Processing Centers (SPC) and delivered to the Global Processing Center (GPC) in accordance with project requirements. Delivery backlogs for NOAA-14/15 continue because of budget shortfalls at NOAA. Steps are now being taken to switch all data deliveries to ftp instead of media; so far ftp deliveries are underway for all AC data to the SCC and B2 data from GOES-EAST to the GPC. The Working Group on Data Management (WGDM) for GEWEX Radiation Projects met in December 2000 to resolve the remaining issues related to adopting a standardized ftp format. The format has been selected and is currently being implemented at all ISCCP data processing facilities. Currently operating satellites are NOAA-14, GOES-8, GOES-10, GMS-5, METEOSAT-5 and METEOSAT-7 with METEOSAT-6 and GOES-11 in reserve. NOAA-16 is expected to begin operations in 2001, in parallel with NOAA-14; eventually NOAA-16 will replace NOAA-14. Plans call for METEOSAT-5 to continue operating over the Asian sector until the end of 2003. If the launch of MSG-1 to replace METEOSAT-7, now scheduled for mid-2002, is successful and either METEOSAT-6 or 7 is still healthy, then one of these satellites will be moved to replace METEOSAT-5 by the end of 2003. METOP-1 launch is now planned for 2005. The launch of MTSAT to replace GMS-5 failed; actions are being taken to extend the life of GMS-5 until launch of MTSAT-R, now planned for mid-2003.

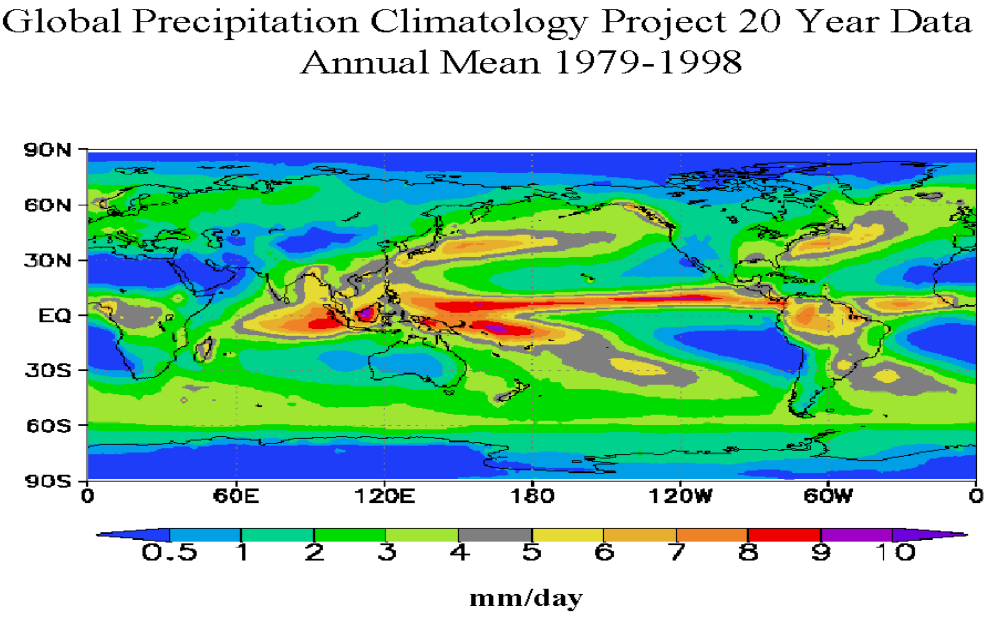

Figure 1. Annual average GPCP Version 2, 1979-1998; mm/day

MTSAT-2 launch is planned for 2004. China successfully launched FY-2B in 2000 and operations are expected to begin in 2001; launch of FY-2C is planned for 2003. Also, operational is the FY-1C polar orbiter; FY-1D is scheduled for launch in 2001. Interactions are continuing to make INSAT data available for ISCCP by expanding the agreement that has led to GPCP receiving data from the Indian satellites. Cooperation with the Chinese is also being pursued to ensure they eventually become contributors to ISCCP. The Satellite Calibration Center (SCC) in Lannion, France, provides monthly satellite-to-satellite radiance normalization, including for the 6.7 and 12-micron radiances. Normalization data are complete through December 2000.

Activities at the GPC in New York for most of 1999 and half of 2000 were severely hampered by a series of major computer system problems: the main tape handling system was down for almost two years and the LAN connecting the processing machines and data-storage devices was down or unreliable for nearly 6 months. These problems have now been eliminated, allowing completion of the porting of the production software from mainframe to workstation, which began more than three years ago. Some datasets still must be moved (format changed) from one system to the other. The GPC monitors the calibration of the polar orbiting radiometers (AVHRR) that serve as the reference standard for the radiance data. Monitoring results are complete through April 2000. Up to date calibration information and other data sets and information are posted on the, recently updated, ISCCP Web page http://isccp.giss.nasa.gov. Routine archival of Stage B3 data has resumed. At the start of 2001 all data had been delivered to the ICA through December 1997 (14.5 years). All B3 data through 1999 (16.5 years) should be delivered by mid-2001 with the exception of NOAA-15 data. Processing of NOAA-15 will require some software changes and may require revisions to the calibration procedures. Atmospheric temperature and humidity profiles correlative datasets are complete through December 1997; sea ice and snow correlative data are complete through December 1999. The next two years of atmospheric data will be delivered by mid-2001. Processing of D-data on workstations has increased processing pace significantly; however, problems with the tape storage system and LAN have delayed processing until recently. Stage DX, D1 and D2 data have now been completed for July 1983 through December 1995, but some additional checking of the last two years of data is still required.

Two CDs have been released containing the D2 data for 1983 - 1988 and for 1989 - 1993. Processing of D data through 1999 should be completed by mid-2001 at which time another CD of D2 data for 1994 through 1999 will be issued. A paper summarizing the differences between the C-series and D-series datasets and the supporting evidence for accuracy estimates of the ISCCP cloud climatology appeared in the November 1999 issue of the Bulletin of the American Meteorological Society.

Complete datasets currently available at the ICA are:

Stage B3 and BT:	July 1983 --- December 1997
Atmospheric data:	July 1983 --- December 1997
Sea ice and snow data:	July 1983 --- December 1999
Stage DX, D1 and D2:	July 1983 --- December 1995

Global Water Vapor Project (GVaP) Summary Status Report

The initial GVaP pilot phase ended in 1997 after having provided the development and distribution of global water vapour 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. Current plans call for finalizing IGPO GVaP Science and Implementation Planning documents to include National and International commitments, continuing coordination with the SPARC Water Vapor Assessment initiative related to an international inter-comparison and assessment of upper and lower tropospheric water vapour observations and modelling results, and releasing of the 1999 GVaP Integrated Observing Systems Test (IOST) data sets. Dr T. Vonder Haar notified the SSG of his intention to step down as Chair of GVaP as soon as a suitable replacement could be named. The SSG acknowledged Dr Vonder Haar's interest in stepping down and commended him for his dedication and leadership in moving GVaP from its pilot phase to a fully functioning WCRP/GEWEX activity. The SSG will take action to find a new GVaP Chair in concert with a recommendation to convene an on-going GVaP science and implementation advisory panel.

Surface Radiative Budget (SRB) Project

The GEWEX SRB program proposal was selected for funding through the NASA Modelling Data Analysis Research (MDAR), Earth Observing System Interdisciplinary Science Program (EOS/IDS), for three years beginning on April 1, 2000. The main goal of the proposal is release and validation of a 12 year SRB data set. 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. The proposal also includes the development of an SRB users group composed of interdisciplinary and international research scientists.

The work during 2000 continued to focus on evaluating and preparing algorithms to produce 1°x1° surface radiation products. Most of the algorithms under consideration have been modified to meet standards set during the validation of specific test months. Two years (1986 and 1992) of data have now been processed through the GEWEX short wave (SW; 0.28 – 5.0 μm), SW Quality Check (QC) and longwave (LW; 4.0 - ∞ μm) QC flux algorithms. Ten months of monthly averaged flux quantities have been released to selected members of the SRB User team for further testing and evaluation. Figure 2 shows the milestones for the SRB Project in 2001. More information about the SRB Project can be found at http://www.gewex.com/srb.html.

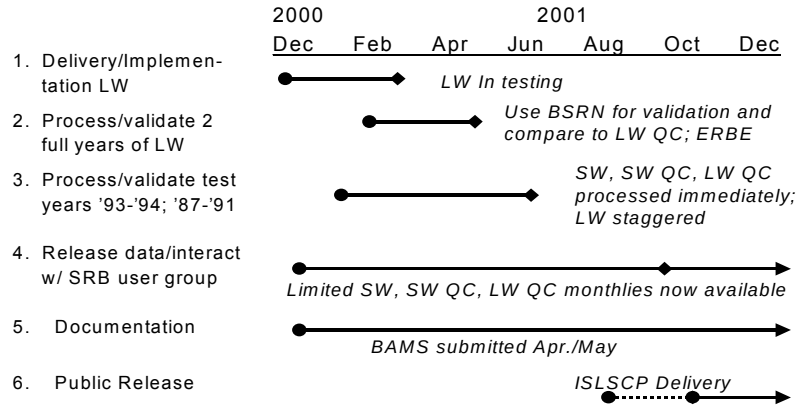

Figure 2. Schematic of task plans and milestones for 2001

Ocean Surface Turbulent Fluxes SeaFlux Initiative

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 that includes *in situ* data, flux algorithms, satellite-derived input parameters and fluxes, and NWP products, which has been named SeaFlux. 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.

The home page http://paos.colorado.edu/~curryja/ocean/intercomparison-cg.html contains information about the SeaFlux intercomparison project, which is now underway. An extensive web-based library of *in situ* data sets from research ships and buoys has been assembled that includes direct turbulent flux measurements, skin and bulk sea surface temperature, wave information, and surface air temperature, humidity, and vector winds. These validation products can be found at http://paos.colorado.edu/~curryja/ocean/valdata-cg.html. The total number of deployments in the data set numbers fifty, with the individual deployments totaling over three hundred months of measurements. A total of thirteen deployments include direct turbulent flux measurements, five deployments include wave information, and seven include skin SST measurements. A total of fifteen deployments are from the tropics (20°N to 20°S), fourteen deployments are from the subtropics (20° to 35°), sixteen are from the mid latitudes (35° to 55°) and five are from high latitudes (55° to 80°). One case over sea ice (SHEBA) is included; although the sea ice obviously has different roughness characteristics than the open ocean, this case is deemed very valuable for evaluating bulk flux algorithms under statically stable conditions. All of the different data sets have been rewritten in a common format and using the same units, for ease of interpretation and use. Metadata is included for each of the different data sources.

Satellite data and NWP analyses have been co-located with the *in situ* measurements. These products include SSM/I brightness temperatures, TRMM brightness temperatures, the Wentz SSM/I and TRMM retrieved products, AVHRR GAC data for cases with skin SST measurements, ISCCP and TOVS products, and the NCEP analyses of surface turbulent fluxes and the input variables. Co-location with scatterometer wind products is currently being undertaken. The evaluation of the NCEP analyses against the *in situ* validation data is well underway. A comparison of ECMWF surface flux products since July 1999 (when the new wave model was incorporated) with observations is underway. A more extensive evaluation of the ECMWF analyses will be undertaken once ERA-40 products are available.

The codes for 10 different bulk flux algorithms that are used either in satellite retrievals or GCMs have made available on the project web site. These codes are currently being evaluated using the *in situ*

data that includes direct turbulent flux measurements. SeaFlux participants made a number of different satellite flux data sets available during 2000. Specific plans for 2001 call for completion of the assembly of the satellite data sets for the intercomparison, the evaluation of the NCEP analyses and the bulk flux algorithms and the evaluation of satellite skin SST retrieval methods. The first intercomparison workshop is planned for May 2001 in San Diego, California, USA, in conjunction with the AMS Conference on Air/Sea Interactions. SeaFlux participants will also participate in the JSC/SCOR Workshop in May 2001. Evaluation of the ECMWF fluxes and the satellite flux products will also begin in 2001. These studies need to be carried out in conjunction with the WGNE "SURFA" project. An outcome of the first intercomparison workshop will be recommendations for improved methods of determining global, high-resolution ocean surface turbulent fluxes. The second intercomparison workshop (2002 or 2003) will include evaluation of improved retrievals against a more extensive *in situ* data set (including more recent data that overlaps with the most recent satellite observations) and evaluation of the performance of the flux products in applications such as constraining the budget and mean transports of heat and freshwater in the global ocean, diagnosing regional and time variations of the coupled atmosphere-ocean system, evaluating the surface fluxes in coupled atmosphere-ocean models and weather forecasting models, and surface forcing for ocean models. The results of the intercomparison project are expected to substantially improve global flux products and to highlight the obstacles to achieving improved accuracies.

Global Aerosol Climatology Project (GACP)

The Global Aerosol Climatology Project (GACP) has been underway for three years. The GACP Science Team includes 41 NASA-funded PIs and 18 GEWEX-sponsored PIs. Since the inception of GACP in 1998, the GACP Science Team has had three programmatic meetings and one topical session at the 1999 AGU Fall Meeting. 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 led by Michael Mishchenko has completed the development of an advanced two-channel aerosol retrieval algorithm based on AVHRR data and applied it to the full period of NOAA-9 observations (February 1985 – November 1988). The results are posted at http://gacp.giss.nasa.gov/retrievals. Joyce Penner has led a detailed intercomparison of global aerosol distributions derived with different aerosol transport-chemistry models. The results of the first 2.5 years of GACP will be summarized in a special issue of the *Journal of the Atmospheric Sciences* (in preparation).

The current work is expected to be followed by the processing of data from other AVHRR instruments with the aim of creating a global aerosol climatology for the full period of NOAA observations. This will require the development of a procedure to “reconcile” the calibration differences between different AVHRR instruments. The second direction of research, in the future, will be the validation of the retrieval results. Since a two-channel algorithm can retrieve only two aerosol parameters and must rely on globally fixed values of all other model parameters, and because the retrieval accuracy can be plagued by factors such as imperfect cloud screening and calibration uncertainties, the work will be characterized the “calibration” of the algorithm in terms of minimizing the difference between the actual and the retrieved global annual averages of the aerosol optical thickness and Ångström exponent. This effort will involve comparisons and consistency checks with other satellite, airborne, and ground-based datasets and models. For the longer term GACP will consider using global long-term results of aerosol retrievals from more advanced instruments such as MISR, MODIS, and POLDER, as a benchmark to resolve most of the issues associated with the calibration of two-channel retrievals. The other approach to be investigated is the improvement of the retrieval algorithm by adopting regional aerosol models, which take into account, e.g., the stronger absorptivity of soot and dust-like particles or the nonsphericity of mineral aerosols.

Other actions and recommendations for GRP, which came out of the SSG review of this component of GEWEX, are noted below.

Endorsement of New GRP Chair and Proposal for Change of Name of the Radiation Panel

The SSG acknowledged the successes GRP had achieved under the leadership of Dr Graeme Stephens and proposed the nomination of Dr William Rossow to GRP Chair position. Time was provided at the meeting for Dr Rossow to review his thoughts on how GRP may continue to build on the work Dr Stephens had undertaken and the direction GRP may take in the future. Dr Rossow noted that with the endorsement of the SSG he will want to rename the GRP to be the GEWEX Flux Panel (GFP) and to place special emphasis on satellite datasets for global climate studies, during Phase II of GEWEX. These concepts were well received by the SSG. Dr Rossow has been formally confirmed as chairperson, and has been given approval to begin to carry his plans forward, in the context of a phasing in of a new structure for the Panel that can continue to be evaluated by the SSG in subsequent reviews.

Endorsement of Concept for a New GRP Sub-Project on Profiling of Clouds, Precipitation and Water Vapor

A new sub-project to be undertaken under the auspices of the GRP was proposed. This new activity would be related to the tropospheric profiling of clouds, precipitation, water vapour and other radiatively important constituents, such as aerosol. The concept is to create and 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 modelling groups. The new GEWEX project team 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. Drs Thomas Ackerman and Graeme Stephens were asked to work with the GRP Chairman to further define the scope and particular details necessary to carry this proposal forward and to make a presentation on these specifics at the next GRP meeting in November 2001. The GRP Chairman should be prepared to make a recommendation about the possible inception of this effort within GRP at the 2002 session of the SSG.

8. GEWEX MODELLING AND PREDICTION

GEWEX Modelling and Prediction Panel (GMPP) has the objective of developing and evaluating improved interactive model formulations of atmospheric and land-surface processes that regulate the global hydrological and energy cycle. This Panel, which includes specifically the GEWEX Cloud System Study (GCSS), and the Global Land-Atmosphere System Study (GLASS), has formulated plans for a new GEWEX Atmospheric Boundary Layer Study (GABLS). Because of the close connections between activities of GMPP and the CAS/JSC Working Group on Numerical Experimentation (WGNE), the two groups meet jointly. Most recently the groups met during the period 23-27 October 2000, at Melbourne, Australia.

GEWEX Cloud System Study (GCSS) and Cloud/Radiation Parameterization Task

The GEWEX Scientific Steering Group (SSG) has continued to endorse the main objective of GCSS to develop refined parameterizations of cloud systems within Global Models, including both climate and numerical weather prediction models, through the improvement of the understanding of the coupled physical processes within different types of cloud systems. Because the Cloud Resolving Models (CRMs) and Single Column Models (SCMs) being exploited by GCSS are the scientific link between cloud process studies and GCMs, they represent an important connection between GEWEX and its “user” community. The success of GCSS has been achieved by applying specialized computing techniques and resources, which have recently become available, with better validation datasets. GCSS has developed a unique Working Group (hereafter WG) organizational structure that has facilitated the collection and application of test cases in focused research and analysis exercises that have lead to improvements in models. The five WGs are:

WG1 - Boundary-layer cloud systems (Chair: Dr P. Duynkerke)
WG2 - Cirrus cloud systems (Chair: Dr D. Starr)
WG3 - Extra-tropical layer cloud systems (Chair: Dr B. Ryan)
WG4 - Precipitating convectively-driven cloud systems (Chair: Dr S. Krueger)
WG5 - Polar cloud systems (Chair: Dr J. Curry)

Each of the WGs has been making progress in mobilizing the CRM community to provide observational/model datasets for many phenomena/processes of importance to GCM development. Rather than try to isolate individual cloud-climate processes and study them separately, GCSS has applied SCMs, CRMs and mesoscale models to study the processes as a coupled system. The models required are being evaluated through the use of observations from regional field experiments. These models are being used as experimental testbeds to develop improved understanding of the processes and to provide realizations of cloud systems. These in turn are used to derive and evaluate parameterizations for the large-scale models.

Revision of the GCSS Science and Implementation Plan

Within this structure there is a set of tasks being undertaken by GCSS, which cut across the individual Working Groups. In response to a recommendation from the joint ECMWF and WCRP/GCSS Workshop (9-13 November 1998, at ECMWF in the UK), the GCSS Chair, with the support of a drafting

team, has produced a new version of the GCSS Science and Implementation Plan. The plan has been published in the International GEWEX Project Office (IGPO) Report series and a copy can be obtained by contacting IGPO by email at gewex@cais.com. One element of the plan addresses the issue of radiative transfer and cloud radiative feedback in the GCSS framework. This interaction between GCSS and the radiation and satellite remote sensing communities is continuing to evolve and expand. A modified version of the plan is being prepared for publication in the *Bulletin of the American Meteorological Society* (BAMS). A first draft of this BAMS article was completed during 2000 and distributed to the WG Chairs for comments. A comprehensive review of the accomplishments of GCSS can be found in the second GCSS Science and Implementation Plan and will also be noted in the BAMS article, for further reference. Working Groups 1, 4 and 5 have continued their interactions with the GEWEX Radiation Panel (GRP) to develop test cases, which promote GRP radiation flux calculation studies.

GCSS Data Integration for Model Evaluation (DIME) Effort

More work is required on plans to make all GCSS test case study data sets available to other groups and to the scientific community at large. An effort to form an Data Integration for Model Evaluation (DIME) working group has advanced and resources are continuing to be available for this work at the Goddard Institute of Space Science (GISS). DIME is undertaking the collection, cataloguing, critique and dissemination of specific GCSS case study datasets. This concept is being investigated as a possible joint initiative with the GRP and the GEWEX Hydrometeorology Panel (GHP) where related data set development activities could benefit from a focused data integration activity. The plans for initiating such an effort were discussed and action is being undertaken by the Working Group Chairs to benefit from the availability of these resources for the organization of appropriate test case data sets.

DIME has been tasked to focus some of its resources on an effort to characterize a standardized SCM case study data set format to be used to evaluate intercomparison exercise results and simplify the related analysis processes. The goal is to have a format ready for presentation and discussion at the April 2001 meeting of the Atmospheric Radiation Measurement (ARM) Project Science Team Meeting. Dr T. Ackerman, the ARM Chief Scientist, has agreed to participate in the review and further development of the proposed data format and to ensure time is provided on the agenda of the ARM meeting for presentation and discussion of the strawman scheme. DIME has also been tasked to pursue the acquisition of larger temporal and spatial domain data sets to enable the correlation with point data sets and to bring out the 3-dimensional aspect of the case studies being undertaken by the GCSS working groups. By undertaking an initiative to include satellite data as a specific element of the GCSS case studies the data and the work will be more directly applicable to broader GCM analyses. It was recommended that GCSS should support the planning of a workshop on radiative feedbacks in the climate system, to be organized in 2001.

Change in GCSS Chairmanship and other Organizational Changes

Dr D. Randall resigned as Chair of GCSS effective at the end of 2000. The GEWEX SSG Chair agreed to the nomination of Dr Steve Krueger, of the University of Utah, to replace Dr Randall as chair of GCSS. This change was considered to be in effect at the end of the December 2000, GCSS meeting. Dr. Wojciech W. Grabowski at the Mesoscale and Microscale Meteorology Division (MMM) of the National Center for Atmospheric Research (NCAR) has agreed to undertake the leadership of GCSS Working Group 4, replacing Dr Krueger, in that capacity. Dr Brian Ryan has stepped down as Chair of WG-3. Dr Ryan's important contributions to GCSS were acknowledged. Dr George Tselioudis, at GISS has accepted the duties of WG-3 Chair.

GCSS Future Plans

Appendix D summarizes the status of work and plans in each GCSS Working Group. As a result of a continuing need to emphasize parameterization development within GCSS science, each WG will continue to schedule extended discussions of specific new/old parameterizations and their performance in SCM's and in other relevant test modes. SCM and CSMs will also be discussed in the context of their application as tools for addressing specific cloud feedback issues that have been given priority in GEWEX modelling (GMPP) and radiation (GRP) studies. Although all WG Chairs are continuing to report progress on this action, it is being carried over for 2001 to emphasize the importance of feedbacks in climate and the role GCSS can play in advancing knowledge on this issue in GEWEX.

Plans will be developed to organize a general GCSS meeting in 2002 encompassing all working group members and invited experts from the NWP/GCM community. Scientific and technical thrusts will be emphasized in line with parameterization issues of importance to the GCM community. Working Group 1 will provide a discussion paper in 2001 that addresses promotion of a field study to investigate tradewind

cumulus convection. Analysis of test cases, which can improve an understanding of conditions related to sub-tropical marine stratocumulus cloud, will be undertaken and test cases, which can address the issue of the diurnal cycle of convection over land, will be developed and analyzed in 2001.

Global Land-Atmosphere System Study (GLASS)

The first meeting of the GEWEX Global Land-Atmosphere System Study (GLASS) Science Panel (GSP) was held from 19 to 21 July 2000 at the Australian Nuclear Science Technology Organization (ANSTO) in Lucas Heights, New South Wales, Australia. Dr Jan Polcher, Chairs GLASS. The GLASS home page is at http://hydro.iis.u-tokyo.ac.jp/GLASS/.

GLASS has been organized under the GEWEX Modelling and Prediction Panel (GMPP) to coordinate land-surface scheme development activities. The goal is to achieve improvements in land-surface schemes for the benefit of numerical weather prediction and climate models such that confidence in the simulated land-surface quantities will be enhanced. This goal will be pursued with schemes decoupled from the atmosphere at the local and global scale, as well as schemes coupled to single atmospheric column models and general circulation models (GCMs). The parallel and coordinated off-line and on-line validations of land-surface schemes have become a necessity with the progress made in planetary-boundary layer and cloud models as well as the requirement to include land-surface processes in operational data assimilation.

GLASS has been organized to achieve these goals, by providing a structure to facilitate the promotion, implementation and coordination of land-surface scheme intercomparisons. Four complementary science actions form the framework within which GLASS will structure land –surface scheme validation and development activities. The inter-actions of these components can be visualized in the form of a matrix, which pairs off-line (uncoupled) and on-line (coupled) modelling activities with local (point/plot/catchment) and large (continental/global) spatial scales. A fifth element of GLASS is provided to aid participants involved in meeting the technical and scientific goals of the overall effort. This infrastructure action will coordinate the logistics related to the work of the other parts of GLASS.

The current activity within the GLASS has been undertaken within the following framework:

Local Off-Line Action Group (PILPS)	Drs Henderson-Sellers, Pitman
Global Off-Line Action Group (GSWP)	Drs Dirmeyer, Oki
Coupled Off-Line Action Group	Drs Gupta, Houser, Viterbo
Coupled On-Line Action Group	Drs Cox, Koster
Infrastructure Action Group (ALMA)	Drs Polcher, Oki

GLASS Action Plans

The Local Off-Line Action Group (PILPS) (A. Henderson-Sellers, A. Pitman) activity will continue Phase 2 projects. Emphasis will be given to experiments associated with an improved understanding of how CO2 is being represented in the current generation of LSS's. The Global Off-Line Action Group (GSWP) (P. Dirmeyer, T. Oki) will run a GSWP 1.5 case with an updated version of the ISLSCP-I data set. A GSWP-2 effort will be broadened to include many aspects of the carbon cycle. A key activity will be to encourage the entire LSS community to provide diagnostics corresponding to satellite observations. The software for these diagnostics will be provided. The Local Coupled Off-Line Action Group (H. Gupta, P. Houser, P. Viterbo) will concentrate on the Atmospheric Radiation Measurement (ARM)/Cloud and Radiation Testbed (CART) site data. A simplified single column model will be distributed and the PILPS-type experiments extended by including the coupling to the atmosphere. A parameter estimation procedure will ensure that the effective parameters are the same in all schemes. The Coupled On-Line Action Group (P. Cox, R. Koster) will have as their priority intercomparison projects that will quantify the impact of surface processes on the predictability of the hydrological cycle, and land-use and climate change on surface processes and climate. The Infrastructure Action Group (J. Polcher, T. Oki), which has developed the Assistance for Land-surface Modeling Activities (ALMA) will continue to assist with the provision of an infrastructure to facilitate land-surface scheme inter-comparisons. Standardization of the experimental set-ups will allow participants to reuse and exchange the tools needed to conduct the simulation and perform the post-processing. PILPS-2e is the first intercomparison within the ALMA framework. A timeline for these and other GLASS milestones is given in Figure 3. The GLASS Project Implementation Plan, which defines the activities, planned for the next several years can be found on the GLASS home page.

GEWEX Atmospheric Boundary Layer Study (GABLS)

GEWEX is initiating a new project focusing on the representation of the Atmospheric Boundary Layer in regional and global models (GABLS). The project referred to as 'GEWEX Atmospheric Boundary Layers Study (GABLS), was approved by the SSG.

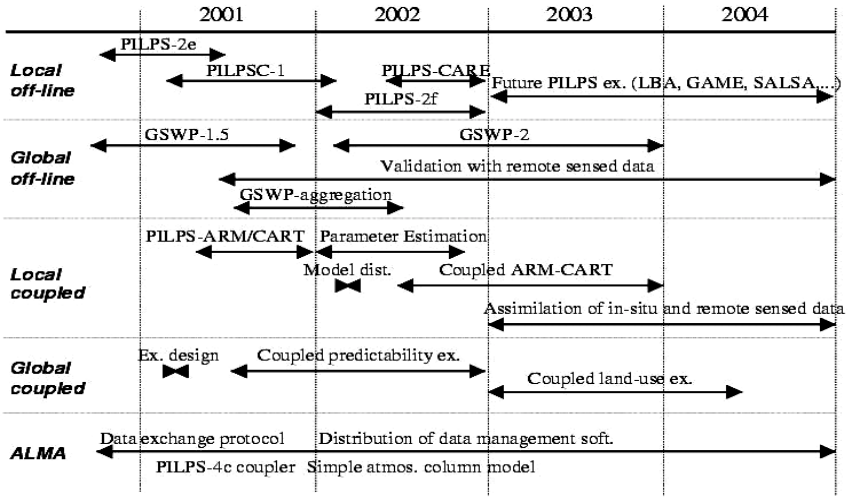

Figure 3. Timeline of GLASS Activities

The main goal of GABLS would be to improve the representation of the Atmospheric Boundary Layer (ABL) in models on the basis of an advanced understanding of the relevant processes. As such GABLS will provide a framework, similar to those established for GCSS and GLASS, in which scientists working on boundary layer research issues at different scales will interact.

The ABL is an important aspect of the physics in regional and global models. It is particularly important when discussing coupled atmosphere/land-surface/ocean models. The intention is to organize an international activity under the GEWEX Modelling and Prediction Panel (GMPP) aimed at stimulating and coordinating research on boundary layer physics. GABLS like GLASS and GCSS will undertake its work in association with the other components of WCRP and especially with WGNE, which endorsed GABLS at its October 2000 meeting. This interaction will ensure that GABLS establishes the same proactive posture in engaging the NWP/GCM community that has been used in GCSS and GLASS. GABLS will include representatives of the weather and climate modelling communities in their deliberations and have them present issues of relevance to large-scale models, which GABLS will then integrate into its work plans.

Dr Bert Holtslag, of the Meteorology and Air Quality Section, at the Wageningen University in The Netherlands, has agreed to Chair GABLS. Dr Holtslag's plans for an initial workshop for GABLS were accepted. The meeting will be held in conjunction with the "Climate conference 2001" being planned for August 20-24, 2001, in Utrecht, The Netherlands (convened by Dr Han van Dop, Utrecht University). A session at the Conference on the representation of "Boundary layers in climate models" is already being planned, in addition to related workshops (convened by Peter Duynkerke, Utrecht University and Bert Holtslag, Wageningen University). Invited contributions at the conference will be given by Dr Anton Beljaars (ECMWF), Dr Dave Randall (CSU) and Dr Bjorn Stevens (UCLA). These relevant sessions are expected to result in a list of specific scientific issues and to go a long way toward development of a GABLS Science and Implementation Plan. A proposed structure for a series of GABLS Working Groups and points of contact to begin work in the GABLS framework will be presented and discussed at the Conference. Finalization of these plans is an expected outcome of the meeting. More information on the Conference can be found at, http://www.phys.uu.nl/~wwwimau/cc2001.html.

Connections/Contributions to NWP/GCM Centres and other Relevant Issues in Modelling

Reports were received by representatives of the USA National Center for Environmental Prediction (NCEP), ECMWF and the Data Assimilation Office (DAO) at NASA that focused on areas which link to GEWEX related research.

NCEP interactions with GEWEX components and research continue to focus on its relation to GCIP and the GCIP follow-on, the GEWEX Americas Prediction Project (GAPP). These issues relate to

predictability in land surface processes, land data assimilation (LDAS), hydrometeorology of orographic systems, predictability in monsoonal systems, testing of models in special climate regimes and use of predictions for water resources management. These topic areas map into NCEP modelling support for CEOP transferability studies and LDAS support, as well as contributions to the North American Monsoon Study (NAME). NCEP will be interested in GAPP validation process studies of land/hydrology models, land data assimilation/initialization and land surface impacts on atmosphere forecasts. Interactions with GEWEX panels and sub-project groups have included active participation by NCEP in GCIP, GCSS, GLASS, ISLSCP and GRP/ARM. Beyond GAPP, new links are expected to evolve with the development of GABLS in GMPP. Additional related to NCEP can be found at http://www.cpc.ncep.noaa.gov/. NCEP has also had a formal atmospheric 4DDA collaboration with NASA/DAO, so that both groups are working toward goals, which are linked to the success of WCRP global objectives. In this context, the DAO's primary product is global analysis, focusing on the accurate 4-Dimensional representation of the Earth system. Its mission includes assimilation of data types that cannot be a part of the operational data system or have little impact on NWP. Its links with GEWEX include the use of GEWEX datasets for validation of DAO products; modelling, analysis and prediction of global water and energy cycles especially associated with the reanalysis of TRMM data and improving the understanding of interactions of the atmosphere and surface processes as highlighted in work on land-surface modelling and assimilation and the impact of land-surface parameters on seasonal forecast and assimilation of surface wind data. DAO has agreed to perform impact studies for GEWEX by way of observing system simulation experiments and real data impact studies. The connection between GEWEX and the major modelling centres has been especially synergistic in the area of the major reanalysis projects, Interactions with ECMWF, on all relevant technical matters have especially been heightened by direct involvement by ECMWF representatives in GEWEX working groups. GEWEX is responding to specific requirements related to issues facing ECMWF and other forecasting centres, including anomalies in the characterization of tradewind cumulus convection, sub-tropical marine stratocumulus cloud and the diurnal cycle of convection over land. The methodologies GEWEX has used in the development of improved parameterizations will be applied to these and other issues in 2001 with a resultant feedback on many of the model and assimilation developments that will be used by ECMWF. The relationship between WCRP/GEWEX and these modelling centres are expected to continue to evolve in a mutually beneficial manner.

Other actions and recommendations for the GMPP and the related modelling and prediction components of GEWEX, which came out of the SSG review, are noted below.

Application of "Other" GEWEX Data Sets for Model Study Test Cases

GCSS must begin to "mine" test cases from other sources within GEWEX for application in cloud and precipitation modelling exercises. This work should be collaborative with GHP, GRP and other parts of GMPP especially linking to efforts designed to develop a "Pan" CSE data set (See Item 5, *Development of CEOP-Like Data Sets,* above). GCSS will also investigate data set development work within the Word Weather Research Programme (WWRP) that may be applicable to GCSS test case studies. This interaction should be undertaken in the context of efforts by GEWEX to explore connections to WWRP, especially related to improving the characterization of orographic phenomena and other related cloud and precipitation analyses, in large-scale models.

Publication of Improvements in Model Development in the Context of WCRP/GEWEX Initiatives

It was important to have more specific references to improvements in large-scale models that could be attributed to specific work within WCRP/GEWEX. The IGPO agreed to undertake a first order reference search that could lead to a bibliography of articles that did reference specific improvements associated with particular WCRP/GEWEX initiatives. This bibliography could be made available by way of the GEWEX home page.

Clarification of WCRP modelling strategy

The GEWEX Scientific Steering Group expressed concern over the strategy being followed in model development in WCRP, and how the objectives of fostering improved model formulations are being met. Clarification of the interactions and overlaps between WCRP-level and project-level groups dealing with modelling issues was needed. The importance of the work being carried out by the GEWEX Modelling and Prediction Panel in cloud, land-surface and atmospheric boundary-layer parameterization feeding through to

the Working Group on Coupled Modelling and the CLIVAR Group on Seasonal to Interannual Prediction, and the appropriate interconnections between these groups was stressed.

9. PLANNING FOR THE FOURTH INTERNATIONAL SCIENTIFIC CONFERENCE ON THE GLOBAL ENERGY AND WATER CYCLE

Planning is well underway for the Fourth International GEWEX Scientific Conference, which will take place in Paris, 10-14 September 2001. This is the latest in the series of major international conferences, organized by the GEWEX scientific community every two to three years, focussed on the scientific progress made and programmatic achievements. The conferences have been held successively in various regions of the world (the first in the United Kingdom in 1994, the second in the USA in 1996, the third in China in 1999, and the fourth now in France in 2001). The conferences are operated on a near self-sufficient basis with substantial support being provided by the hosts, as well as significant contributions from sponsors. In particular, the International GEWEX Project Office devotes major efforts to seeking sponsors (as well as assisting in the practical organization of the Conferences). Only very limited WCRP support is needed, mainly to assist participation from developing countries or from countries with economies in transition.

The fourth conference is being kindly hosted by the Institute Pierre-Simon Laplace in Paris, who are also overseeing all the local arrangements. A first circular giving details of the Conference was widely distributed in December 2000, and announcements have been placed in EOS, Bulletin of the American Meteorological Society etc. More information is available on a web page especially established for the Conference (http://www.ipsl.jussieu.fr/gewex) via which intending participants can register and submit abstracts. Based on previous experience, there are expected to be some 40 oral presentations and up to 300 posters (the latter will be allocated prime time morning and afternoon sessions). The closing date for abstracts has been set as 30 March 2001, with a provisional detailed programme then being prepared by June. At this time of transition of GEWEX from Phase I to Phase II, the conference will include reviews of the accomplishments in the first phase, as well as looking forward to the future.

10. PLANS FOR THE NEXT SSG SESSION

The SSG has accepted the offer of Dr A. Hollingsworth to hold the fourteenth session of the GEWEX SSG in the Council Room of the European Centre for Medium-Range Weather Forecasts (ECMWF) for the period of 28 January to 1 February 2002. ECMWF is located at Shinfield Park, in Reading, UK. The JPS for WCRP will contact Mrs Els Kooij-Connolly (txe@ecmwf.int) who will be acting as the focal point for local logistics. The JPS will work with the SSG Chair and the IGPO to finalize the details of the meeting and make appropriate announcements concerning the arrangements, in due course. Information on ECMWF may be found at http://www.ecmwf.int.

APPENDIX A

LIST OF PARTICIPANTS

Dr T. Ackerman
Pacific Northwest National Laboratory
PO Box 999 MSRIN: K9-90
Richland, WA 99352
USA
Tel: 1-509-372-6032
Fax: 1-509-372-4434
Email: ackerman@pnl.gov

Mr S. Benedict
World Climate Research Programme
World Meteorological Organization
7 bis, Avenue de la Paix
Case Postale 2300
CH-1211 Geneva
Switzerland
Tel: 41-22-730-8247
Fax: 41-22-730-8036
Email: seb@www.wmo.ch

Dr A.J. Busalacchi
Director, Earth System Science Interdisciplinary Center (ESSIC)
University of Maryland
224 Computer and Space, Science Building
College Park, MD 20742-2425
USA
Tel: 1-301-405-5599
Fax: 1-301-405-8468
Email: tonyb@essic.umd.edu

Dr R. Carbone
Mesoscale and Microscale Meteorology Division
NCAR
P.O. Box 3000
Boulder, CO 80307-3000
USA
Tel: 1-303-497-8926
Fax: 1-303-497-8181
Email: carbone@ucar.edu

Dr D. Carson
World Climate Research Programme
World Meteorological Organization
7 bis, Avenue de la Paix
Case Postale 2300
CH-1211 Geneva
Switzerland
Tel: 41-22-730-8246
Fax: 41-22-730-8036
Email: carson_d@gateway.wmo.ch

Ms D. Erlich
International GEWEX Project Office
1010 Wayne Avenue, Suite 450
Silver Spring, MD 20910
USA
Tel: 1-301-565-8345
Fax: 1-301-565-8279
Email: gewex@cais.com

Dr W. Grabs
Hydrology and Water Resources Department
World Meteorological Organization
7 bis, Avenue de la Paix
Case Postale 2300
CH-1211 Geneva
Switzerland
Tel: 41-22-730-8358
Fax: 41-22-730-8043
Email: grabs_w@gateway.wmo.ch

Dr A. Hollingsworth
European Centre for Medium-range Weather Forecasts
Shinfield Park
Reading, Berkshire RG2 9AX
United Kingdom
Tel: 44-118-949-9000
Fax: 44-118-986-9450
Email: a.hollingsworth@ecmwf.int

Professor B. Holtslag
Head of Meteorology and Air Quality Section
Wageningen University
Duivendaal 2, 6701 AP Wageningen
The Netherlands
Tel: 31-31-748-5519
Fax: 31-31-748-2811
Email: Bert.Holtslag@user.metair.wag-ur.nl

Dr P. Ingmann
Head, Atmospheric Unit
Earth Sciences Division
ESA-ESTEC
PO Box 299
NL-2200 AG Noordwijk
The Netherlands
Tel: 31-71-565-4459
Fax: 31-71-565-5675
Email: Paul.Ingmann@esa.int

Mr Y. Ito
Earth Observation Research Center (EORC)
National Space Development Agency of Japan (NASDA)
1-9-9, Roppongi, Minato-ku
Tokyo 106-0032
Japan
Tel: 81-3-3224-7058
Fax: 81-3-3224-7051
Email: yito@eorc.nasda.go.jp

Professor S. Krueger
Department of Meteorology
University of Utah
135 South 1460 East, Room 819
Salt Lake City, UT 84112-0110
USA
Tel: 1-801-581-3403
Fax: 1-801-585-3681
Email: skrueger@met.utah.edu

Dr R. Lawford
NOAA Office of Global Programs
1100 Wayne Avenue, Suite 1210
Silver Spring, MD 20910
USA
Tel: 1-301-427-2089, ext. 146
Fax: 1-301-427-2073
Email: lawford@ogp.noaa.gov

Dr S. Lord
National Centers for Environmental Prediction
Director, Environmental Modeling Center (EMC)
5200 Auth Road
Camp Springs, MD 20746-4306
USA
Tel: 1-301-763-8000, ext. 7202
Fax: 1-301-763-8545
Email: slord@ncep.noaa.gov

Dr L. Martz
University of Saskatchewan
Department of Geography
9 Campus Drive
Saskatoon, SK S7N 5A5
Canada
Tel: 1-306-966-5667
Fax: 1-306-966-5680
Email: lawrence.martz@usask.ca

Professor C.R. Mechoso
University of California
Department of Atmospheric Sciences
7127 Math Sciences Building
405 Hilgard Avenue
Los Angeles, CA 90095-1565
USA
Tel: 1-310-825-3057
Fax: 1-310-206-5219
Email: mechoso@atmos.ucla.edu

Dr M.W. Moncrieff
MMM Division
National Center for Atmospheric Research
Boulder, CO 80307-3000
USA
Tel: 1-303-497-8960
Fax: 1-303-497-8181
Email: moncrief@ucar.edu

Dr P. Morel
Goddard Earth Sciences and Technology Center
University of Maryland, Baltimore County (UMBC)
1000 Hilltop Circle
Baltimore, MD 21250
USA
Tel: 1-410-455-8808
Fax: 1-410-455-8806
Email: morel@umbc.edu

Dr C. Nobre
Centro de Previsao de Tempo e Estudos Climaticos - CPTEC
Rod. Pres. Dutra, Km 40
Cachoeira Paulista SP 12630-000
Brazil
Tel: 55-12-561-2890
Fax: 55-12-561-2835
Email: nobre@cptec.inpe.br

Dr J. Noilhan
Météo-France
CNRM/GMME/MC2
42, Avenue Coriolis
31057 Toulouse
France
Tel: 33-5-61-07-94-74
Fax: 33-5-61-07-96-26
Email: noilhan@meteo.fr

Dr J. Polcher
LMD-CNRS
4 Place Jussieu
75252 Paris Cedex 05
France
Tel: 33-1-44-27-47-63
Fax: 33-1-44-27-62-72
Email: jan.polcher@lmd.jussieu.fr

Dr J. Purdom
Director, Office of Research and Applications
National Environmental Satellite
Data Information Service
National Oceanic and Atmospheric Administration
5200 Auth Road
Camp Springs, MD 20746-4304
USA
Tel: 1-301-763-8127
Fax: 1-301-763-8108
Email: James.Purdom@noaa.gov

Dr K. Puri
Australian Bureau of Meteorology Research Centre (BMRC)
GPO Box 1289K
Melbourne 3001
Australia
Tel: 61-33-669-4433
Fax: 61-33-669-4660
Email: k.puri@bom.gov.au

Dr D. Randall
Department of Atmospheric Science
Colorado State University
Fort Collins, CO 80523-1371
USA
Tel: 1-970-491-8474
Fax: 1-970-491-8428
Email: randall@redfish.atmos.colostate.edu

Dr L. Riishojgaard
Data Assimilation Office
NASA Goddard Space Flight Center
Mail Code 910.3
Greenbelt, MD 20771
USA
Tel: 1-301-614-6245
Fax: 1-301-614-6297
Email: larspr@dao.gsfc.nasa.gov

Dr J. Roads
University of California San Diego, 0224
Scripps ECPC, Climate Research Division
8605 La Jolla Shores Dr., NH 441
La Jolla, CA 92093-0224
USA
Tel: 1-858-534-2099
Fax: 1-858-534-8561
Email: jroads@ucsd.edu

Dr W.B. Rossow
NASA Goddard Institute for Space Studies
2880 Broadway
New York, NY 10025
USA
Tel: 1-212-628-5567
Fax: 1-212-628-5622
Email: wrossow@giss.nasa.gov

Dr R. Schiffer
NASA Headquarters, Code YS
300 E Street, SW
Washington, DC 20546
USA
Tel: 1-202-358-1876
Fax: 1-202-358-2770
Email: rschiffe@hq.nasa.gov

Professor U. Schumann
Deutsches Zentrum für Luft und Raumfahrt
DLR-Institut für Physik der Atmosphäre
Oberpfaffenhofen
D-82230 Wessling
Germany
Tel: 49-8153-28-2520
Fax: 49-8153-28-1841
Email: Ulrich.Schumann@dlr.de

Professor I.A. Shiklomanov
State Hydrological Institute
23, 2d line
St. Petersburg 199053
Russia
Tel: 7-812-323-3517
Fax: 7-812-323-1028
Email: ishiklom@zb3627.spb.edu

Dr P.L. Silva Dias
Instituto Astronomico e Geogisico-IAG
University of Sao Paulo-USP
Rua do Matao, 1226
Sao Paulo/SP 05508-900
Brazil
Tel: 55-11-3818-4713
Fax: 55-11-3818-4714
Email: pldsdias@model.iag.usp.br

Professor S. Sorooshian
Department of Hydrology and Water Resources
Harshbarger Building; Room 122
University of Arizona
Tucson, AZ 85721
USA
Tel: 1-520-621-1661
Fax: 1-520-626-2488
Email: soroosh@hwr.arizona.edu

Professor G. Stephens
Department of Atmospheric Science
Colorado State University
Foothills Campus
Fort Collins, CO 80525
USA
Tel: 1-970-491-8541
Fax: 1-970-491-8449
Email: stephens@atmos.colostate.edu

Dr R. Stewart
Climate Processes and Earth Observation Division
Meteorological Service of Canada
Downsview, Ontario M3H 5T4
Canada
Tel: 1-416-739-4122
Fax: 1-416-739-5700
Email: Ron.Stewart@ec.gc.ca

Dr I. Troen
European Commission, DG Research
Biodiversity and Global Change Unit
Rue de la Loi 200
B-1049 Bruxelles
Belgium
Tel: 32-2-2950465
Fax: 32-2-296-3024
Email: ib.troen@cec.eu.int

Dr P. Try
International GEWEX Project Office
1010 Wayne Avenue, Suite 450
Silver Spring, MD 20910
USA
Tel: 1-301-565-8345
Fax: 1-301-565-8279
Email: gewex@cais.com

Professor T. Vonder Haar
Department of Atmospheric Science
CIRA/Colorado State University
Fort Collins, CO 80523
USA
Tel: 1-970-491-8566
Fax: 1-970-491-8241
Email: vonderhaar@cira.colostate.edu

Dr M. Whitaker
GEWEX Research Scientist
Department of Hydrology and Water Resources
Harshbarger Building; Room 122
University of Arizona
Tucson, AZ 85721
USA
Tel: 1-520-626-2972
Fax: 1-520-626-2488
Email: mplw@hwr.arizona.edu

Professor T. Yasunari
Institute of Geoscience
University of Tsukuba/FRSGC
Tsukuba, Ibaraki 305-8571
Japan
Tel: 81-298-53-4399
Fax: 81-298-51-9764
Email: yasunari@atm.geo.tsukuba.ac.jp

APPENDIX B

ISSUES/ACTIONS/RECOMMENDATIONS
FROM THE GEWEX SSG 13th SESSION

1.0 GENERAL TOPICS

1.1 Missing Data from NOAA Geostationary Satellite System

ISSUE: The SSG was informed that due to special national considerations the availability of Geostationary satellite data from the USA GOES Satellite System has been restricted in the southern hemisphere. These restrictions are limiting the use of this data for the LBA and other climate research initiatives. These limitations are restricting the ability of researchers to achieve their goals and are, thereby, impacting the potential advancement of knowledge important to the global objectives of WCRP/GEWEX.

ACTION: The GEWEX SSG has recommended that a letter be drafted, on this and related topics, by the **International GEWEX Project Office (IGPO)**, to be reviewed for possible signature by the Director of the WCRP. The letter should reiterate concerns identified earlier about the loss of data from procedures instituted at eclipse times, and asking that NOAA give consideration to reducing those restrictions and those related to loss of data below the equator during high priority national events, to the extent possible or to finding alternative ways to provide the missing measurements to accommodate the on-going research, at least during the CEOP time period. This action should be accomplished by mid-2001.

1.2 Improving Scientific Understanding

ISSUE: The SSG should consider the issue of what are the impediments to improved scientific understanding. What steps do we need to take that will cause WCRP/GEWEX to better understand the processes that are important to meeting the Program objectives. As a corollary issue the SSG may want to address whether GEWEX Phase II is creating a shift in focus toward climate change detection versus quantification/understanding of processes and if so how would this impact the current framework of GEWEX?

ACTION: The SSG asked **Drs U. Schumann and M. Moncrieff** to better articulate this issue and provide a draft of a statement that expresses the need for GEWEX to continue to focus on the underlying scientific considerations of importance to its success and that of WCRP in meeting their objectives. This statement should be provided to the GEWEX SSG Chair by the end of February.

1.3 Statement of Requirements to Space Agencies (including New Aerosol Products)

(i) ISSUE: The GEWEX SSG should consider drafting another letter to Space Agencies that reiterates/restates the highest priorities measurements necessary for WCRP/GEWEX to meet its global objectives. Specifically, request that, by 2002, agencies exploit a series of new satellite instrumentation to generate products, which can provide insight into aerosol optical depth over ocean/desert to be used by the NWP/GCM community to reduce model variations in incoming "clear-sky" solar radiation.

ACTION: The SSG agreed that there were two separate topics for consideration and, therefore, recommended that two letters be drafted, the first on the topic of GEWEX requirements and the second specifically addressing the issue of aerosol products (as articulated by Dr T. Hollingsworth). **Drs Stephens and Rossow will assist the International GEWEX Project Office (IGPO)**, to draft the appropriate letters for review and possible signature by the Director of the WCRP.

(ii) ISSUE: There is a limited time period in which to impact the channel selection design to be used on the USA DOD/NASA/NOAA NPOES satellite system.

ACTION: Because of a change in channel configuration could have a significant impact on WCRP/GEWEX related research the SSG felt it was necessary to note that this window of opportunity existed. The **JPS for WCRP** will ensure that this statement will be included in the report of the meeting for information to the WCRP/GEWEX community, at large. Any formal request for a change to the spacecraft configuration will be supported by the SSG, but will require specific

independent action by an individual/group of researchers willing to manage the formal change control process.

(iii) ISSUE: The SSG should consider giving action to the International GEWEX Project Office (IGPO) to contact space agency representatives to ensure that information available on future plans for earth observing systems that are available for publication are made available through the GEWEX Web page.

ACTION: The **IGPO** accepted the action to investigate the possibility of adding links to appropriate Space Agency Web pages and making the SSG aware of their inclusion on the GEWEX Web Page as they become available.

1.4 USA Agency Support of WCRP/GEWEX Global Climatological Data Sets

ISSUE: The GEWEX SSG should seek verification from the USA that the letter requesting continuing support of the GEWEX climatological data sets through 2005 will be given an official response. Other international partners in the development and generation of these data sets have all responded positively to this request, by way of official letters to the WMO Secretary General.

ACTION: The **Director of the WCRP** agreed to take action to contact, through established WMO channels, the USA Permanent Representative for WMO to determine the status of this letter within the appropriate USA Agencies.

1.5 Endorsement for GPCP to become an integral Component of an International Precipitation Working Group as proposed by the WMO Coordination on Geostationary Meteorological Satellites (CGMS)

ISSUE: The SSG should recognize the need for an International Precipitation Working Group and accept the recommendation by the Coordination for Geostationary Meteorological Satellites (CGMS), that GPCP form a core element of such a working group. The Manager of GPCP should be made aware of the SSG recommendation.

ACTION: The SSG endorsed the recommendation for GPCP to undertake a central role in the formation and operation of an International Precipitation Working Group. The **JPS for WCRP** will advise the Manager of GPCP to advance the development of the proposed working group.

In the ensuing discussion it was suggested that WCRP take action to communicate to CGMS the need for consideration of involvement by other components of WCRP in appropriate, existing or yet to be constituted, CGMS International Working Groups, especially including those which do or may deal with topics related to Cloud and Radiation and their associated feedbacks. **Dr W. Rossow** agreed to draft a paragraph on this subject for further application, by the **JPS for WCRP**, in an appropriate communication, through the Director of WCRP, to CGMS.

1.6 GEWEX Connections to World Weather Research Program (WWRP)

ISSUE: The SSG should consider what advantages exist, if any, for collaboration with the WWRP. Possible topics should include orographic processes (cloud and precip) and water vapor data set development/enhancement.

ACTION: The SSG concurred that there are realistic possibilities for interactions with WWRP that would yield mutual benefits and which should be pursued. Because the greatest number of scientific topics of common interest between GEWEX and WWRP are focused under GRP, the SSG asked the **Chair of GRP** to interface with WWRP to determine the possibility of pursuing joint initiatives and to advise the SSG Chair before the end of 2001, of any concrete proposals for such activities.

1.7 Promotion of a Euro-GEWEX Paradigm

ISSUE: The SSG was informed that there is an advantage to proposers to EU “Calls”, which have connections to larger International Scientific Frameworks. This may lead the SSG to consider recommending that the GEWEX community in Europe formalize a Euro-GEWEX infrastructure and assist in

its formation perhaps in concert with the organization of the Fourth International GEWEX Scientific Conference in France in September 2001.

ACTION: The SSG supported the idea of a framework for grouping of various GEWEX related research activities underway in Europe and it agreed that the Fourth International GEWEX Scientific Conference would be an appropriate venue for a discussion on this concept. **Drs Joel Noilhan and Ulrich Schumann** agreed to take action to look into the possibility of such a framework evolving in Europe and to bring ideas on its possible implementation forward during a formal side meeting on the subject at the GEWEX Conference in Paris in September 2001.

1.8 Data Management Issues in WCRP/GEWEX

ISSUE: The SSG should consider the need for improving the management of GEWEX data products. Consideration should be given to possible recommendations/contributions that GEWEX can provide to assist with improved management of data within WCRP.

ACTION: It was noted that there would be a discussion on the topic of WCRP-wide Data Management issues, at the WMO/ICSU/IOC Joint Scientific Committee (JSC) for WCRP meeting scheduled for 19-24 March 2001, in Boulder, Colorado, USA. The **IGPO** agreed to take action to prepare material for presentation, by the SSG Chair, at the JSC meeting, which addresses the present status, current concerns and future issues of Data Management within GEWEX.

1.9 Expanded Interactions with ARM

ISSUE: The SSG should consider recommending that all GEWEX Panels expand formal cooperative interactions with ARM including possibly joint working groups for special research topics, e.g. the profiling working group initiative proposed in Item 3.5 below.

ACTION: The SSG noted that there were a number of ARM-like initiatives underway in Europe and at other locations around the Globe and asked that the **Chair of GRP** undertake an action on behalf of GEWEX to pursue connections with these ARM-type facilities. This action should consider the proposal put forward by Dr Tom Ackerman on this topic (See Item 3.5, below), but should broaden the context of that proposal to include an international perspective on the matter.

2.0 GEWEX HYDROMETEOROLOGY PANEL (GHP)

2.1 Endorsement of a New GHP Chair and a Science and Implementation Leader for the Coordinated Enhanced Observing Period (CEOP)

ISSUE: The SSG will want to act on the recommendation that since a complete rotation of GEWEX Continental Scale Experiment (CSE) representatives acting as GHP Chair has taken place, (a different Chair each year for the previous five years) a “permanent” GHP Chair should be named. The SSG will also want to address the need for continuity of responsibility for CEOP implementation.

ACTION: The SSG noted that for continuity on important issues that relate to the commitment by GHP to meet certain goals, associated with CEOP, Water and Energy Budget Studies (WEBS), and Water Resources Applications Project (WRAP) as well as others, as contributions to WCRP/GEWEX global objectives, a GHP Chair should be appointed for a minimum of a three year term. **Dr Ron Stewart**, who had been acting as GHP Senior Scientist, was appointed, by the SSG Chair, after consultation with a majority of CSE representatives at the meeting, to undertake the first, non-rotating, GHP Chair position, for an initial three year term. The position of GHP Senior Scientist was to be dissolved.

In the ensuing discussion, the SSG agreed to accept the nomination of **Dr Toshio Koike** as Lead Scientist and Director of Implementation of the GHP Coordinated Enhanced Observing Period (CEOP). **Dr Tetsuzo Yasunari**, agreed to notify, Dr Koike of this action. If the nomination is accepted, **Dr Koike** will need to advise the SSG before the March 2001 JSC meeting of his approach to the organizing and managing CEOP science and implementation tasks as reflected in current CEOP documentation.

2.2 Carbon Cycle Focus

ISSUE: The SSG was informed that the GHP agreed to form a working group to consider issues related to the role of the Carbon Cycle in GEWEX relevant research. Dr Carlos Nobre agreed to assist in the organization of this working group until a permanent Chair can be found. Each CSE agreed to nominate a representative to support the work of the group. The GEWEX SSG should ask Dr Nobre to provide terms of reference for this working group for review by mid-2001 and provide a recommendation for further development of this action in concert with GRP and GMPP.

ACTION: The SSG noted that the issue of the WCRP contributions to improved understanding of the role of the Carbon Cycle in the global Climate System extended beyond GHP and required close coordination within WCRP and among other international frameworks, such as the International Geosphere/Biosphere Programme (IGBP). The SSG also appreciated the effort by Dr Moustafa Chahine, to coordinate the inclusion of the GEWEX possible contributions to the WCRP Global Carbon Study document commissioned by the JSC. It was agreed that the main points of the document, as presented at the meeting by Dr Pierre Morel, reflected the overall framework in which WCRP may be able to advance science in this arena. The **GHP Chair** was asked to work with **Dr Nobre** to ensure that the GHP aspect of the GEWEX contribution would be better understood before the JSC meeting in March 2001 and to further assist in development of a consolidated presentation of the role GEWEX may play in the overall WCRP Global Carbon Study. This action will need to be undertaken within the context of the GEWEX material presented in the document prepared by Dr Chahine and in concert with inputs from the **Chairs of GRP and GMPP**.

2.3 BALTEX Data Center Support

ISSUE: The GHP was informed that funding for the BALTEX Meteorological Data Center would be phased out by the end of 2001. The SSG may want to ask the GHP Chair to coordinate, with the GHP BALTEX Representative, the drafting of a letter endorsing the continuation of the Center beyond the end of 2001 and up to at least the end of the CEOP time period. The SSG may want to recommend that the letter be developed for review and signature by the SSG Chair on behalf of WCRP/GEWEX.

ACTION: The SSG asked the **GHP Chair** to investigate further the situation surrounding the continued support of the BALTEX Meteorological Data Center to determine the exact issue associated with the continued funding of the Center. The result of this investigation, as reported to the Chair of the SSG by the time of the JSC meeting in March 2001 will determine the necessity for further action on this matter.

2.4 LBA Connection to La Plata Basin Study

ISSUE: A presentation on a new regional scale project in the La Plata river basin in southeastern Amazonia was made to the SSG. This effort may be undertaken as a joint GEWEX/CLIVAR experiment. The SSG may want to consider the recommendation for this effort to become a joint scientific field experiment under GHP.

ACTION: The SSG appreciated being advised of the initial steps underway in relation to plans for a possible experiment in the La Plata Basin. The SSG acknowledge the fact that these plans needed further development and recommended that a more focused science study team be established continuing under joint leadership between GEWEX and CLIVAR. From the GEWEX SSG perspective, the goal is to a have a more formal proposal for this study that can be addressed in 2001 by the GHP and brought forward to the SSG for final review and action at the 2002 SSG meeting.

In the ensuing discussion it was agreed that, in the interim, the **GHP Chair** should take action to establish a set of criteria, which could allow a better, and more efficient evaluation process for proposed GEWEX Continental Scale Affiliate (CSA) projects. The CSE's are subject to specific evaluation criteria, which establishes there value and maintains there level of commitment and contribution to WCRP/GEWEX objectives. "Other" specialized experiments, such as the La Plata Basin experiment, that cannot achieve CSE status have been designated as CSA's but no specific criteria have been formally established, by GEWEX, for such activities. (See Item 2.5 below on the CATCH CSA).

2.5 CATCH as a GEWEX Continental Scale Affiliate (CSA) Experiment

(i) ISSUE: The SSG may want to address the best way to entrain CATCH-like, CSA initiatives, such as one being proposed for the La Plata Basin (See Item 2.4 above), the Murray Darling River basin in Australia and others.

ACTION: The SSG has asked the **GHP Chair** to propose criteria that can be used to evaluate proposed experiments that may contribute to GEWEX on an affiliated basis. (See Item 2.4 above)

(ii) ISSUE: An important issue associated with CATCH is for the GEWEX SSG to discuss recommending that the Director of WCRP send a letter of endorsement for the CATCH proposal, which has been made for funding from the Global Environmental Fund (GEF). The proposal for support to CATCH from GEF was made in early 2000 and no response has been given to its disposition within the GEF funding process. The GHP felt strongly that the SSG should ask WCRP to take the lead in determining the status of the proposal and working to ensure any open issues that could be blocking support for CATCH in GEF are asserted and appropriately addressed.

ACTION: The **Director of WCRP** will take action to determine the status of the GEF, CATCH proposal and advise the SSG Chair of any further action that may be required, on behalf of CATCH.

2.6 Response to WMO Hydrology and Water Resources (HWR) Expectations/Requirement List

ISSUE: GEWEX should respond to expectations, which WMO HWR have with respect to interactions with GEWEX. The SSG should make a recommendation on how to address the connection with HWR.

ACTION: The SSG asked the **GHP Chair** to investigate ways to interact with HWR. The main connections should be made through the GHP Water Resources Application Project (WRAP), but other areas of mutual interest should also be investigated. How to manage risk associated with water resources management was raised by Dr Tony Hollingsworth as a topic where GEWEX and HWR may be able to collaborate to improve understanding of risk assessment techniques. The SSG will want to know more about the GHP/HWR interactions at its next meeting.

2.7 Development of CEOP-Like Data Sets

ISSUE: The SSG may want to recommend that the GHP develop standardized data sets (format/variables) across each CSE, of the type that are being planned for CEOP, but using retrospective data to enable longer time series.

ACTION: The **GHP Chair** agreed to take action to work with the CSE points of contact and the Science and Implementation Leader of CEOP to encourage the development of pre-CEOP data sets for release on appropriate media prior to the completion of CEOP. This effort will be carried out in concert with work in other parts of GEWEX that are dealing with the collection and formatting of GEWEX data sets including the Assistance for Land-surface Modeling Activities (ALMA), and the Data Integration for Model Evaluation (DIME) effort, both being established in the GEWEX Modeling and Prediction Panel (GMPP).

In the ensuing discussion, it was agreed that in order to take the greatest advantage of expertise within GEWEX for ensuring the most valuable and complete data sets will be provided, by the CSE's, through GHP, it would be necessary for the **Chairs of GRP and GMPP** to undertake themselves or to name a point of contact within their Panels to work in concert with the GHP Data Management Task Group to evaluate the GHP data set production processes and plans. In specific, the **GHP Chair** was advised to ask the **GMPP Chair** to provide, through GLASS, an evaluation of the surface flux tower data currently being gathered by the CSE's in terms of its completeness and potential usefulness in atmosphere/land-surface case studies. This is a critically important interface, which could allow for adjustments in CSE data collection processes that would make the data being gathered more valuable to the research community at large.

2.8 Expanded focus of the GHP Water and Energy Budget Study (WEBS) and the Water Resources Application Project WRAP

ISSUE: The SSG will want to know that the WEBS and WRAP initiatives, which began under GHP, are developing in a more formal way to include other elements of GEWEX. To meet their objectives these activities will need to gain support and involvement by both GMPP and GRP.

ACTION: The SSG asked that the **Chairs of GHP, GMPP and GRP** meet to discuss these initiatives and other related activities, which require support by each GEWEX Panel to succeed. A joint presentation by the GEWEX Panel Chairs on such matters will be required at the next SSG meeting.

In the ensuing discussion it was agreed that to make interactions with GRP and GMPP more direct and formal the **GHP Chair** would solicit each **CSE Representative** to provide a point of contact for interactions with GRP and GMPP for cloud and radiation research issues.

3.0 GEWEX RADIATION PANEL (GRP)

3.1 Endorsement of New GRP Chair

ISSUE: The SSG will want to acknowledge the action by Dr Graeme Stephens to step down as Chair of GRP and endorse the selection of Dr Bill Rossow to undertake Chairmanship of the Panel. This action should include review of Dr Rossow's statement of the priorities for future work in GRP.

ACTION: The SSG acknowledged the successes GRP had achieved under the leadership of Dr Stephens and endorsed the nomination of **Dr Rossow** to GRP Chair position. Time was also provided at the meeting for Dr Rossow to review his thoughts on how GRP may continue to build on the work Dr Stephens had undertaken and the direction GRP may take in the future. The material was well received by the SSG and **Dr Rossow** was given approval to begin to carry his plan forward, in the context of a phasing in of a new structure for GRP that can continue to be evaluated by the **SSG** in subsequent reviews.

3.2 GRP Membership Considerations

ISSUE: The SSG should task the new GRP Chair to undertake quick action to resolve open issues with regard to the membership of the Panel several of whose terms have formally expired.

ACTION: The **GRP Chair** agreed to undertake action on this matter immediately with support from the JPS for WCRP.

3.3 Change in Leadership for GVaP Sub-Project

ISSUE: The SSG will want to acknowledge the action by Dr Tom Vonder Haar to step down as the Leader of GVaP and to institute a search for a new GVaP Chair.

ACTION: The new **GRP Chair** agreed to undertake a search for a new Leader for GVaP. This action should be taken in concert with a possible restructuring of GVaP to include organization of a science advisory team with appropriate international representation.

3.4 Oversight of GEWEX Long Term Data Sets

ISSUE: The SSG may want to reiterate the role GRP must continue to play in maintaining oversight of the GEWEX Global Climatological Data Sets on behalf of WCRP/GEWEX. This action should be undertaken in concert with the vision for future GRP work as stated by the new GRP Chair but should include the possibility of the use of these data sets as part of an exercise to involve these data sets in the verification of reanalysis data products, GCM outputs and related intercomparisons. An efficient methodology for such intercomparisons should be devised.

ACTION: The new **GRP Chair** agreed to ensure that GRP maintain its role of oversight of production of the subject data sets, on behalf of GEWEX, but to orient the focus of the GRP more toward diagnosis of the data for improving understanding of the main scientific issues associated with the global objectives of WCRP/GEWEX. GRP will contribute to Phase II of GEWEX by providing leadership in the packaging and use of the existing and new data sets for climate research rather than continuing to merely ensure the continued production of those data sets.

3.5 Endorsement of Concept for a New GRP Sub-Project on Profiling of Clouds and Water Vapor

ISSUE: The SSG will want to review the proposal for GRP to undertake an initiative on tropospheric profiling of clouds and water vapor as contained in a draft outline by Drs Tom Ackerman and Graeme Stephens (see attached).

ACTION: Dr Ackerman agreed to take the lead in moving this proposal forward in the context of GEWEX efforts to expand formal cooperative interactions with ARM and ARM-like data initiatives, now in operation or planned in Germany and other regions of the globe. (See Item1.9 above). Development of this effort should be done in collaboration with the GMPP as appropriate.

3.6 SeaFlux Initiative

(i) ISSUE: The SSG should consider recommending that the Leader(s) of SeaFlux improve coordination and alignment of this work with other WCRP initiatives in this arena.

ACTION: The **GRP Chair** agreed to ensure an appropriate level of interaction will take place between SeaFlux and the other activities in WCRP that are focused on various aspects of this research issue.

(ii) The SSG should consider asking the GRP Chair to ensure that SeaFlux incorporate scatterometer data sets in its analysis.

ACTION: The **GRP Chair** agreed to take action to contact providers of the Scatterometer data and to apply it as appropriate in the SeaFlux effort.

In the ensuing discussion the SeaFlux effort was characterized by Dr Rossow to be primarily focused on what determining what could be done with the available observational data to produce a useful data set for application in model validations and intercomparisons. In this context the SSG agreed that the SeaFlux initiative had the potential to be of important value to the WCRP/GEWEX scientific community and was in keeping with the objectives of related initiatives in GEWEX and the future direction the SSG has endorsed for GRP, as noted in Item 3.4 above.

3.7 GPCP Priorities

(i) ISSUE: The SSG should consider recommending that the GRP Chair contact the GPCP Manager to discuss the steps necessary for GPCP to undertake a new “round” of algorithm intercomparisons and to otherwise encourage GPCP to interact more formally in concert with other components of GEWEX such as GCSS (See Item 4.1 below).

ACTION: The **JPS for WCRP** agreed to act on behalf of the **GRP Chair** to convey, to the GPCP Manager, the interest of the SSG to have more emphasis placed on the testing and evaluation of new methodologies for estimating precipitation. This work should be initiated using existing data sets with consideration given to data having been gathered under the auspices of the TRMM project especially as associated with the Euro-TRMM activity.

(ii) ISSUE: The GPCP should address issues associated with incorrect model results over land and ocean in the Asian Monsoon region. This work should evolve through continued efforts by GPCP to verify its results against Model products in specific regions.

ACTION: The **JPS for WCRP** agreed to act on behalf of the **GRP Chair** to convey, to the GPCP Manager, the interest of the SSG to better understand the implications of discrepancies between existing precipitation estimates and model results in the Asian Monsoon region. **Dr Tetsuzo Yasunari** agreed to be a contact for clarifying the exact area of interest and the specific results in question in this region.

4.0 GEWEX MODELING AND PREDICTION PANEL (GMPP)

4.1 GCSS Emphasis on Precipitation

ISSUE: The SSG may want to recommend that GCSS place more emphasis on precipitation issues in its test case exercises.

ACTION: The **GCSS Chair** agreed to take action within the GCSS Working Groups to note this issue and to raise the level of attention toward precipitation issues within case studies as appropriate and to report back to the SSG on this matter at the next SSG session.

4.2 Cirrus Cloud Modeling Emphasis

ISSUE: The SSG may consider recommending that GCSS place even greater emphasis on Cirrus cloud model development and possibly expanding the work to include test cases that address issues of cirrus cloud and aerosol interactions.

ACTION: The **GCSS Chair** agreed to note this issue with the GCSS Cirrus Cloud Working Group Chair and to advise the SSG of the steps foreseen to raise the priority of these matters in that Working Group's task plan. A specific response to this suggestion will be noted in the GCSS presentation at the next SSG meeting.

4.3 Application of "Other" GEWEX Data Sets for Model Study Test Cases

ISSUE: The SSG may want to consider recommending that GCSS begin to "mine" test cases from other sources within GEWEX for application in cloud modeling exercises. This work should be collaborative with GHP, GRP and other parts of GMPP especially linking to efforts designed to:

(a) develop a "Pan" CSE data set (See Item 2.7 above)

(b) Exploit more ARM data sets in the context of GEWEX efforts to work more closely with ARM in formal joint activities (See Item 1.9 and 3.5 above), and

(c) Investigate data set development work with WWRP that may be applicable to GCSS test case studies. This interaction should be undertaken in the context of efforts by GEWEX to explore connections to WWRP, especially for orographic phenomena and other related cloud and precipitation analyses. (See Item 1.6 above).

ACTION: The **GCSS Chair** agreed to undertake action to investigate exploiting work in other components of GEWEX that could benefit GCSS work by building on collaborative initiatives in GRP and GMPP.

In the ensuing discussion the SSG agreed that the action was on the **GEWEX Panel Chairs** to discuss joint activities that built on work related to their specific objectives and scientific foci, but which could benefit from synergistic overlap of efforts and responsibilities. The **Panel Chairs** will want to explore these types of collaborative activities and report on their progress in such mutually beneficial initiatives at the next SSG meeting (See Item 2.8 above).

4.4 Endorsement of a GEWEX Global Atmospheric Boundary Layer Study (GABLS)

ISSUE: The SSG should recommend that GMPP go forward with an effort to address improvement in Boundary Layer parameterizations in large-scale models. This recommendation should be implemented by GMPP in the context of the GABLS framework as presented by Dr Bert Holtslag. The recommendation should include the endorsement of Dr Holtslag as Chair of GABLS with a mandate to begin organization of GABLS as part of GMPP with the stipulation that emphasis is placed on an integrated approach that considers applicable collaborations with other components of GEWEX and WCRP and specifically emphasizes work focused on improving parameterization formulations and of importance to the climate modeling community. This will require that GABLS apply the same proactive posture in engaging the NWP/GCM community that has been used in GCSS and GLASS. GABLS will need to invite representatives of these communities to attend their meetings and present issues of relevance to work on large-scale models, which GABLS will then integrate into its work plans.

ACTION: The SSG endorsed the initiation of GABLS and asked **Dr Holtslag** to move ahead with the action plan presented at the meeting. The SSG noted that this activity is another effort that will benefit from cooperative interactions with the other elements of GEWEX and asked the **GMPP Chair** to ensure that in his deliberations with the **GRP and GHP Chairs** the GABLS effort would be a priority item for possible mutual collaboration.

5.0 GEWEX CONTRIBUTIONS TO NWP/GCM MODEL DEVELOPMENTS

5.1 Publication of Improvements in Model Development in the context of WCRP/GEWEX Initiatives

ISSUE: The SSG felt that it was important to have more specific references to improvements in large-scale models that could be attributed to specific work within WCRP/GEWEX.

ACTION: The SSG asked the **IGPO** to undertake a reference search that could lead to a bibliography of articles that did reference improvements associated with specific WCRP/GEWEX initiatives.

5.2 Emphasis on Data Sets that have Value to the Modeling Community and Improved Overall Connections between GEWEX and NWP/GCM Centers

ISSUE: The SSG felt that there was a need for GEWEX to continue to improve its connections to the large-scale modeling community and particularly to be aware of the requirements of this community on work in GEWEX.

ACTION: The SSG reiterated its call for the **GEWEX Panel Chairs** to take action to develop data sets with standardized characteristics that allow them to be utilized efficiently in modeling exercises (See Item 2.7 above).

In the ensuing discussion, the **GRP, GHP and GMPP Chairs** were asked to take specific action to ensure that members of the NWP/GCM communities were invited to attend panel meetings and were contacted to provide working representatives to support sub-project/Working Group initiatives designed to improve understanding of representations of the water and energy cycle in models. The SSG will want the **GEWEX Panel Chairs** to report on progress in this area including specific actions to engage this community by having representatives attend appropriate meetings to discuss specific parameterizations and their formulations in models.

5.3 Clarification of WCRP Modeling Strategy

ISSUE: Concern was expressed over the overall strategy for improved model development in WCRP.

ACTION: The **Director of WCRP** agreed to take action to further clarify the overall strategy WCRP has for meeting its objectives for contributing to improved model formulations. The interactions and overlap between the WCRP level and Project level groups focused on modeling issues needs to be clarified.

6.0 SPECIFICATIONS FOR THE NEXT GEWEX SSG MEETING

ISSUE: The SSG will want to determine the date and place for the fourteenth session of the SSG (2002).

ACTION: The SSG has accepted the offer of Dr A. Hollingsworth to hold the fourteenth session of the GEWEX SSG in the Council Room of the European Centre for Medium-Range Weather Forecasts (ECMWF) for the period of 28 January to 1 February 2002. ECMWF is located at Shinfield Park, in Reading, UK. The **JPS for WCRP** will contact Mrs Els Kooij-Connolly (txe@ecmwf.int) who will be acting as the focal point for local logistics. The **JPS** will work with the **SSG Chair** and the **IGPO** to finalize the details of the meeting and make appropriate announcements concerning the arrangements, in due course. Information on ECMWF may be found at http://www.ecmwf.int.

GEWEX CONTINENTAL SCALE EXPERIMENT (CSE) STATUS SUMMARIES

MAGS Status Summary

The goals and objectives of MAGS have been fully articulated in earlier documents that are available for review by way of the MAGS web page at http://www.msc-smc.ec.gc.ca/GEWEX/MAGS.html. A synthesis of MAGS-1 indicates that the objectives of the first phase of MAGS were to quantify the major processes affecting the water and energy cycles of the Mackenzie River Basin (MRB), to assess the relative importance of various high latitude processes, to develop datasets for model parameterization, and develop a framework for coupling the models required to reproduce the observed transport of moisture and energy into and through the basin on monthly and longer time scales.

Cold climate processes have been a key focus. A variety of studies have characterized the MRB moisture properties, identified major moisture sources including strong moisture transport by synoptic systems and summertime evapotranspiration, examined orographic influences, and documented its interannual variability. Some uncertainties, including the diurnal variability and storage effects, remain to be understood and modelled. MAGS researchers are relying on satellite measurements and special surface measurements to help deduce the solar radiation budget. Model evaluations using these fields are revealing inadequacies to be further examined. Blowing snow is one high latitude process that has been extensively studied by MAGS researchers. Models of these effects have been developed and algorithms are available to be incorporated into land surface schemes. For examining heterogeneous land surfaces, boundary layer data sets have been compiled using ground based and aircraft measurements. Better representations of boundary layer processes have been developed for incorporation into large-scale models.

A major development in the MAGS program strategic plan over the past year has been has been a confirmation to extend the research program into a second, five-year phase. The University research component of this program has secured financial support through the Natural Science and Engineering Research Council of Canada and Environment Canada has committed to support the government research component into its second stage. A number of other industrial and stakeholder partners have also committed to support MAGS-2 program in various ways.

BALTEX Status Summary

The BALTEX studies (http://www.gewex.com/baltex.html) have identified a number of limitations both in the observational system and in the way observations are exploited in the forecasting process. Examples of such limitations are the lack of upper-air observations over the Baltic Sea such as radiosonde and sufficient radar observations, insufficient use of available satellite data as well as insufficient integration of many observations in real-time data processing. The two outstanding goals of the BALTEX program are to obtain better and more comprehensive observations from the entire Baltic Sea catchment area, and to develop more realistic coupled models for the atmosphere, the land surface including rivers and lakes and the Baltic Sea and sea-ice. Within BALTEX Modelling results from the Max-Planck Institute for Meteorology (MPI) and the Swedish Meteorological and Hydrological Institute (SMHI) have shown that parts of the water cycle and energy budgets over the region can now be modelled reasonably well. Other components need improvement. Modelling Studies when compared to observations of total precipitation, found that although peak values did not agree well, very good agreement was found with the observed average values.

The Main BALTEX Experiment (*BRIDGE*) will be a central element in the BALTEX program in the future. It has been established as the central observational and modelling phase of the program. BRIDGE consists of ongoing activities like continuous observations at different sites and five Enhanced Observation Periods (EOPs) with special process studies and field activities. There are five two month EOPs between August 2000 and February 2002, each covering different periods/seasons. The Coordinated Enhanced Observation period (CEOP), has been included in the BRIDGE milestones to show the potential BALTEX contributions to this effort. Other milestones include the Third Study Conference on BALTEX, (2-6 July 2001, Aland, Finland).

GCIP/GAPP Status Summary

GCIP was initiated as a full scale five-year program in October 1995. The program was centered around focused efforts in different parts of the Mississippi River Basin. GCIP has focused considerable effort on characterizing the regional water and energy budget in the Mississippi River Basin. As an example of how researchers are using data from the various CSEs, analyses of boundary layer conditions over various areas (GCIP, BOREAS/ MAGS, and LBA) has led to the development of a generalized conceptual model of boundary layer development over land surfaces. According to these analyses, for a given vegetative resistance, mixing layer cooling increases as the sensible heat flux increases and latent heat flux increases as the surface moisture forcing (determined by soil moisture and vegetation) increases. In addition surface and mixing layer forcing determine the depth of the boundary layer, although they do not affect significantly the potential temperature of the boundary layer and its specific humidity

Although GCIP has accomplished most or all of its objectives it has not fully delivered on the central mission of the GHP namely to " predict changes in water resources and soil moisture on time scales of seasonal to annual as an integral part of the climate system". In order to address this need GCIP has been extended and reformulated to provide a clearer focus on prediction issues. The extended program will be known as the GEWEX Americas Prediction Project (GAPP). Its first objective has been defined as: "to develop and demonstrate a capability to make reliable monthly and seasonal predictions of precipitation and land surface hydrologic variables through improved understanding and representation of land surface and related hydrometeorological and boundary layer processes in climate prediction models." More information about studies being undertaken as part of GCIP/GAPP can be found at the GCIP home page at http://www.ogp.noaa.gov/mpe/gapp/index.htm.

GAME Status Summary

Understanding of the role of the Asian monsoon in the global energy and water cycle remains the main thrust of GAME.

The main issue associated with further development of GAME is the pending decision for Japan to end the first phase of GAME in 2002 and begin a GAME phase II. For GAME phase II (2002-2003/4) the focus will be on applying improved analysis methodologies that rely on advanced information technology (IT) techniques to enhance the integration of knowledge of the unique atmospheric and hydrological characteristics of the monsoon into a unified system; development of model schemes for a range of spatial and temporal scales and applying improved predictive ability to meet the primary goal of GAME. At the same time, a GAME follow-on activity is being proposed that would build on the heritage of the GHP CSEs, including GAME, and will contribute directly to the CEOP. This new initiative is being designated the Coordinated Asian Monsoon Experiment (CAMP). CAMP is expected to be the Asian/Australian region component of CEOP. CEOP/CAMP will at least cover the 2001-2003 time period.

A main element of GAME includes the support of the Japan Meteorology Agency (JMA) to perform 4DDA using advanced global forecasting models (e.g. T213L30) with horizontal grid-scales of about 50km or less. Where possible high quality data has been collected during special GAME Inhanced Observing Periods (IOPs) at the GAME regional sites to be assimilated for estimating energy and water cycle processes of the monsoon system. Products from the initial work undertaken during the GAME IOPs and reanalyzed products using the most updated assimilation system with the highest quality data gathered during the IOPs have been entered into nodes under the control of the GAME Archive Information Network (GAIN) . The initial version of the results from the GAME reanalysis project was released in September 2000 and another release is due in 2001. The GAIN-Hub http://gain-hub.mri-jma.go.jp provides accesses to these products.

A decision has been made to continue studies in the GAME-Tropics (GAME-T http://climate.gsfc.nasa.gov/~taikan/GAME-T/game-t.html) region. The second phase of this work has been designated GAME-T2. The GAME-T, which will end in 2001, has improved the quantitative monitoring of vapor flux, precipitation, evapotranspiration, radiative flux, and their seasonal, intra-seasonal, and interannual variation in the south-east Asia region. The data monitoring network set in place for this effort will be retained as a contribution to CEOP/CAMP and GAME-II.

In the GAME-HUBEX study (http://www.ihas.nagoya-u.ac.jp/game/GAME-HUBEX.html), heat and moisture budgets were calculated using NCAR/NCEP reanalysis data and precipitation data provided by Chinese researchers in the region. The HUBEX Regional Data Assimilation System (RDAS) was also developed by the Chinese investigators. Observational data from the GTS, the HUBEX IOP and the Chinese National Satellite Center were assimilated and the RDAS was tested for a heavy rainfall event observed during the June I998 IOP.

Observations in the GAME-Tibet region (http://www.ihas.nagoya-u.ac.jp/game/GAME-Tibet.html) of the central Tibetan plateau are continuing to be taken and analyzed by six teams of Japanese and Chinese researchers. The Installation of Automated Weather Stations (AWSs) has continued along with a boundary layer tower, soil moisture and temperature sensors, and a three dimensional Doppler Radar. Intensive observational periods were also conducted as a contribution to GAME-I objectives.

The GAME-Siberia sub-project team (http://www.ihas.nagoya-u.ac.jp/game/GAME-Siberia.html) is concentrating on the observation of the land - atmosphere interaction in three regions of Siberia marked by tundra, plain taiga, and mountain taiga. The Lena River, which has its source in the mountain taiga area and subsequently flows through the tundra and plain taiga areas, is also under investigation in the GAME Siberian study region. Third International Workshop on Water and Energy in Siberia and GAME was held from 15-16 March 2001, near Tokyo, Japan. The results reported at the meeting have been placed on the GAME Siberia, web page.

LBA Status Summary

The overall time frame for LBA (http://lba.cptec.inpe.br/lba/indexi.html) has been set as 1996-2005. LBA wants to determine how Amazonia currently functions as a regional entity and how will changes in land use and climate affect the biological, chemical and physical functions of the region, including the sustainability of development in the region and the influence of Amazonia on global climate.

The actual field phase of LBA started at the end of 1998. The first IOP occurred during January/February 1999 in the form of two closely coupled experiments, a wet season atmospheric mesoscale campaign (LBA WET/AMC) and a ground validation experiment for the Tropical Rainfall Measuring Mission (Referred as TRMM-LBA). A 100 km grid box over the Southwest Amazonia region (Rondonia) was heavily instrumented for atmospheric and land surface monitoring. Eleven long term, continuously monitoring flux/climate/ecological sites have been established over the LBA region. An IOP campaign designed to study the transition from dry to wet seasons is to take place from October through during the second half of 2002 in Southwest Amazonia. A special issue of Journal of Geophysical Research is to be published in 2001 with the first results of the TRMM-LBA and WET-AMC. LBA is also sponsoring a number of specialized training activities related to global change research as part of its outreach efforts. Short courses have been held on carbon dynamics, LBA operations and isotopic research techniques. The time line for the LBA experiments coincides better with the CEOP Principal Research Phase from 2003 to 2005, than with the CEOP data collection period of 2001-2002.

A primary issue is being able to predict what impact deforestation will have on the ecological, climatological and hydrological functioning of Amazonia and how it may affect the region's long-term sustainability. Recent results have indicated that Amazonian forests may be taking up carbon at a low but significantly important rate, in terms of the global carbon budget. The research indicates, however, that the rate of uptake may be highly sensitive to temperature so that the region may change from being a sink to being a source of carbon with only an average temperature rise of a degree or less.

CATCH Status Summary

The Couplage de l'Atmosphère Tropicale et du Cycle Hydrologique (CATCH, http://www.lthe.hmg.inpg.fr/catch/welcomeen.html) initiative has developed from work accomplished during the HAPEX-Sahel experiment that was carried out under GEWEX auspices in Niger from 1991 to 1993. HAPEX-Sahel was a mesoscale experiment aimed at studying atmosphere/ land surface interactions in the Sahelian region of West Africa (Goutorbe et al., 1997). It has been agreed that in order to understand the mechanisms controlling the hydrological variability of the West Africa region it is necessary to study its unique features as a climatic ensemble. Therefore, in 1997, CATCH as a regional experiment that could be undertaken on a time scale that could account for the interannual and decadal variabilities of the water cycle of the region, was promoted.

Since no watershed of sufficient size could be identified to set up a CSE, a multiscale approach was chosen. West Africa as a whole was considered to provide the basis for studying the structure and the variability of large atmospheric entities, such as the prevailing jets, the easterly waves and the convective complexes that propagate over several hundred to a few thousands of kilometers. A 5° (0°- 5°E) by 9° (6°N-15°N) window (the CATCH window, covering roughly 660,000 km²) has been defined to study in more detail the atmospheric and hydrologic variabilities over a region spanning all of the climatic regimes of West Africa. This window is being used as a reference area to compare the outputs of various atmospheric models (global to mesoscale) with observations. At a lower scale, two focus areas have been selected for carrying out fine resolution measurements and process studies. One is the Niamey square and the other is the upper Ouémé.

At the mesoscale, a series of 10 years of high resolution measurements are now available on the Sahelian site of Niamey. Given the return to wetter conditions since 1998, this data set will allow the study of the water balance of the region over a range of annual rain amounts. On the Ouémé site, the year 2000 was the first with full operation of the nominal hydrometeorological network currently in place. One aspect of the CATCH field program is to contribute to the validation of TRMM data. The set up of a TRMM validation site over West Africa could be part of the a joint European initiative that could be get underway in the near term. A validation study comparing the LMD GCM to observations taken over the CATCH region showed the difficulty such models can have in properly characterizing the rainfall regime associated with the West African Monsoon (Lebel et al., 2000). This result supports the necessity for reinforcing hydro-climate studies in West Africa. A regional atmospheric sounding campaign (in the context of a proposal to the GEF) is still considered as a possibility as a contribution to CEOP in the 2001 to 2003 time period. Various international teams have expressed an interest in participating, including one from Brazil that has participated in LBA. Local meteorological services have also shown an interest to contribute, provided their personnel were instructed in the experimental protocol. Within the CATCH region both the Niamey and the upper Ouémé catchment sites will be active during CEOP. The proposal application to the GEF is important to how well these sites are prepared to contribute to CEOP. A joint international project designated H20, is being undertaken by several Benin, French and German institutions. The main project has been set up to study the water balance of the Ouémé catchment, its interannual variability and the impact of this variability on the water resources, food security and socio-economics of the region.

APPENDIX D

STATUS and PLANS of GCSS WORKING GROUPS

WG1 (Boundary Layer Cloud Systems) Status and Plans

The Boundary Layer Cloud Working Group aims to improve physical parameterizations of Boundary Layer clouds, other boundary layer processes, and their interactions. The methodology is to conduct intercomparisons between observational or laboratory case studies, one-dimensional GCM column model results, and 2-dimensional (2D) and 3-dimensional (3D) eddy-resolving models of cloud-topped boundary layers. The main contributors to this effort include the leading boundary layer cloud modelling groups from around the globe, which continue to participate in the on-going series of WG1 workshops. The Boundary Layer Clouds working group is currently chaired by Prof. Peter Duynkerke P.G.Duynkerke@phys.uu.nl of the Institute for Marine and Atmospheric Research Utrecht (IMAU), The Netherlands. Updates on actions being taken by the Group are available by joining an email list. The email box identification is gcss-l@phys.uu.nl. To join, send a message containing the words "subscribe gcss-l" to server Majordomo@phys.uu.nl. The other source of information on the status of the Boundary Layer Clouds Working Group work is on the Internet at: http://www.atmos.washington.edu/~breth/GCSS/GCSS.html.

The two highest priority studies now under investigation by WG1 are, a continental shallow cumulus boundary layer diurnal cycle (ARM Oklahoma site) case that was presented at the January 2000 WG1 workshop held at Boulder, CO, USA and a diurnal cycle of stratocumulus case that uses data taken off of the coast of California, USA during the FIRE 1987 experiment. The case coordinator for the continental shallow cumulus case is Dr A. Brown from the UKMO. Dr Brown's email address is arbrown@meto.govt.uk. The case summary and specifications can be obtained by anonymous file transfer (ftp) from <email.meto.gov.uk> where it is necessary to first type the phrase "connect email.meto.gov.uk" and then the phrase "cd pub/apr/arm". The necessary files can then be obtained. The case coordinator for the FIRE '87, diurnal cycle of stratocumulus case, is Dr Peter Duynkerke from IMAU. Dr Duynkerke's email address is P.G.Duynkerke@phys.uu.nl. The case specifications for this case are still being developed.

The priority issues now under consideration by WG1 have followed earlier work on several test cases. For example, because no attempt had been undertaken previously to do a systematic intercomparison of non-precipitating (shallow) cumulus convective type boundary layer clouds, a test case with those characteristics was chosen from phase 3 of the Barbados Oceanographic and Meteorological Experiment (BOMEX) from 22 June to 30 June 1969. Since this was the first intercomparison study on shallow cumulus convection, a trade wind cumulus case with vertical profiles, which are typical for a large part of the trade wind region, was selected. More information on this case can be found at: http://www.knmi.nl/~siebesma/gcss/bomex.html.

In 1998 an intercomparison was undertaken that was based on an idealization of observations made during the Atlantic Tradewind Experiment (ATEX). This case was chosen for study because it was felt that it represented a more "typical" tradewind regime; one in which cloud fractions were nearer 50 percent. More information about this case can be found at: http://www.asp.ucar.edu/~bstevens/atex/contents.html.

WG2 (Cirrus cloud systems) Status and Plans

WG2 is working to advance development of physically based parameterizations of cirrus cloud processes for implementation in large-scale models used for climate simulation and numerical weather prediction (NWP). State-of-the-art general circulation models (GCMs) now explicitly predict the occurrence and amount of cloud ice in the atmosphere. Models such as the ECMWF model produce cloud ice (cirrus) in a qualitatively realistic fashion, both via large-scale ascent (dominant in winter hemisphere middle latitudes) and via detrainment from deep convective cloud systems (Jakob, 2000). However, there is little observational guidance in terms of the actual ice water budget of the atmosphere, especially at cold upper tropospheric levels where the radiative impact of clouds can be quite strong in the infrared spectral region. Thus, present GCM results show significant range, even for gross parameters such as the global mean ice water path (Rasch and Kristjansson, 1998). The fundamental approach of WG2 is to conduct systematic quantitative comparisons of cirrus cloud models, including CRMs and SCMs as well as the (parcel) models underlying the treatment of cloud microphysical development in CRMs. The intent is to identify key processes and parameters leading to significant inter-model differences such that the investigators and measurements can be focused on resolving those differences. The ultimate goal is to validate the CRMs versus observations and then to use these models for studies supporting parameterization development in GCMs.

The focus of the research has been on results of the first two WG2 projects. These projects are the Idealized Cirrus Model Comparison (ICMC) Project, developed and led by Dr Starr (WG2 Chair at NASA GSFC), and the Cirrus Parcel Model Comparison (CPMC) Project, developed and led by Dr Ruei-Fong Lin (USRA at NASA GSFC). Other members of WG2 contributed to the development of these test cases including Dr Phil Brown (UKMO) and Dr Paul Demott (CSU). Consideration for possible future WG2 projects are being focused on existing well-observed cirrus cases at the Southern Great Plains (SGP) ARM site in Oklahoma, as well as future cloud IOPs planned there. Plans related to the FIRE CRYSTAL (Cirrus Regional Study of Tropical Anvils and Layers) experiments and other relevant field activities are also being followed carefully for possible future WG2 test cases. Most recently it was agreed that the Group should pursue an observed cirrus case study and that the SGP ARM data sets were the most appropriate available candidates. Drs Starr and Mace agreed to lead this effort to begin in 2000-2001 time period.

A copy of the paper with the preliminary results from the ICMC and CPMC activities and other information about GCSS WG2 and its projects may be found at the GCSS WG2 web page: http://eos913c.gsfc.nasa.gov/gcss_wg2/.

Specific test cases being developed include, the ARM-94 Cold Cirrus Case described in Sassen, K., G.G. Mace, J. Hallett, and M.R. Poellot, 1998: Corona-Producing Ice Clouds: A Case Study of a Cold Midlatitude Cirrus Layer. *Appl. Optics*, **37**, 1477-1485; the EUCREX-93 Warm Cirrus Case; and Anvil Simulations case(s).

WG3 (Extra-Tropical Layer cloud systems) Status and Plans

Layer cloud systems are a major component of the extra-tropical region and they consequently play a fundamental role in the water and energy cycles of the mid-latitudes. The main scientific issue for this working group is to ensure that critical aspects of these systems are suitably represented in climate and weather general circulation models (GCMs). A common question that links many of the scientific issues being undertaken by this group is: Is there an optimal combination of GCM resolution and sub-grid scale parameterization of mesoscale cloud structure and cloud layering in extra-tropical cloud systems? Other scientific and technical questions of importance are related to what features of these cloud systems can be adequately handled with imposed GCM resolutions and what processes are not properly parameterized, and what are the specific threshold scales for critical features?

One of the main cases under analysis by WG3 is based on data from the FASTEX Intensive Observing Period number 16. Drs Clark and Lean (UKMO) are leading this effort. The other most significant effort by the group is related to the development of large-scale survey techniques to identify model problems in generating midlatitude cloud structures being led by the incoming WG3 Chair Dr Tselioudis, at the NASA GISS.

Significant new results arising from the Working Group 3 activities can be found at the WG3 home page: http://www.msc-smc.ec.gc.ca/GEWEX/GCSS/GCSS_wg3.html.

WG4 (Precipitating Convective cloud systems) Status and Plans

The goal of GCSS WG4 is to improve the parameterization of precipitating convective cloud systems in GCMs and numerical weather prediction models through an improved physical understanding of cloud system processes. The WG4 home page is at: http://www.met.utah.edu/skrueger/gcss/wg4.html.

Ongoing activities of WG4 during 2000 included the continuing valuable collaboration with DOE ARMs CPM (Cloud Parameterization and Modeling) and CP (Cloud Products) WGs. Several of the European WG4 modelers are funded under EUROCS (European Project On Cloud Systems In Climate Models). They will focus on the diurnal cycle of deep convective clouds based on a period during Case 3. ECMWF continues to provide valuable perspectives on parameterization issues as well as column output from its global forecast model for the ARM sites. NCEP's Environmental Modeling Center (EMC) is also involved with GCSS and ARM through its global forecast model, the column output from the global model for the ARM sites, and the SCM derived from the global model.

The Fifth WG4 meeting was held jointly with the ARM CPM WG from 6 to 8 November 2000 in Silver Spring, Maryland, USA. The meeting was hosted by NCEP's EMC. Further analysis of the results of Case 3 led to new findings. One such finding by Dr John Petch showed that using a horizontal grid size smaller than 2 km improved the timing of convection initiation in the UKMO CRM. Dr Marat Khairoutdinov made an extensive

intercomparison of Case 3 simulations using the CSU 3D CRM in different configurations. He found that for two of the subcases the 2D and 3D versions of the model produced similar results. One outcome was that both 2D and 3D results showed no significant dependence on the domain size in the range of several hundred to a few thousand km except that the variances in the 2D simulations increased with domain size. Dr Yali Luo compared the CSU-UCLA CRM Case 3 simulated cirrus cloud properties to observed properties. The simulated cirrus cloud occurrence frequency was greater than observed. In addition, the simulated cirrus clouds were thicker than observed, and had lower cloud bases.

Several new observational datasets for Case 3 were produced during 2000. These included a 25-mb-layer version of the Case 3 variational analysis (produced by Minghua Zhang), a cirrus properties dataset (Jay Mace), a boundary layer depth dataset (Cederwall, Coulter, Lazarus, and Krueger), a GCAPE analysis (Cripe and Randall), more extensive satellite cloud properties (Pat Minnis), and a compilation of the climatological diurnal cycle of precipitation at the SGP (Cederwall and Krueger). Dr John Yio put the Case 3 model results online in netCDF format in both native and interpolated-to-analysis-level vertical coordinates. Contact Ric Cederwall (rcederwall@llnl.gov) for access to these datasets.

In 2000, WG4 agreed to accept as one of its priorities development of a test case associated with the diurnal cycle of deep convection over land. To move this action forward Dr Wojciech W. Grabowski, incoming WG4 Chair, has asked that consideration be given to a proposal by Dr Christian Jakob from ECMWF for a case that deals with convection over the Amazon basin. A database compiled during the TRMM/LBA campaign in this region and work already being undertaken with the data by members of the Working Group make this case an extremely viable one for further investigation.

Before the details of the LBA-based case can be finalized it was felt that the Working Group should benefit first from development and analysis of a deep convection case being undertaken in the context of a European Union cloud system study designated the EUROCS project (http://www.cnrm.meteo.fr/gcss/EUROCS/EUROCS.html). The WG1 of GCSS and the boundary layer working group of EUROCS have been cooperating on various test cases that are also of relevance to WG4.

A manuscript is in work that describes the results of an early WG4 case (Case 2: multi-day simulation of TOGA COARE convection). Finalizing this paper is important so that it can be referenced in other papers being submitted for publication by WG4 members. Dr Grabowski has agreed to work with Dr Krueger to have a draft of the manuscript finished by the end of 2001. Efforts are underway to arrange for WG4 to meet jointly with GCSS WG2 (cirrus clouds), chaired by Dr Starr. A joint meeting/workshop is being considered in conjunction with the next WG4 meeting the week of 22 October 2001. It is felt that such a meeting would be of mutual benefit and specifically that WG4 would be interested in evaluating existing microphysical schemes in WG2 test cases. The Working Group members are being encouraged to support two up-coming meetings a Second TRMM Latent Heating Algorithm Workshop on the topic of TRMM Heating Products: Requirements and Applications (10-12 October 2001 at NCAR, Boulder, CO, USA) and a Cumulus Parameterization Mini-Workshop (13-15 November 2001, NASA/Goddard Space Flight Center, Greenbelt, MD, USA). Please contact WG4 member Dr Wei-Kuo Tao (tao@agnes.gsfc.nasa.gov) for further information on either of these meetings.

WG5 (Polar cloud Systems) Status and Plans

A GCSS focus on polar clouds was motivated by the fact that there is a poor understanding of the physical processes at work in the polar cloudy boundary layer and that current GCMs do well at simulating cloud, radiation, and boundary layer processes in the polar regions. The need to do better with these parameters is also motivated by the idea, associated with positive radiation feedbacks in the climate models, that there will be an amplification of the greenhouse warming in the Arctic. The effort is timely in light of a number of recent activities that have made a wealth of data on arctic clouds and radiation available. These include the Surface Heat Budget of the Arctic Ocean (SHEBA), a field experiment deployed in the Arctic Ocean during the period October 97 through October 98; the FIRE III Arctic Clouds Experiment deployed research aircraft during the period April through July 1998 over the SHEBA surface observations; and the ARM Program deployment of instrumentation at Barrow, Alaska for a period of up to 10 years, beginning in March 1998. These data have provided the basis for the initial case studies that WG5 is considering. Older datasets have also been under consideration and even newer data will also be actively pursued in conjunction with planned and future field programs, particularly in the Antarctic.

The main scientific issues for WG5 are reflected in the revision of the GCSS Science and Implementation Plan. The focus is on improved parameterizations associated with cloud microphysics (especially mixed phase clouds) cloud distribution, radiation fluxes, surface turbulent fluxes and stable atmospheric boundary layer. The priority test cases being developed and analyzed by the members of the working group are listed on the WG5 home page at: http://paos.colorado.edu/~curryja/wg5/home.html Dr J. Curry, from the University of Colorado, at Boulder, CO, USA is the WG5 Chair.