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ACTIONS AND RECOMMENDATIONS FROM SSG-16

A/ Recommendations to the attention of JSC

A-1. The SSG endorses BSRN becoming part of GCOS. This recommendation should be taken to the JSC. Action: Soroosh Sorooshian, IGPO.

A-2. A proposal was made to disbandon WGSM when COPE WGOA is formed. This topic will be raised at COPE discussions at the JSC. Action: Soroosh Sorooshian, IGPO.

A-3. Given the importance of parameterization issues it was agreed that the topic of parameterizations as a pan-WCRP topic should be raised at the JSC. Action: Soroosh Sorooshian.

A-4. JSC will be asked to approve the submission of a recommitment letter to be sought for ISCCP, GACP, GPCP and SRB projects. The letter will go from the SG to agency heads. Action: Bill Rossow and IGPO will draft a note for the JSC to be presented in the GEWEX JSC presentation.

A-5. Bill Rossow will serve as the GEWEX WGOA member. JSC should be informed of this decision. Action: Soroosh Sorooshian, IGPO.

B/ General recommendations

B-1. GEWEX needs to identify ways in which it will contribute to IPCC. This should take into account proposals from GRP on global WEBS (jointly with the other two panels) and the assessment of global data products. Suggestions are to be sent to Gilles Sommeria. Action: all.

B-2. The need for GEWEX representatives on the JSC flux committee will be reviewed. Action: Bill Rossow, IGPO.

B-3. Given the complexity of separating the effects of forcing and feedback effects in the climate system, it was agreed that the GEWEX objectives related to climate feedbacks should be reviewed with a view to sharpening them. Action: IGPO.

B-4. Given the importance of parameterization issues it was agreed that experts should be invited to give a half-day tutorial on parameterizations at the next GEWEX SSG. Action: All are to forward names to IGPO.

B-5. The following actions will be taken regarding Phase 1 communications of results:

a) the Phase I Results brochure will be completed
b) Phase 1 will be summarized in a chapter in the 25-year WCRP anniversary book. Action: Soroosh Sorooshian, Panel Chairs, IGPO.
c) A BAMS summary paper will be developed. Action: IGPO, Soroosh Sorooshian, Panel Chairs.

B-6. Phase 1 accomplishments document should be modified to include some background on the importance of reducing errors and the contribution

B-7. The feasibility of finding a suitable location and host in India for the next GEWEX SSG will be explored as well as other venues. The proposed dates are 31 January-4 February 2005. Action: Gilles Sommeria, IGPO.

B-8. The definition of soil moisture and soil wetness was defined as point of confusion for both modelers and obervationalists. It was agreed that someone should be found to write an article on the topic for a future GEWEX Newsletter article. Action: IGPO.

B-9. Comments on the GEO draft implementation plan should be routed to IGPO who will consolidate them for forwarding them to WCRP. Action: IGPO.

B-10. The possibility of sending a letter to James Mahoney on extending TRMM should be explored. Action: Gilles Sommeria.

B-11. A letter on extending TRMM will be sent to L. Smarr. Action: Soroosh Sorooshian.

B-12. The roadmap will be filled out with milestones and projects and a refined list of goals. Action: IGPO, Panel Chairs.

B-13. iLEAPS is creating an ex-officio member position. GEWEX Panel Chairs will be invited to participate and one will come to the meeting. Action: John Roads, Bill Rossow and Jan Polcher to decide how to deal with the revolving invitation.

B-14. A letter will be sent to WMO inviting them to support HEPEX. Action: IGPO.

B-15. Phase 1 accomplishments document should be modified to include some background on the importance of reducing errors and the contribution of GEWEX to building infrastructure in various areas. Action: Paul Try, Dawn Erlich.

B-16. Membership on GEWEX panels should be reviewed. Action: Panel Chairs.

C/ Cross-cutting themes

C-1. The precipitation cross-cut was adopted subject to further development of the concept.

a) Names of members for the precipitation cross-cut should be forwarded to IGPO, Action: John Roads, Jan Polcher.
b) TORs for the precipitation cross-cut should be developed Action: Bill Rossow, IGPO.
c) Invitations should be extended to CliC and GPCC to participate in this activity. Action: IGPO.

D/ GHP items

D-1. It was agreed that the GHP will focus on a review of the role of the CSEs at its next annual meeting. Action: John Roads.

D-2. WRAP should be asked to develop a plan to deal with mountain issues as a follow-up to the previous GEWEX SSG meeting. Action: IGPO to send a note to L. Martz.

D-3. WRAP should be asked to identify the ways in which it will contribute to GWSP. Action: IGPO to write a note to L. Martz.

D-4. A letter should be sent to Pavel Kabat and Forest Hall thanking them for past contributions and asking them to bring forward a plan for addressing any niche not currently filled by GLASS, GWSP, surface flux activities and GLDAS. This plan should be presented at the mid-year executive meeting. Action: IGPO to send a note to Pavel Kabat and Forest Hall. Pavel Kabat to consult with Panel Chairs in developing the plan.

D-5. Letters of thanks will be prepared and sent to CSE leaders and GHP global projects. Action: John Roads, IGPO.

D-6. A note should be sent from the SSG to Roberto Mechosco to tell him that La Plata River Basin was accepted as a CSE, it should note that the SSG would like to see an implementation plan in the near future. Action: IGPO, Soroosh Sorooshian.

D-7. A note should be sent to Prof. Yasunari saying that GEWEX endorses the further development of the Asian monsoon concept. Action: IGPO.

D-8. GEWEX should review the situation of AMMA funding and determine if there are any steps it can take to help AMMA get adequate funding. Action: IGPO.

D-9. MDB should be asked to prepare an implementation plan for submission to GHP and GEWEX. Action: John Roads, IGPO.

E/ GRP items

E-1. A letter of thanks will go to the BSRN managers with request for continued support. Action: Els Dutton, IGPO.

E-2. Clarification is needed regarding the linkages between CliC and GEWEX on solid precipitation measurements. Action: IGPO.
E-3. A one-page article on GEWEX global data sets should be prepared for the CLIVAR Newsletter. Action: Bill Rossow.
E-4. A plan should be developed (complete with timelines) for bringing GRP data sets into CEOP archives. Action: Toshio Koike, Bill Rossow.

E-5. A more integrated approach to precipitation measurements is needed. A white paper should be developed for consideration at the executive summer session. Action: Bill Rossow and Bob Adler.

E-6. A more comprehensive approach to clouds is needed that will integrate chemistry, radiation and cloud dynamics. A recommendation for addressing this issue is needed at the summer executive session. Action: Bill Rossow and Christian Jakob.

E-7. A plan for implementing the LANDFLUX project so that it cross-cuts all the panels should be brought forward to the summer executive session. Action: Bill Rossow and Paul Dirmeyer.

F/ GMPP items

F-1. WGNE/ GMPP to invite GHP to present a talk its work on regional climate modeling at a relevant upcoming workshop or meeting. Action: Kamal Puri, Jan Polcher.

F-2 GMPP will take the lead in developing the diurnal cycle crosscutting theme by choosing a validation site and coordinating activities with the other panels. Action: Jan Polcher.

F-3. The GEWEX SSG approves the choice of Christian Jakob as the new GCSS chair. The community should be informed of this decision and a letter of thanks should go to the past Chair. Action: Jan Polcher, Soroosh Sorooshian, IGPO.

F-4. Steps should be taken to promote North American involvement in GABLS. Action: Bert Holstslag.

G/ CEOP items (see also recommendation E-4)

G-1. CEOP should try to encourage stronger connections between CIMS and CLIVAR. Action: Toshio Koike.

G-2. DOE is planning a field campaign on cloud and radiation in the summer of 2006. CEOP should determine if it can take advantage of participating in this activity. Action: Toshio Koike.

G-3. NASA is waiting to hear about the products that are needed for CEOP before forwarding data and products to the CEOP archive. This should be viewed as a priority action. Action: Toshio Koike.

G-4. CEOP should develop a plan for its second phase for review by GEWEX. Action: Toshio Koike.

G-5. CEOP scientists should develop some case studies to show the value of CEOP data. Action: Toshio Koike.

G-6. A CEOP rep should be identified to attend the next CLIVAR meeting. Action: Toshio Koike.

1. INTRODUCTION AND OVERVIEW

This report summarises the main developments in GEWEX during the past year, including the main items and recommendations from the sixteenth session of the GEWEX Scientific Steering Group kindly hosted by the University of Marrakesh and the French Institute for Research and Development.

2003 was a year of integration between the various GEWEX projects following the implementation of Phase II, and was marked by the nomination of Rick Lawford as new Director of the International GEWEX Project Office in October.

GEWEX Milestones worth noting for 2003 are:

- The first CEOP full annual cycle of observations and data gathering scheduled to last until the end of 2004, with the joint commitment of the continental scale experiments, the space agencies and the global modelling community.
- An increased coordination of Continental Scale Experiments (CSEs) with the development of joint studies and the approbation of the LPB (La Plata Basin) as a new CSE.
- The reorganisation of global data sets under a common umbrella and the initiation of a GEWEX working group on data management and analysis
- The completion of a first boundary layer model intercomparison study by the newly formed GABLS project
- The approval by IGOS Partners of the IGOS Water Cycle theme report, in which GEWEX has a leading role

Dialogue between GEWEX projects and panels was encouraged as part of the organisation of "cross-cutting" activities in the following areas: observation, modelling and forecast of precipitation, global closure of the water and energy budget (global WEBS), data management and analysis, and the initiation of a specific activity on the diurnal cycle.

The efforts for a closer interaction between GEWEX and the other WCRP components have been pursued: the interaction with CLIVAR is particularly strengthened by joint participations to CEOP with a significant monsoon component and by the evolution of continental scale experiments towards dual CLIVAR-GEWEX sponsorship. The interaction with CLIC, which takes place regularly through the Continental Scale Experiments, is developing particularly in precipitation related activities and as part of CEOP. WGNE remains a key partner of GEWEX through joint activities with GMPP, however uncertainties on the funding of AMIP has slowed down the intercomparison of global atmospheric models. WGCM was represented at SSG this year, with the scope of increasing interaction in the domain of cloud-radiative feedbacks and in the representation of physical processes including the diurnal cycle.

The positioning of GEWEX with programmes outside WCRP is also considered as a major item. Coordination with the new IGBP components is building up; this presently concerns mainly ILEAPS, which will benefit from joint membership with GMPP in its scientific committee. The need to maintain close contacts with IPCC on water related topics was confirmed by the SSG, as the preparation of the 2007 report is under way. The relations with GCOS have been reinforced during the year following the activity of the satellite working group, and with the proposal for BSRN to be adopted as a joint GCOS/WCRP baseline surface radiation network.

Within WMO, one should mention the continuing coordination with the Hydrology Department on the management of water resources (joint support of WRAP, Water Resources Application Project), and the cooperation with AREP (Atmospheric Research and Environment Programme) on two aspects: aerosols and radiative flux measurements involving BSRN and GAW (Global Atmospheric Watch) and the preparation of THORPEX with common interests in the fields of water cycle data and process studies.

There is a continuing effort to maintain a close relationship with space agencies, with the participation at SSG of ESA, JAXA and NOAA, and frequent contacts during the year with NASA and EUMETSAT. A major involvement of GEWEX in the satellite WG activities helped to initiate relations with the space agencies of Canada, France, India and Russia. One should also mention in this respect the leading role of GEWEX in the IGOS-Partners water theme. Relationship with the main modelling centres is maintained on a continuous basis, as part of the modelling activity of GMPP and as part of CEOP. The dialogue with UNESCO has also developed during the year in hydrology observations and applications. With the IAEA (International Atomic Energy Agency), a new cooperative project is developing, taking advantage of isotope measurements as tracers of the water cycle.

Although CEOP has now acquired a WCRP-wide status, it retains its scientific roots in GEWEX and its advances were presented and discussed at the SSG. The data collection phase is progressing well, but a continuous support of funding agencies is required to get full benefit of the work done up to now, in order to support a research phase after 2004 and to possibly extend CEOP in view of the establishment of a long term global water cycle observation system. CEOP should naturally be considered as a demonstration experiment for COPE and its possible extension as a WCRP contribution to the GEO process.

The publication and communication effort on GEWEX results is felt by the SSG and the IGPO to be of prime importance. A brochure collecting the main results of phase 1 has been prepared by the IGPO, and a brochure describing phase 2 orientations is planned. A more comprehensive paper covering phase 1 achievements is intended to be written as part of the 25 year WCRP anniversary book, with a possible separate publication to be submitted to the B.A.M.S.

2. MAIN ORIENTATIONS AND RECOMMENDATIONS FROM SSG

A mid-year report was issued in July and a strategy meeting with the main GEWEX officers was held in Tucson in August, in order to review the main orientations of the project and to improve the response to JSC and SSG recommendations. At the SSG, in order to assess this evolution and to provide guidance for future actions, members were specifically asked to evaluate progress made relative to the five guiding goals of GEWEX Phase II, to reflect on a GEWEX roadmap and the participation of GEWEX to the COPE initiative.

2.1 COPE and general WCRP strategy

The roadmap under preparation and the organisation of cross-cutting activities within GEWEX can be considered as preparatory work in the COPE perspective. Concerning a possible “sunset date” for GEWEX, it was felt that a key date for the achievement of phase II can be set at 2012. All scientific challenges of GEWEX will clearly not be reached by that date, and a relay by another project or a new phase of GEWEX will probably have to be defined then. With respect to WCRP cross-cutting activities, GEWEX can provide a major input in the fields of tropical convection, global precipitation and data management, domains where a significant interaction with other projects already exists. The modelling activity of GEWEX should be considered as an important contribution to the overall WCRP objectives, with advances foreseen in the parametrisation of physical processes and a potential for a stronger involvement in AGCM and CGCM experimentation and validation. Its “global data set” expertise should allow GEWEX to develop a key role in the future Working Group on Observations and Assimilation. It is suggested that the development of homogeneous climate products for the period 1979-present by using available Earth Observation and in situ data be considered as a first major task for the WGOA.

Concerning the specific objectives outlined as part of COPE, GEWEX is able to particularly contribute to:

- **Climate research for arid and desert regions:** the expert workshop which was envisioned to take place in Marrakesh jointly with the SSG had to be postponed and is now planned for early fall 2004 in Cairo with a strong UNESCO participation.
- **Task force on seasonal prediction:** the main contribution of GEWEX up to now to this activity is the experimentation of the effect of land surface fluxes on seasonal predictability as carried out within the GLASS project. The SSG recommended a better use of global data sets for model boundary conditions and validation, and a stronger involvement of CSE modelling teams for regional simulations.
- **Monsoon activities:** the main contribution of GEWEX is channelled through the CEOP Monsoon Studies Working Group, with the aim to assess, validate and improve the capabilities of climate models in simulating physical processes in monsoon regions. A broad support on this topic was noticeable at the Berlin planning meeting last April, followed by a specialised workshop on Himalayas related issues.
- **Characterisation of present climate:** the expertise of GEWEX in global data sets covering the last 30 years will help determine the mean present climate and its variability. This will be complemented by CEOP data for the components of the water cycle.

2.2 Evaluation of GEWEX phase II advances

An evaluation of advances in GEWEX phase II was carried out with the contribution of SSG members acting as "rapporteurs". Main conclusions can be summarised as follows:

- The focus on objective 1, **"the production of consistent descriptions of the Earth's energy budget and water cycle and their variability and trends, and data sets for the validation of models"** remains valid and a major asset of GEWEX. Three major aspects of GEWEX activity contribute to this objective: the CEOP data set which will mostly improve estimates of budgets at the regional scale by an homogeneous treatment of observations from Continental Scale Experiments; water cycle data from global reanalyses, among them the ECMWF ERA-40 made widely available in 2003, which however suffers from model weaknesses including parameterisation defects; global data sets making mostly use of satellite data, which still suffer from the difficulty to develop accurate retrieval techniques for the water cycle, but are now available for periods over 20 years. Those data are used extensively for developing parametrisation schemes and for model validation. The question of variability and trends is still open, and should be the object of special attention in new developments. The accuracy of precipitation data remains a major challenge. A major gap remains the lack of data sets for evolving surface properties and surface fluxes over land.

- Objective 2**,"enhancing the understanding of how energy and water cycle processes contribute to climate feedbacks"** has been the object of specific attention since the November 2002 Atlanta workshop organised jointly with WGCM. It is felt this objective should be refocused to take into account what is really feasible with available data and state of the art models. A first step would be to diagnose causes of observed variability of the energy and water cycle for the past 15-25 years, and to partition this variability between internal variability and response to external forcing. A new workshop on this topic will be scheduled jointly with GCM modelers.

- Objective 3, **"developing improved parameterisations encapsulating these processes and feed-backs for atmospheric circulation models"**
  GMPP is the main contributor to this objective and the approach underlined by its three components, cloud systems, boundary layers and land surface processes, combining one-column, 3-D eddy resolving models and GCM validation, is directly aimed at improving parametrisations. A good participation of GCM modelers to workshops organised by these groups is noticeable. In addition, the GCCS group is involved in the development of new advanced parametrisation techniques, making use of a "multi-scale modelling framework", that is embedding a cloud resolving model at each gridpoint, in which. The nomination of a new GCSS Chair with GCM experience should also be noted. However it appears that a specific effort would be needed to use the expertise of the other GEWEX panels in this domain, and the question of an overall parametrisation cross-cutting activity at the WCRP level remains open.

- Objective 4, **"interacting with the wider WCRP community in determining the predictability of energy and water cycles"**
  The increasing interaction with CLIVAR should be noted, particularly in the perspective of the COPE initiative. This is noticeable in the evolution of CSE's, which tend to combine water cycle aspects with studies of climate variability and change, and with the development of joint GEWEX-CLIVAR expertise in Monsoon studies. If one considers the various regional experiments, GAPP is a partner in the North American Monsoon Experiment NAME, AMMA endorsed last year by both GEWEX and CLIVAR is an example of comprehensive approach involving the expertise of both communities for the understanding of an important regional component of the climate system, the newly approved PLATIN (Plata Basin experiment) also involves both communities. In Asia, as GAME is ending next year, a new regional project aimed at the modelling and prediction of monsoons, water cycle and water resources is being envisioned, possibly under a joint CLIVAR-GEWEX umbrella. CEOP remains an important field of cooperation, now that the main observation period is under way, and with the first scientific results coming up. The Monsoon working group mentioned above has been fairly active during the year with the design of strategy for experimentation and validation of a range of models, from cloud resolving to regional and global.

  CliC's newly defined scientific strategy takes into account GEWEX objectives and complements the GEWEX approach in areas where cryospheric processes are important. CliC complements GEWEX in relevant Continental Scale Experiments (MAGS, BALTEX, GAME Siberia and Tibet) and in the CEOP observational network. Joint efforts are on-going for the evaluation of precipitation measurements. A clear interest has been shown by CLIC on the reanalysis of climate data sets, as proposed by the satellite working group, particularly with respect to clouds and land surfaces. A specific reflection is needed to take advantage of the International Polar year for the development of joint research themes.

The interaction with SPARC has not evolved substantially during the year. A natural interaction exists with the GEWEX radiation panel for the development of radiative data sets and the evaluation of water vapour and aerosol effects. As it is the case for CLIC, it is expected that the new initiative proposed for climate data sets would revive the cooperation.

Objective 5**: "interacting with the water resource and applications communities to ensure the usefulness of GEWEX results".**

This objective is carried out mainly by the water resources and applications (WRAP) project, which has organised a series of workshops with hydrologists, including two in 2003. The effort of publication and outreach of the group is important. Two main new initiatives include the development of water resource assessment "indicators" and a joint project with the hydrology community for hydrological ensemble forecasting. The interaction with both the WMO Hydrology Department and UNESCO has been significant and a white paper under circulation provides a good basis for future developments.

2.3 Specific issues raised by SSG Chair for JSC

In addition to the overview of GEWEX activities and orientations presented above, GEWEX Chair wishes to raise the following issues for formal endorsement by JSC:

- GEWEX SSG is supporting the proposal for BSRN to become a joint WCRP-GCOS baseline surface radiation network. This proposal is submitted to JSC for approval.
- GEWEX SSG is proposing that the new Working Group on Observations and Assimilation takes over the activities of the Satellite Working Group, ensuring the continuation of the relationships with space agencies.
- Given the importance of parameterisation issues, this topic is proposed for a joint WCRP activity.
- The prolongation of the ISCCP, GACP, GPCP and SRB projects, for which funding is not secured after 2005, is submitted for approval to JSC. This should enable WMO SG to seek recommitments from supporting agencies for those projects.
- JSC is invited to support the continuation of CEOP, with the establishment of a research phase after 2004 and the principle of the extension of CEOP as a contribution to a long term global water cycle observation system.

3. HYDRO-METEOROLOGY

3.1 Overview

The hydrometeorology activity of GEWEX is coordinated by the GEWEX Hydrometeorology Panel (GHP), its main objective being "to determine the hydrological cycle and energy fluxes, model the global hydrological cycle and its impact, develop a capability to predict variations in global and regional hydrological processes and foster the development of observing techniques, data management and assimilation systems". GHP presently coordinates the following regional Continental Scale Experiments (CSEs): the Mackenzie GEWEX Study (MAGS), GEWEX Americas Prediction Project (GAPP), the Large-Scale Biosphere-Atmosphere Study in Amazonia (LBA), the Baltic Sea Experiment (BALTEX), the GEWEX Asian Monsoon Experiment (GAME), the Murray Darling Basin (MDB). In addition, the La Plata Basin (LPB) was endorsed as a new CSE by the 16th SSG in Marrakech. The GHP is also following jointly with CLIVAR the Analyses Multidisciplinaires de la Mousson Africaine (AMMA), which is considered as an affiliated CSE. It also has an advisory role for a few hydrometeorologically relevant projects such as the Global Runoff Data Center (GRDC), the International Satellite Land Surface Climatology Project (ISLSCP), Global Precipitation Climatology Center (GPCC), as well as the International Association of Hydrologic Sciences (IAHS) and International Atomic Energy Agency (IAEA). The Coordinated Enhanced Observation Period (CEOP), which originated in GEWEX, also reports to GHP. Besides providing a hydrometeorological focus for the GEWEX CSEs and affiliated global projects, organizations, and agencies, the GHP has formed various working groups to focus on specific issues, including: Water and Energy Budget Synthesis (WEBS), Water Resources Application Project (WRAP), Data Management (DM), Sources and Cycling of Water (SCW), Extremes, Predictability Working Group (PWG), and Transferability Working Group (TWG).

The GHP held its annual meeting at Lüneburg, Germany, where the GHP CSEs, affiliated experiments, global projects, organizations, and agencies reported on their progress and contributions to GHP goals.

Also during this past year, a review article lead by R. Lawford and summarising the past 8 years of GHP activities has been submitted to BAMS for publication.

The 2003 developments are reported below. The main issues to retain for the year can be summarised as follows:

- All CSEs mentioned above have been active during the year and, except the few more recent ones, have published at least one review article. BALTEX will go through a major review at a Conference to be held in May 2004, and some new orientations are being envisioned as part of European climate research. LBA has now entered a mature phase and some of its objectives may have to be revised in the near future. MAGS will normally end in 2005 and its possible prolongation is not decided. GAME is also going to end in 2005, and a new regional project is under preparation. AMMA is pursuing its plan for a formal beginning in 2005 and intensive periods scheduled for 2006. Finally, as mentioned above, the La Plata Basin experiment has been approved as a new CSE.
- A specific reflection is being carried out to take into account the orientations of GEWEX phase 2 and the growing cooperation with CLIVAR in the requirements for and objectives of the CSE. Increased integration is required as well as the development of horizontal activities, mainly in the domains of the various working groups mentioned above.
- The interaction with other GEWEX components is already developing mainly in the domains of the closure of water and energy budgets, and data management and analysis. It is starting in the cross-cutting precipitation activity and intended in the diurnal cycle activity. SSG has recommended a stronger involvement of CSE modelling teams in the general GEWEX modelling activity and a more visible participation in regional climate research along with other modelling groups.
- The future of ISLSCP has been discussed. There is a definite interest in the potential use of phase 2 products just released or to be released very soon. The plan for a ISLSCP potential phase 3 needs a thorough review in order to ascertain it fits with the requirements of GEWEX.
- The contribution of GPCC and GRDC (Global Run-off Data Center) to gather data for GEWEX use is widely acknowledged, including their specific capabilities with respect to quality control and quantification of uncertainties. A continuing effort is needed to improve delivery of data to those centers.
- IAHS provides a venue for GHP hydrologic science efforts to interact with the broader science community. In that regard, IAHS has been encouraging various groups to become involved in its Prediction of Ungauged Basins (PUB) 10-year initiative and intends to interact with WRAP to better utilize GEWEX products for various applications. The IAHS is also interested in helping CEOP to become more relevant to various catchments.
- The IAEA has an Isotope Hydrology Program, which not only provides the international standards for making isotope measurements, but also collects and analyzes global isotope measurements in precipitation and streamflow. The IAEA will be working with and helping to coordinate GHP/SCW efforts to develop models capable of simulating and predicting these isotope measurements.
- The SSG has endorsed the proposal by J. Shaake of a HEPEX (Hydrological Ensemble Prediction Experiment) workshop to be held under joint sponsorship of the WMO Hydrology Department at ECMWF in March.
- The next GHP meeting will take place in Montevideo, 13-16 September 2004, giving the opportunity to create new links with the La Plata Basin community.

3.2 Updates on Continental Scale Experiments

1) The Baltic Sea Experiment (BALTEX)

Major BALTEX activities in 2003 included: 1) a science plan for BALTEX Phase 2 drafted and approved; 2) exploration of observational data taken during the BALTEX/BRIDGE EOP (1999 to 2002) continued; 3) a major EU-funded BALTEX project (CLIWA-NET: BALTEX Cloud Liquid Water Network) successfully concluded; 4) Two major coupled model systems established and model runs for the BALTEX region conducted; 5) CEOP contributions to 4 reference sites and the development of MOLTS data archive at MPI Hamburg); 6) Planning for 4th Study Conference for May 2004 on Bornholm, Denmark, and 7) mid-term assessment of the BALTEX-related research programme DEKLIM.

Major research contributions to BALTEX originating from several projects within the DEKLIM programme include modelling soil frost and snow, regional evaporation at grid and pixel scale over heterogeneous land surfaces, an integrated Baltic Sea environmental study on analysis and simulation of hydrological and ecological variability in the last 1000 years; towards an operational soil moisture analysis

based on screen level observations and remotely sensed data; accurate areal precipitation measurements over land and sea; and BALTIMOS coupled modeling, extreme saltwater inflow 2003 to the Baltic Sea.

2) GEWEX Asian Monsoon Experiment (GAME)

GAME entered in its Phase II, which includes further research and data analysis, some additional process studies, and modeling needed for the synthesis of the overall GAME objectives. Key research issues for the energy and water cycle of monsoonal Asia include the understanding of cloud and precipitation processes and their interaction with large-scale atmospheric circulation, and the interaction between the cloud/precipitation system and the land surface conditions, including topography and land use/land cover conditions. The International Symposium on the Climate System of Asian Monsoon and its Interaction with Society was held November 11-13, 2003 in Khon Kaen, Thailand. A CD –ROM is available with main GAME data and results. The 2nd International Workshop on Regional Modeling for Monsoon System was held in March 4-6, 2003, co-sponsored by GAME-ISP (International Science Panel) and FRSGC (Frontier Research System for Global Change). The International Asian Monsoon Symposium (IASM) will be held in 18-20 February 2004, Honolulu, USA. The Seventh Workshop on GCM Simulations of East Asia Climate (EAC) and the Third Workshop on Regional Climate Modeling will be held in conjunction with IASM.

3) GEWEX Continental-scale Experiment (GCIP)/ GEWEX Americas Prediction Project (GAPP)

GAPP, a follow-on to the GEWEX Continental-scale International Project (GCIP), is being supported to "demonstrate the capability to predict changes in water cycle variables (e.g., precipitation, soil moisture) on times scales up to seasonal and interannual through better understanding and model representation of land surface and boundary layer processes." GAPP will support, in conjunction with CLIVAR Pan American Climate Studies (PACS), the 2004 North American Monsoon Experiment (NAME) field campaign. GAPP also plans to have another field campaign in the western Cordillera towards meeting the water resources needs of the western USA. In addition, significant efforts will continue to be directed at land memory processes, predictability studies, water resource application studies, and the development of prediction systems. GAPP continues to support and contribute to CEOP.

4) Large-scale Biosphere-Atmosphere Experiment in Amazonia (LBA)

Over 200 investigators are involved in about 85 studies in the Large-Scale Biosphere Atmosphere Experiment in the Amazon Basin (LBA) related to physical climate, atmospheric chemistry and composition, carbon storage and exchange, biogeochemical cycles, land-surface hydrology and water chemistry, and land use and land cover changes. Special issues of Journal of Geophysical Research, Theoretical and Applied Climatology, Global Biogeochemical Cycles and Acta Amazonica have been or will be published in 2003 or 2004. The Third LBA Science Conference will take place in Brasilia in 2004

In 2002 and the first half of 2003, several activities took place, including the installation of the measurement and monitoring components at the LBA research sites. The second major field campaign was the SALLJEX-Brazil that took place during the austral summer of 2003. This is a Brazilian component of the SALLJEX initiative from the CLIVAR-VAMOS program on the South American monsoon, and represents collaboration between GEWEX and CLIVAR. One of the major activities of LBA Phase II will be the Regional Atmospheric Carbon Budget in Amazonia– BARCA. Major field campaigns as part of BARCA/LBA are planned for May 2004 (biomass burning) and October 2004 (towers with continuous monitoring).

5) The Mackenzie River GEWEX study (MAGS)

The MAGS scientific program is on or ahead of schedule in meeting its objectives. The establishment of strong linkages between stakeholders and scientists is becoming a key element of our ongoing activities. MAGS research in 2003 has been focused on model developments includes completion of development and initial evaluations of intermediate-level coupled models and finalizing development of the fully-coupled atmospheric-surface-hydrologic model. Highlights of the MAGS scientific activities during the first half of 2003 have been completion of a CAGES special issue in J. Hydrometeorology (in press), publication of journal article summarizing achievements of MAGS Phase-1 in BAMS, the MAGS Modelling Workshop (Ottawa, ON, March, 2003), a MAGS Session at CMOS Congress (Ottawa, ON, June 2003), and release of 1994/95 Water Year Study dataset CDROM. MAGS also continues its strong contribution to GHP initiatives as well as its interaction at national and international levels with other organizations and agencies with common interests (e.g., GAME-Siberia, CEOP, CLiC, and CASES).

6) The Murray-Darling Basin Water Balance Project (MDBWP)

The major objectives of MDB are to: 1) Monitor and predict the daily water budget, 2) Develop real-time products for water agencies, 3) Observe, understand and model processes controlling soil moisture, 4) Improve the representation of land surface processes in weather and climate models, which can assist in the prediction of land salinization and water resource management, 5) Estimate carbon and moisture exchanges between the atmosphere and the land surface in the MDB, with an emphasis on emissions from salinity affected areas.

During 2003, progress included: 1) a study to monitor and predict the mean areal daily rainfall over the MBD has been initiated and a study using naturally occurring radioactive and stable isotopes together with nuclear techniques characterising key processes driving cycles of interaction between the land surface and the atmosphere boundary layer on diurnal and seasonal timescales has been initiated, 2) development of real-time products for water agencies including a project to provide an irrigation authority with forecasts of rainfall and evaporation has been started, 3) maintaining the network of 18 soil moisture sites situated in the Murrumbidgee Catchment, 4) a study applying isotopic techniques to water balance studies in regional basins has been initiated under the GNIR (Global Network for Isotopes in Rivers) Project, 5) forcing data for the Viterbo and Beljaars Land Surface Scheme (VB95) have been compiled and used to evaluate the VB95 Scheme, and 6) IPILPS has been initiated under the auspices of GLASS.

7) La Plata Basin (LPB)

LPB, recently approved as a CSE at SSG-16, is coordinated by the PLATIN Science Study Group (SSG), which is co-chaired by C.R. Mechoso representing CLIVAR/VAMOS and P.L. Silva Dias representing the GHP. CLIVAR and GEWEX formed the PLATIN SSG in recognition that LPB is a climate-hydrology system with components that are potentially predictable with useful skill from seasons in advance, and whose variability has important impacts on human activities. The long-term goal of LPB is to improve understanding and prediction of the La Plata Basin's climate and hydrology based on their unique regional features and sensitivity to the variability of remote climates. Specifically, LPB addresses the following questions: 1)How predictable are the regional weather and climate variability and its impact on hydrological, agricultural and social systems of the basin? 2) How are droughts and floods in the basin characterized from a climatological and hydrological point of view? and 3) What is the role of global climate change and land use change on regional weather, climate, hydrology and agriculture?

The most important activity of LPB in 2003 was the realization of the South American Low Level Jet Experiment (SALLJEX). Another important activity of LPB in 2003 was the participation with the United Nations Environmental Program (UNEP), Organization of American States (OAS) and the Intergovernmental Coordinating Committee for La Plata Basin (CIC) in a request for funds to the Global Environmental Facility (GEF). The approved funds are for support the planning and implementation of strategic actions to be taken by the governments of countries in LPB for the environmentally and socially sustainable economic development of the basin. Areas specifically targeted are protection and integrated management of water resources and adaptation to climatic change and variability.

8) African Monsoon Multi-disciplinary Analysis (AMMA) (affiliate)

AMMA is a multidisciplinary and international project, building on projects such as CATCH (GEWEX CSA) and WAMP (West African Monsoon Project, a European modelling project). AMMA is built around four main components: observing system, modelling activities, satellite component, training program. Currently the main effort is on organising the Enhanced Observing Period (EOP) and the related modelling and satellite activities. One major issue in this respect is to secure the operation of the existing radio sounding network over West Africa and, possibly, to reinforce it where needed, especially around a selected Monsoon window. The EOP, planned for 2005-2006, is designed to document the annual cycle of the surface conditions and atmosphere, and to study the surface memory effects at the seasonal scale. Special Observing Periods, scheduled in 2006, will focus on detailed observations of weather systems at three key stages of the rainy season.

3.3 Other projects and activities

1) International Satellite Land Surface Climatology Project (ISLSCP)

ISLSCP Initiative I produced the first interdisciplinary Earth Science data collection. Initiative I included two years of monthly surface meteorology, vegetation, soils, surface routing and runoff, atmospheric radiation data and clouds. An effort was funded by NASA's hydrology program to produce the ISLSCP Initiative II collection, a ten-year global collection spanning 1986 to 1995, with some data sets spanning a 17-year period, 1982-1998. 2001 land cover and albedo data sets from MODIS are also included. Initiative II added new carbon data to support specific carbon cycling issues, new state-of-the art data sets for soils, precipitation, runoff, land cover, and topography as well as human dimension data to study the human footprint on the environment. The Initiative II collection, consisting of 48 individual data series, is nearing completion, with 46 of the 48 data sets received. Its evaluation will focus on: (1) consistency across data series, (2) internal consistency within data series, (3) validation against ground measures, (4) impact of data quality on global scientific analyses, and (5) sensitivity analyses.

A number of WCRP and IGBP initiatives leveraged on ISLSCP II are already beginning to use completed portions of the collection, including the GEWEX Global Soil Wetness Project (GWSP), the Global Carbon Observing System (GCOS), NASA's Interdisciplinary Science Projects (IDS), NASA's Seasonal to Interannual Prediction Project (NSIPP), the GEWEX Global Land Atmosphere System Study (GLASS).

2) Data Management Working Group (DMWG)

It develops coordinated hydrometeorological data sets from all of the CSEs, affiliated GHP projects, and other GEWEX projects. During the 2002-2003 period, the DMWG membership worked on maintaining the DMWG World Wide Web: http://www.joss.ucar.edu/ghp/, incorporating data from the GEWEX CSEs into this archive, continuing discussion with the CLIVAR and CLIC programs to coordinate data activities, managing CEOP data collection data from the various CSEs, developing a prototype “composite” data set from CEOP’s first Enhanced Observing Period (EOP-1), July through September 2001, using data from 16 Reference Sites located around the world (http://www.joss.ucar.edu/ghp/ceopdm/refdata_report/), continuing discussions to coordinate GHP data management activities with the other GEWEX Projects (i.e. GRP, GLASS, and ALMA) and preparation of data format verification software to be used to check submitted data sets.

3) Water and Energy Balance Study (WEBS)

Its objective is to develop the “best available” global and regional synthesis of water and energy variables and processes from global and regional observations and analyses for the 1997-2001 time period. A number of global and regional GEWEX data sets have slowly become available and they now need to come together in order to enable to develop a full global land (and perhaps ocean also) water and energy budget synthesis from GEWEX and CSE observations. At the 2003/07 IUGG Workshop, it was decided to first develop an atlas which will later be distilled for publication in a refereed journal. In particular, annual and seasonal means (DJF, MAM, JJA, SON) will be developed for the period Jul. 1996-June 2001.

4) Water Resources Applications Project (WRAP)

It is designed to engage in a dialogue with hydrological modeling community and operational environmental service, demonstrate skill in predicting changes in water resources and soil moisture on time scales up to seasonal and annual, and to develop collaboration with water resources agencies to develop better hydrometeorological predictions. WRAP held a workshop in conjunction with the 9th Annual GHP meeting in Lüneburg, Germany (22-26 September 2003). The primary activities have been to develop a website, organization of workshops to dialogue with the water resource planning and management community (ICWRER, IUGG), preparation of articles for the GEWEX and IAHS newsletters, participation in planning exercises and consultation with other programs and agencies, collaboration with the World Water Applications Project (WWAP) on scientific indicators for global water resources assessment, and initiation of a “white paper” on the application of GEWEX-related science to water resource issues. A proposal for a workshop entitled Transferring Hydrological Data across Spatial and Temporal Scales was submitted to IAHS. A proposal for an international workshop on hydrological ensemble forecasting was developed by Dr John Schaake and a subsequent discussion of a potential “predictability” working group was led by Jose Marengo.

5) Transferability Working Group (TWG)

It will provide a framework for systematic evaluation of simulations of dynamical and climate processes arising from different climatic regions. An important aspect of this intercomparison is to evaluate transferability of regional climate models and their components, for example the extent to which a model developed to study one region can be applied to other regions. Since several models will be used for each regional domain, the TWG will perform an intercomparison by examining individual and ensemble performance between domains as well as on particular domains. Anchored by coordinated observations from continental scale experiments, modeling studies under TWG will examine influences of physical parameterization choices (clouds, convection, precipitation, surface processes), resolution and nesting dependencies, modeling choices (grid point, spectral, stretched grid), and boundary condition influences on the quality of predictions.

6) Extremes Working Group

It is under development and will examine feedback mechanisms affecting the water cycle and how these influence wet and dry periods. Although some work on extremes has been conducted within the various components of GHP, a collective effort has not yet been established. At the 2002 GHP meeting, the need to consider extremes in a collective manner was raised again and an initial, short workshop was held in conjunction with the 2003 meeting. The main objective of the workshop were to review individual activities within the CSEs and to consider future, collective efforts on this issue within GHP.

4. COORDINATED ENHANCED OBSERVATION PERIOD (CEOP)

CEOP is seeking to achieve a database of common measurements from both in situ and satellite remote sensing measurements, as well as matching model output that includes Model Output Location Time Series (MOLTS) data along with four-dimensional data analyses (4DDA; including global and regional reanalyzes) for a specified period. In this context, carefully selected reference stations are linked closely with the existing network of observing sites involved in the GEWEX Continental Scale Experiments (CSEs), which are distributed around the world. The observational component of CEOP will continue at least through the end of 2004 and has already begun to support research in the existing projects and sub-activities in CEOP. An on-going process of coordination and review of work in CEOP has been undertaken, through regular monthly teleconference calls. A major milestone was met when the Second International CEOP Implementation Planning meeting was held in Berlin, Germany from 2 to 4 April 2003.

A CEOP session was recently convened at the 2003 Fall AGU meeting by J. Roads and R. Lawford. The session provided an overview of the data and scientific aspects of the CEOP initiative as well as links with climate programs. Even while CEOP continues its observational phase, these papers provide early scientific results, using CEOP's initial dataset (EOP1), that show the direction the CEOP Research phase will take. A Science Steering Committee (SSC) has been established to guide the scientific work of the five main CEOP working groups (Water and Energy Simulation and Prediction, Monsoon Systems Studies, Satellite Data Integration, Data Management and Model Output Implementation). The activation process of the CEOP Advisory and Oversight Committee (AOC) was completed. The AOC will have representatives from CNES, ESA, EUMETSAT, JMA, JAXA, NASA and the IGOS-P Water Theme who will meet in a parallel session at the Third CEOP Implementation Planning Meeting 10 to 12 March 2004. The AOC will provide additional oversight and connections to the main supporting agencies.

The main implementation phase of CEOP was on schedule. Progress has been made according to the CEOP Implementation Plan on the CEOP Data Management, Satellite Data Integration, Model Output Production, Water and Energy Simulation and Prediction (WESP) and Monsoon Systems Studies (CIMS) activities within CEOP. Information concerning the characteristics of the CEOP reference sites has been made available in the CEOP Reference Site Table at: http://www.joss.ucar.edu/ghp/ceopdm/rsite.html. An initial (seasonal) CEOP dataset, designated EOP-1, is also available at that site. The implementation of the CEOP annual cycle datasets that will form the key deliverables of CEOP is moving forward. Two of these, EOP-3 and EOP-4 cover the period from 1 October 2002 up to the end of 2004.

A major international CEOP Monsoon Systems Studies Workshop focused on the Himalayas CEOP Reference Site Region was held from 7 to 8 April 2003, at Milan Italy, The summary report of the workshop findings is being published in BAMS. CEOP/WESP has developed 3 main working groups: (1) Water and Energy Budget Studies; (2) Land Data Assimilation Systems; (3) Transferability Experiments. A WESP

major activities plan has also been produced. A number of specific studies and proposals have begun to mature under WESP.

The Third CEOP Implementation Planning meeting will take place from 10-12 March 2004 at Irvine, California, USA. CEOP EOP-3 data sets (October 2002 to September 2003) should be completed by the end of 2004. Centralized Archive Centers for the CEOP in-situ and model data sets at UCAR/JOSS and MPI respectively should reach proto-type development levels by the end of 2004. A CEOP Satellite Data Archive and Integration System will be demonstrated in 2004. A number of studies using CEOP data to validate models and satellite data algorithms will be advanced in 2004. Efforts will also begin to apply these predictions for water resource applications. There will be another CEOP Monsoon Systems Studies Workshop in 2004. The meeting will be a joint CEOP/VAMOS Workshop and will be held in conjunction with the 2004 GHP meeting (September 2004, Montevideo, Argentina).

In addition to the finalisation of the data integration phase, main issues for CEOP concern progress of the research components and the use of the momentum acquired up to now for the benefit of the hydrology and climate communities. A research phase is obviously needed after 2004 with adequate support by funding agencies, and its planning will be prepared at the Irvine meeting with contributions from the existing working groups, and with guidance from the SSC and AOC. On the observation and data side, a reflection has been initiated on how to take full benefit from CEOP in the preparation of a sustainable global water cycle observation system. The proposal of a Coordinated Enhanced Hydrology Data Collection Period is being studied with the participation of a network of reference sites. In addition a specific project on the hydrology of cold regions is envisioned with joint participation of CLIC and GEWEX scientists.

5. RADIATION PANEL AND GLOBAL DATA SETS

5.1 Overview

The 2003 GEWEX Radiation Panel meeting was held in Victoria, Canada, on 10-12 November 2003. The meeting was followed by a Workshop on 3-D Clouds and Radiation on 13-14 November 2003. Both meetings were hosted by the Cloud Physics Research Division of the Meteorological Service of Canada. The GRP reviewed the status and accomplishments of all its projects and decided how best to proceed towards its goals.

Main issues can be summarised as follows:

- Most of the commitments by agencies to support current satellite data products end in 2005, thus requiring a recommendation at the JSC level to seek the extension of those projects through the period 2006-2010.
- Present data sets will be assessed by 2005 and it is recommended to ensure that this assessment be considered as input to the new IPCC report.
- All of the GRP project data management groups (for GPCP, ISCCP, GACP and SRB with representation from BSRN and GPCC) were merged into a single WG on Data Management and Analysis (WGDMA); the members of the group represent each participating data center in these projects. The first meeting of this group was held 12-16 May 2003, hosted by NCDC in Asheville, North Carolina. It is intended that this group become the nucleus for a GEWEX data management and analysis group with possible extension to the WCRP level.
- A number of GRP initiatives, including the SeaFlux project and the Feedback study, have coalesced into the preparation and analysis of a comprehensive collection of satellite-based global datasets. It is suggested that this activity be coordinated as the Global Water and Energy Budget Study (GWEBS).
- GRP has been the driving force within the WCRP satellite working group and it is recommended that the proposal for the development of homogeneous data products, making use of all available satellite and in situ data for the last 20-30 years, be adopted at the WCRP level, as a contribution to COPE.
- The status and achievements of BSRN have been reviewed and GRP supports the proposal of BSRN becoming a joint WCRP-GCOS baseline surface radiation network
- Following the success of GRP in addressing global radiation budget issues, new developments are envisioned with respect to the observation of aerosols and clouds. They require a multidisciplinary approach with other GEWEX components. The WCRP strategy with respect to aerosols should be updated.

- A specific effort is needed for the development of adequate data sets for evolving surface properties and surface fluxes. This issue should be considered as a priority either in a new phase of ISLSCP or be taken up by GRP.

Within GRP, concerns have been raised with regard to a number of issues concerning satellite missions under way or under preparation: (1) the possible early termination of TRMM, precluding the absolutely unique opportunity to observe precipitation with TRMM and CloudSat, (2) the threat to MeghaTropiques and EarthCare from funding shortfalls, (3) the possible gap in coverage by afternoon polar orbiting weather satellites before the first launch of NPOESS, and (4) the reversal of the decision to fly the spare CERES instrument on NPP to reduce the risk of a gap in Earth Radiation Budget coverage later this decade. The GRP welcomed the approval of SMOS and expressed strong support for EGPM plans to put significant effort into snowfall measurement and for the JAXA GoSat missions. A major cause for concern to the whole GEWEX program is the possible early termination of TRMM operations next year that NASA is considering. This would not only preclude the unique opportunity of operating two differing-sensitivity precipitation radars at the same time, when CloudSat is launched in early 2005, but would eliminate any chance that TRMM could operate until replaced by GPM.

In the coming year the GRP will organize workshops on comparisons of satellite-based data products for aerosols, water vapor, clouds, precipitation and radiative fluxes, develop a comprehensive on-line GCM radiative transfer code test kit in collaboration with ARM, organize workshops on radiative transfer codes for application to lidar and active/passive microwave observations, produce a comprehensive collection of global, long-term datasets describing the variations of the global energy and water cycle, and formulate an integrated clouds-aerosol-precipitation-radiation research strategy.

The next meeting of the GRP in October 2004 will be hosted by Kyoto University (T. Hayasaka).

5.2 Global data sets and satellite projects

1) International Satellite Cloud Climatology Project (ISCCP)

ISCCP completed its 20th year of data collection on 30 June 2003. Radiances from all operating meteorological satellites, with the exception of FY-2B, are being routinely collected by the cognizant Sector Processing Centers (SPC) and delivered to the Global Processing Center (GPC) and International Archives Center (ICA) in accordance with project requirements. All project datasets are now being delivered via Internet except for the DX product. Currently operating satellites are NOAA-16, NOAA-17, GOES-9, GOES-10, GOES-12, METEOSAT-5 and METEOSAT-7 with METEOSAT-6 and GOES-11 in reserve. GOES-12 replaced GOES-8 on 1 April 2003. METEOSAT-5 is located at 63E longitude, providing coverage of the Indian Ocean -- Asia sector since July 1998. MSG-1 was launched in 2002 and is going through an extensive commissioning phase; it is not planned to be fully operational until 2005. At that time, METEOSAT-6 will be moved to provide coverage of Asia. METOP-1 launch is planned for 2005. GOES-9 is now located at 155E longitude, replacing GMS-5 on 22 May 2003. The launch of MTSAT-1R is now scheduled for early 2004. China successfully launched FY-1D (polar orbiter) in 2002 and plans to introduce a much more advanced polar orbiter, FY-3, in 2005. ADEOS-2 data are available for approximately six months in 2003.

2) *GEWEX Global Aerosol Climatology Project (GACP)*

Following the completion of Stage DX, D1 and D2 ISCCP data for July 1983 through September 2001 (18.25 years), the GACP aerosol product has been derived and is available for the same period. An error in the processing of the Snow/Ice (SI) product was discovered that may affect the ISCCP D-data products for 1998 onwards. After these data have been re-processed, we will analyze the significance of this error on the aerosol product. The expected delay in the processing of the ISCCP D-data beyond September 2001 will similarly delay the GACP aerosol products. The current estimate of the processing schedule is as follows: (1) Complete and deliver GACP datasets for October 2001 through March (or June) 2003 by August 2004, 2) Deliver GACP data products through December 2003 by January 2005.

3) *Surface Radiation Budget (SRB)*

The WCRP/GEWEX Surface Radiation Budget (SRB) project has produced a 12+ year (148 months) data set spanning July 1983 to October 1995 for the GEWEX SW, SW Quality Check (QC), GEWEX LW and LW QC flux algorithms. Monthly and daily averaged data from three of these data sets are archived at the NASA Langley Atmospheric Sciences Data Center (ASDC) and available to the public. Concurrently, with the

data processing, activities in validation and analysis of the data sets are being pursued. The project has been selected by NASA Headquarters to continue through April 2006. The level of funding is such that nearly all proposed upgrades, validation, processing and archival activities will continue. SRB uses satellite data from ISCCP, meteorological data from the NASA Global Modeling and Analysis Office (DAO) and ozone data from TOMS and TOVS when needed. All data required for SRB Release 2 have been obtained. All data are archived at the NASA Langley ASDC. All ISCCP data are also archived at ASDC, which will act as the data source for continued processing. The SRB project will collect other data inputs as needed.

4) *Global Precipitation Climatology Project (GPCP)*

There is now a 23-yr precipitation data record (pentad and monthly mean, 300 km) and a 5-yr record (daily, 100 km resolution); the development of a 3-hourly product is being planned. TRMM data have provided a very useful input for the validation and improvement of algorithms. All GPCP data processing centers have approval to operate through 2005 and are operating normally, except the SRT continues to re-build their TOVS processing software system due to a computer replacement. As a result, the GMDC is awaiting TOVS input to compute the final monthly and daily precipitation estimates for November 2002 forward, and CPC is awaiting final Version 2 SG fields to compute the pentad estimates for November 2002 forward. The SRT is currently doing end-to-end testing. All intermediate data products are available from the respective producers some 1-2 months after the end of the data-month; all such products are current except for TOVS, which currently ends with October 2002. The Version 2 SG monthly is available over the period January 1979-October 2002 in final form and over November 2002-July 2003 in provisional form. The Pentad product is available over the period January 1979-October 2002. The 1DD product is available over the period January 1979-October 2002 in final form and over November 2002-July 2003 in provisional form.

5) *Baseline Surface Radiation Network (BSRN)*

The BSRN collection system consists of approximately 35 surface sites collecting at a minimum the downwelling solar and thermal infrared hemispheric irradiances. Basic meteorological variables and routine upper air soundings are also made at most of the sites. Additional observations of upwelling irradiances, spectral atmospheric transmission (for aerosol optical depth), UVB and ozone are made at some of the sites as resources and conditions allow. Several new candidate sites are being proposed. Although the original intent of the BSRN was to provide direct observations of surface irradiances at globally remote and regionally representative sites, interests and demands of the project have expanded that mission. BSRN continues to expand observations by analyzing the current measurement capabilities and proceeding by establishing specifications for measurement systems that will supply data of the necessary quality. The procedures for implementing network-wide aerosol optical depth measurements are being established and the evaluation of UVB and PAR measurement capabilities are under way. New methods for determining cloud base height are being investigated and future measurements of spectral irradiance and non-radiative heat fluxes are being considered. Such relatively sophisticated and costly measurements could only be done if the necessary funding can be obtained.

6. MODELLING AND PREDICTION

6.1 Overview

The aim of the GEWEX Modelling and Prediction Panel (GMPP) is to improve the numerical representation of the processes linked to the water and energy cycle in the climatic system and develop conceptual models which allow simulations of small scale processes in global models. Attempts are underway to create pan-GMPP activities which would intensify the interactions between the working groups on cloud processes (The GEWEX Cloud System Study, GCSS), on land surface processes (The Global Land/Atmosphere System Study, GLASS) and on the planetary boundary layers (The GEWEX Atmospheric Boundary Layer Study GABLS). These activities will be presented here while the achievements of each of the panels are discussed in the following sections. The proposed cross-cut activities within GMPP are a common theme for the analysis of models and the selection of a common site for model inter-comparisons.

The common theme for the analysis of model inter-comparisons which is proposed is the diurnal cycle. It is expected that this choice will guide the activities in all three groups and encourage a closer study of the couplings, which exists between them. Through the collaboration with AMIP, the theme will also strengthen the link with global climate models. Although a number of studies have already been carried out on the ability of general circulation models to represent the diurnal cycle, there is still a lack of systematic analysis, which would identify the regions and processes where problems are most common in GCMs.

GMPP proposes to evaluate the ability of our models to represent the diurnal cycle using model inter-comparisons as it has proven its value in previous GMPP activities. The strategy envisaged is to diagnose the diurnal cycle in parallel on the processes with which GMPP deals and on the global climate scale before moving onto the analysis of the interactions between clouds, the atmospheric boundary layer and land-surfaces. This plan was submitted and accepted by the 3 panels and was also well received by WGNE , which proposes to call this a common GMPP/WGNE theme. In collaboration with WGNE the analysis of diurnal cycle could be extended to NWP models. It was proposed that the interactions with WGNE on the diurnal cycle theme would be as follows: 1) At the joint WGNE/GMPP meetings NWP centers would report on problems they encountered with the diurnal cycle in their models, 2) this could trigger research within GMPP. Ideally the NWP centers would propose case studies based on data they have available or on regions, which they have identified as critical, and 3) GMPP can request specific diagnostics from NWP centers, which would allow to gain a better understanding of the problems encounter in the models.

It is hoped that through the diurnal cycle theme and the interactions it will trigger, we can loosen the "implementation bottleneck" which exists between GMPP developments and their implementation in large-scale models. The diurnal cycle theme also offers some opportunities for the collaboration between GMPP and CEOP. With the first data sets available through CEOP the ability of some NWP models to reproduce the diurnal cycle on the locations chosen for MOLTS was evaluated. As these areas are covered by a large set of in-situ observation they would ideally be suited for more in-depth analysis through GMPP lead model inter-comparisons.

Another opportunity to encourage pan-GMPP collaborations and work on the coupling of cloud, land-surface and PBL processes could be achieved if a common site for model inter-comparisons could be found. Because of the very different needs in the 3 groups, the choice of a common site could prove difficult. A pre-selection of possible common sites will be submitted to the GMPP panels in 2004 and by the end of the year the best candidate with the corresponding scientific questions could be selected. The coming year will see the implementation of the diurnal cycle theme. This should result in first results on the systematic errors of CRMs, cloud parameterizations and land-surface models in their representation of the diurnal cycle. The various candidates for the common site for GCSS, GLASS and GABLS will be studied. For the next WGNE/GMPP meeting a proposal needs to be tabled for the continuation of AMIP. The preparation of this proposal will involve GMPP and its panels.

Specific issues raised at the SSG were the following:

- The proposal for a diurnal cycle theme has been approved
- The nomination of Christian Jacob as New GCSS Chair has been approved, Steven Krueger pursuing his involvement as deputy
- GMPP recommended a closer interaction with the modelling teams of the CSE's in order to contribute to the improvement of regional models
- A stronger involvement of North American scientists in GABLS is recommended.

6.2 GEWEX Cloud System Study (GCSS)

The goal of GCSS is to improve the parameterization of cloud systems in GCMs (global climate models) and NWP (numerical weather prediction) models through improved physical understanding of cloud system processes. The main tool of GCSS is the cloud-resolving model (CRM), which is a numerical model that resolves cloud-scale (and mesoscale) circulations in either two or three spatial dimensions. The large-eddy simulation (LES) model is closely related to the 3D CRM, but resolves the large turbulent eddies. The primary approach of GCSS is to use single-column models (SCMs), which contain the physics parameterizations of GCMs and NWP models, in conjunction with CRMs, LES models, and integrated, high-quality observational datasets, to evaluate and improve cloud system parameterizations. Integrated, high-quality observational datasets are required to run the models and to evaluate their results. GCSS and collaborating programs (such as DOE ARM) produce these valuable datasets, which are available from GCSS-DIME (Data Integration for Model Evaluation) (http://gcss-dime.giss.nasa.gov). In addition, GCSS has recently begun to lead diagnostic studies of the representation of cloud processes in GCMs.

Meetings held for GCSS this past year include: 1) June 2003: ARCMIP (WG 5) met in Potsdam, Germany, and 2) 27-30 Oct 2003: WGs 1, 3, 4 held workshops in Broomfield, CO, USA, in conjunction with the DOE ARM Cloud Parameterization and Modeling WG and Cloud Property WG. The GCSS Science Panel also met.

6.3 GEWEX Global Land-Atmosphere Study (GLASS)

The GLASS project is progressing through the various actions which were defined in the implementation plan. Within GLASS, PILPS operates the off-line intercomparisons. The goal of PILPS is to contribute improved understanding of continental surface and near-surface processes through international intercomparison of current state-of the-art parameterizations employed in coupled climate, atmospheric and earth system models. Since the early 1990s PILPS has evaluated the parameterization of energy and water fluxes to/from the land-atmosphere interface. In 2002 carbon fluxes were included in this land-surface MIP (Viovy, 2002). In 2004/5 we plan to incorporate stable water isotopes in a new phase of PILPS - "IPILPS".

Two rare but naturally occurring isotopes of water, $^{1}H_{2}^{18}O$ and $^{1}H^{2}H^{16}O$, will be exploited in IPILPS as part of the overall GEWEX push into the use of isotopes in modelling and monitoring the global water cycle.

Progress for this past year includes: 1) Completed Arctic basin study – ACSYS/PILPS completed and generating publications (17 papers in a Special Issue of Global and Planetary Change 2003), 2) Continued tropical forest study, PILPS 1(c) completed and still generating publications (Henderson-Sellers et al., 2002a.; Henderson-Sellers & Pitman 2002), 3) More on frozen soil and snow–PILPS 2(d) still generating publications (Luo et al., 2003, Pitman et al., 2003; Lettenmaier and Bowling., 2002), 4) Coupled comparisons continue, PILPS 3 (AMIPII DSP 12) generating publications as results from AGCMs released through PCMDI (Henderson-Sellers et al. 2002b & 2003a and 2003b; Irannejad et al., 2003), 5) Carbon fluxes, PILPS C1 progressing well, http://www.pilpsc1.cnrs-gif.fr/ (14 LSSs participating; all runs completed and preliminary analysis done), a workshop to evaluate results held in May 2003 in Gif-sur-Yvette, 6) Launched arid environments, PILPS San Pedro workshop in Tucson in August 2003 (Bastidas, L.A., Gupta, H., V., Nijssen, B., Emmerich, W. & Small, E., 2002, the PILPS San Pedra-Sevilleta Experiments Model Comparison over Semi-Arid Areas), and 7) Isotopes in PILPS - IPILPS draft proposal approved by the GLASS Science Panel Aug 2003 Henderson-Sellers et al., 2004, Henderson-Sellers & McGuffie, 2004.

6.4 The Global Soil Wetness Project 2 (GSWP-2)

A 13½ year meteorological forcing data set (global 1° resolution, 3-hourly interval) was prepared for GSWP-2. It is based on the NCEP/DOE reanalysis data set prepared by COLA for the ISLSCP Initiative II data set. Additionally, land surface characteristics from ISLSCP Initiative II (soil, hydrology, topography and vegetation properties) were prepared for GSWP-2 through conversion to NetCDF and the ALMA data standard (http://www.lmd.jussieu.fr/ALMA/).

Baseline land surface model simulations have been completed by research groups on four continents, and results sent to the GSWP-2 Inter-Comparison Center (ICC) at the University of Tokyo. Analysis and validation will be a distributed effort, centered on U. Tokyo and COLA. For simulation of brightness temperatures associated with soil wetness, we have chosen the L-MEB (L-band Microwave Emission of the Biosphere) model from INRA (France) to couple with the LSSs. This model is based on the 'state-of-the-art' knowledge of passive microwave emission from various land covers (herbaceous and woody vegetation, frozen and unfrozen bare soil, snow, etc). In preparation for the analysis phase of GSWP-2, and to establish a baseline of existing global land surface data sets for climate applications, we have compiled and assessed existing global data sets of soil wetness than span at least the period 1980-1999 for model-based products, or at least 1992-1999 for satellite-based products.

6.5 GEWEX Atmospheric Boundary Layer Study (GABLS)

The objective of GABLS is to improve the representation of the atmospheric boundary layer in regional and large-scale models. The first focus of GABLS is on stable boundary layers (SBLs) over land. On the basis of previous discussions and meetings, a benchmark case was selected to discus the state of the art and to compare the skills of single column (1D) models and Large-Eddy Simulation (LES) models for the Stable Boundary Layer. The case is based on the results presented in a study by Kosovic and Curry (2000) for a shear-driven and stable case. As such the boundary layer is driven by an imposed, uniform geostrophic wind, with a specified surface-cooling rate over ice, which attains a quasi-steady state SBL (after about 9 hours). More than 10 groups participated in the comparison for the LES models and more than 15 groups for the 1D models (including the models from the large operational weather and climate centers).

The findings were presented at a workshop at the University of the Balearic Islands in Mallorca, September 22-26, 2003. Results indicate that the models show quite significant differences for the mean temperature and wind profiles as well as the turbulent fluxes and other model outputs for the same initial conditions and forcing conditions. At the workshop several options were explored for future activities, including comparisons with models with more elaborated data sets for cases with stronger cooling over different type of surfaces and increasing complexity. In addition, suggestions were made to explore existing observations over the Baltic Sea and at Antarctica (notably Halley). It is foreseen that the outcome of the Mallorca workshop will be presented in a number of journal papers as well as a meeting.

In summary, this report provides an overview of progress achieved by the various GEWEX projects during the past year. Main issues to be dealt with in 2004 include the completion of the CEOP main observation period and the planning of follow-up activities, the reorganisation of CSE activities to fit GEWEX phase 2 objectives, further work on a joint global data set approach in preparation for the development of new climate products, and the development of the modelling activity. Cross-cutting activities on precipitation, water and energy budgets, data management and analysis, and the diurnal cycle will deserve specific attention. GEWEX project leaders are also keen to improve the interaction with other WCRP projects, particularly in view of the preparation for COPE.

APPENDIX A

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APPENDIX B

AGENDA
FOR THE WORLD CLIMATE RESEARCH PROGRAMME (WCRP)
SCIENTIFIC STEERING GROUP
OF THE GLOBAL ENERGY AND WATER CYCLE EXPERIMENT (GEWEX-SSG)
SIXTEENTH SESSION, MARRAKECH, MOROCCO, 26-30 JANUARY 2004

Monday, 26 January 2004:

8.45: **REGISTRATION**

9.00-10.00: **OPENING CEREMONY/CEREMONIE D'OUVERTURE**

Professeur Ahmed Jebli
Président de L'université Cadi Ayyad, Marrakech

Son Excellence Maitre Mohamed El Yazghi
Ministre de l'Aménagement du Territoire, de l'Eau et de l'Environnement

Docteur Gilles Sommeria, Programme Mondial de Recherche sur le Climat

Professeur Soroosh Sorooshian, Président du Programme GEWEX : Experience Globale sur le Cycle de l'Eau et l'Energie

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10.00-11.00: **BREAK**

11.00-12.30 **1. OVERVIEW OF ACTIVITIES AND PLANS**

1.1: Introductory remarks (G. Sommeria)
1.2: Chairman's report (S. Sorooshian)
1.3: International GEWEX Project Office report (R. Lawford)

12.30-14.00: **LUNCH**

14.00-15.30: **2. RELATIONS WITH SPACE AND CLIMATE RESEARCH FUNDING AGENCIES**

2.1: ESA (A.-E. Herland, P. Ingmann)
2.2: NOAA/US climate research initiative (J. Huang, M. Patterson)
2.3: JAXA (T. Tanaka)

15.30-16.00: **BREAK**

16.00-18.00: **3. CEOP**

3.1: CEOP Update (T. Koike)
3.2: WESP (J. Roads)
3.3: CIMS (J. Matsumoto)
3.4: Overview of CEOP Data Activities (S. Williams)
3.5: International Co-ordination (S. Benedict)
3.6: CEOP Issues for the GEWEX SSG
i) Hydrologic data set collection
ii) Others

18.30: **WELCOME COCKTAIL RECEPTION**

Tuesday, 27 January 2004:

8.30-10.00: **4. GEWEX RADIATION PANEL (GRP)**

4.1: Status of Projects (W. Rossow)
4.2: Specific GRP Issues, Successes
4.3: BSRN (E. Dutton)
4.4: ISLSCP (P. Kabat)
4.5: Actions needed from the SSG

10.00-10.30: **BREAK**

10.30-12.30: **4. GRP PRESENTATIONS (Continued)**

12.30-14.00: **LUNCH**

14.00-15.30: **5. PARTNER PRESENTATIONS**

5.1: CLIVAR (A. Busalacchi)
5.2: CliC (B. Goodison/R. Lawford)
5.3: WGNE (K. Puri)
5.4: WGCM (B. McAvaney)

15.30-16.00: **BREAK**

16.00-17.30: **5. PARTNER PRESENTATIONS (Continued)**

5.5: IGBP/ILEAPS (P. Kabat)
5.6: IGOS Water Cycle Theme (R. Lawford)
5.7: Discussion on interface between GEWEX and other programmes

17.30-18.00: **HOST PRESENTATION** (G. Chehbouni)

18.00: **ADJOURN**

Wednesday, 28 January 2004:

8.00-10.00: **6. GEWEX HYDROMETEOROLOGY PANEL (GHP)**

6.1: Overview of the GHP (J. Roads)
6.2: BALTEX (H. Grassl)
6.3: LBA/La Plata Basin (P. Silva Dias)
6.4: La Plata Basin (R. Mechoso)
6.5: GAME, FRSGC, FORSGC and other related activities (T. Yasunari)

10.00-10.30 **BREAK**

10.30-12.00: **6. GHP (Continued)**

6.6: AMMA (S. Janicot)
6.7: WRAP (L. Martz)
6.8: WEBS (J. Roads)
6.9: Summary and actions needed by the SSG

12.00-13.00: **LUNCH**

13.00: **FREE AFTERNOON/EXCURSION**

Thursday, 29 January 2004:

8.30-10.00: **7. FIRST EXECUTIVE SESSION**

10.00-10.30: **BREAK**

10.30:12.30: **8. GHP RELATED ACTIVITIES**

8.1: The Use of Isotopes (IAEA (P. Aggarwal)
8.2: Global Water System Project (R. Lawford)
8.3: IAHS PUB (K. Takeuchi)
8.4: GTN-H (W. Grabs)

12.30-14.00: **LUNCH**

14.00-15.30: **9. GEWEX MODELLING AND PREDICTION PANEL (GMPP)**

9.1: Overview of GMPP activities (J. Polcher)
9.2: GCSS Activities (S. Krueger)
9.3: GABLS (B. Holtslag)

15.30-16.00: **BREAK**

Thursday, 29 January 2004: (Continued)

16.00-17.30: **9. GMPP (Continued)**

9.4: GLASS (P. Dirmeyer/J. Polcher)
9.5: Summary and Actions needed by the SSG

17.30-18.00: Special presentation:
"Ice Jam Floods in Siberia. The Lena River case-study" (Z. Kopaliani)

18.00: **ADJOURN**

Friday, 30 January 2004:

8.30-10.00: **10. INSERTION OF GEWEX IN THE GENERAL WCRP STRATEGY**

10.1: Overview of the COPE Concept (G. Sommeria/ S. Sorooshian)
10.2: Report on satellite WG workshop and climate data strategy (G. Sommeria/W. Rossow)
10.3: Views on how GEWEX could contribute to COPE (General discussion)

10.00-10.30 **BREAK**

10.30-12.30: **11. HORIZONTAL ACTIVITIES AND GEWEX STRATEGIES**

11.1: Precipitation (W. Rossow)
11.2: Global WEBS (J. Roads)
11.3: Diurnal-Cycle (J. Polcher)
11.4: Data Management Issues (S. Williams/W. Rossow)
11.5: Discussion on Long-term GEWEX Opportunities and Strategies (S. Sorooshian)
11.6: The GEWEX Roadmap (R. Lawford)

12.30-13.30: **LUNCH**

13.30-16.00: **12. SECOND EXECUTIVE SESSION**

16.00: **ADJOURN**

APPENDIX C

LIST OF SCHEDULED MEETINGS CONCERNING GEWEX

2004

26-30 Jan	16th Session of the GEWEX SSG	Marrakesh, Morocco
4-6 Feb	IGOS International Workshop	Tokyo, Japan
18-20 Feb	International Asian Monsoon Symposium	Honolulu, Hawaii, USA
1-6 March	25th Session of the WCRP Joint Scientific Committee	Moscow, Russian Federation
8-9 March	Workshop on CEOP Model Output and Analyses	Irvine, CA, USA
8-10 March	Hydrological Ensemble Prediction Experiment (HEPEX) Workshop	ECMWF, Reading, UK
10-12 March	Third CEOP Implementation Planning Meeting	Irvine, CA, USA
29 March - 2 April	WCRP Regional Scale Climate Modelling Workshop	Lund, Sweden
20-22 April	Aquarius/SAC-D-SMOS-HYDROS Joint Satellite Science Workshop	Miami, FL, USA
17-21 May	AGU 2004 Spring Meeting	Montreal, Canada
23-28 May	Challenges in the Climate Sciences	Blois, France
24-29 May	4th International Symposium on the Asian Monsoon System (ISAMA4)	Kumming City, China
24-28 May	Fourth Study Conference on BALTEX	Island of Bornholm, Denmark
5-9 July	CEOP and Asian Monsoon Systems Session, Joint AOGS 1st Annual Meeting & APHW 2nd Conference	Singapore
26-28 July	3rd LBA Science Conference (special session on water and energy balances in the Amazon Basin)	Brasilia, Brazil
29-30 July	VIII LBA-ECO Meeting	Brasilia, Brazil
26-30 July	8th BSRN Workshop and Scientific Review	Exeter, United Kingdom
8-11 Aug	8th International Conference on Precipitation	Vancouver, Canada
30-31 Aug	GAPP PIs Meeting	Boulder, CO, USA
5-10 Sept	2nd TRMM International Science Conference Contact: Tetsuo Nakazawa, e-mail: nakazawa@mri-jma.go.jp	Nara City, Japan
13-16 Sept *(New Date)*	10th Meeting of the GEWEX Hydrometeorology Panel	Montevideo, Uruguay
17-18 Sept	CEOP Monsoon Meeting	Montevideo, Uruguay
21-23 Sept	12th session of the GEWEX Cloud System Study Scientific Steering Group	New York, NY, USA
10-14 Oct	SOLAS Open Science Conference	Halifax, Canada
11-15 Oct	20th session of the CAS/JSC WGNE/ 8th Session of the GMPP	Exeter, United Kingdom

18-21 Oct	Joint WGNE/WGCM/WGSIP Workshop on Ensemble Methods: From Weather Forecasting to Climate Change	Exeter, United Kingdom
18-19 Oct	GRP Working Group on Data Management and Analysis (WGDMA)	Kyoto, Japan
20-22 Oct	15th Session of the GEWEX Radiation Panel	Kyoto, Japan
Nov	10th Annual MAGS Meeting	Vancouver, BC, Canada
1-2 Dec	9th GAME International Science Panel Meeting	Sakyo-ku, Kyoto, Japan
3-5 Dec	6th International Study Conference on GEWEX in Asia and GAME	Sakyo-ku, Kyoto, Japan

2005

31 Jan - 4 Feb (tentative dates)	17th session of the GEWEX Scientific Steering Group	Location to be confirmed
20-24 June	5th International Scientific Conference on the Global Energy and Water Cycle	Orange County, CA, USA
16-20 May (tentative dates)	GCSS Scientific Conference	Athens, Greece

APPENDIX D

PUBLICATIONS AND REPORTS 2003-2004

2003

Informal Reports

1/2003	Report of the thirteenth session of the GEWEX Radiation Panel (GRP), Zurich, Switzerland, 31 July-2 August 2002
3/2003	Report of the eighth session of the GEWEX Hydrometeorology Panel (GHP), Palisades, NY, USA, 10-12 September 2002
4/2003	Report of the fourteenth session of the GEWEX Scientific Steering Group, Reading, UK, 28 January-1 February 2002
8/2003	Report of the WCRP Satellite Working Group on "Update of Space Mission Requirements for WCRP", Geneva, 6-7 November 2002
11/2003	Report of the GEWEX-GPCP Workshop on Precipitation Analysis, Reading, UK, 11-13 March 2003
12/2003	Report of the fifteenth session of the GEWEX Scientific Steering Group, Bangkok, Thailand, 20-24 January 2003

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3/2004	Update of Space Mission Requirements for WCRP: Second report of the WCRP Satellite Working Group, 20-22 October 2003, Geneva, Switzerland
4/2004	Report of the fourteenth session of the GEWEX Radiation Panel (GRP), Victoria, BC, Canada, 10-12 November 2003
5/2004	Report of the sixteenth session of the GEWEX Scientific Steering Group, Marrakech, Morocco, 26-20 January 2004