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OF UNESCO

WORLD CLIMATE RESEARCH PROGRAMME

REPORT OF THE SEVENTEENTH SESSION

OF THE GEWEX SCIENTIFIC STEERING GROUP

(Kunming, China, 31 January-4 February 2005)

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ACTIONS AND RECOMMENDATIONS FROM SSG-17

1. WCRP/COPES

1.1: The latest version of the COPES plan is under review. Comments should be sent directly to Brian Hoskins and David Carson by February 24, 2005. (ACTION: SSG members and Panel Chairs). <no further action needed>

1.2. Information on the early WCRP work on Clouds and Radiation will be forwarded to WCRP so it can be appropriately reflected in the history of WCRP. (ACTION: Bill Rossow, Peter Lemke)

2. ESSP/GWSP

2.1. The GWSP plan will be reviewed and specific links with GEWEX and related proposed action items will be presented at the next GEWEX SSG meeting. (ACTION: Lawrence Martz, Dennis Lettenmaier, IGPO)

3. GEWEX General

3.1. The need and potential benefits of another letter to NASA Senior Review advocating the continuation of TRMM will be explored. (ACTION: Soroosh Sorooshian) <no further action needed>

3.2. Panel Chairs will either participate at the special European EGU session on GEWEX or send a representative. (ACTION: Panel chairs to inform Peter van Oevelen of their representatives) <no further action needed>

3.3. Based on the revised GEWEX objectives a draft of the GEWEX roadmap will be prepared for the GEWEX Executive meeting. (ACTION: IGPO)

3.4. In view of the lack of progress on GEWEX cross-cutting themes, the status of each one will be reviewed and a proposal for a new lead and a timetable for action developed for each theme. (ACTION: IGPO, Panel Chairs, Soroosh Sorooshian)

3.5. The GEWEX representative to WOAP will solicit input on data management needs and issues for discussion at the upcoming WOAP meeting. (ACTION: Bill Rossow) <no further action needed>

3.6. Proposals for the location of the 2006 GEWEX SSG meeting will be reviewed and a decision made before the GEWEX Conference. (ACTION: Soroosh Sorooshian, IGPO, Gilles Sommeria) <no further action needed>. The next meeting will take place in Dakar, Senegal, 9-13 January 2006.

4. GMPP

4.1. The SSG endorsed the proposed changes to GMPP to promote more integration within GMPP. GMPP meeting would be held every second year and independent GMPP would be held on the alternate years. GMPP is asked to implement this plan as soon as feasible. (ACTION: Jan Polcher)

4.2. In order to promote integration across GMPP projects, a plan for a pan-GMPP project will be proposed at the next GEWEX SSG meeting. (ACTION: Jan Polcher)

4.3. A strategy for incorporating SnowMIP into GMPP will be developed and presented for approval at the summer GEWEX executive meeting. (ACTION: Jan Polcher)

4.4. A discussion on GCSS strategy will be prepared for the next GEWEX SSG meeting. It will refer in particular to the questions raised by U. Schumann (*cf. footnote*). (ACTION: Christian Jakob, Jan Polcher)

4.5. The number of Chinese scientists participating in GMPP and other GEWEX activities should be increased. G. Wu will suggest some names for consideration by GMPP project leaders. (ACTION: G. Wu)

4.6. To address the interest of IPY, GCSS, WCRP and IGBP in aerosols and cloud problems, a small workshop will be organized between these communities. (ACTION: Christian Jakob, IGPO)

5. GHP

5.1. AMMA was accepted as a GEWEX CSE. AMMA will be asked to present its implementation plan at the next GHP meeting. (ACTION: John Roads, Jan Polcher)

5.2. GHP will develop a science plan (or strategy) that accounts for its expected contributions to COPES and the plan for dealing with CSEs as they phase out. An outline of this science plan or strategy will be presented at the summer GEWEX Executive meeting. (ACTION: John Roads)

5.3. A brief summary of the expected 2005 accomplishments of WEBS, ICTS, WRAP, GLDAS and Global Analysis comparisons will be provided to IGPO before the GEWEX Executive meeting. (ACTION: John Roads)

5.4. Based on input from T. Yasunari on the precise needs, a letter to the GAME community will be prepared to support a new GEWEX initiative on monsoons in Southeast Asia. (ACTION: John Roads, IGPO)

5.5. The MDB project chair will be asked to accelerate the completion of an implementation plan. (ACTION: John Roads)

5.6. LPB should be asked to develop its implementation plan and submit it to the next GHP meeting. (ACTION: John Roads)

Footnote for Item 4.4

1. What are the key science questions (such as diurnal cycle, aerosol-cloud-precipitation impact)
2. What are the key processes
3. Which are the base models that need to be improved
4. What data should be used for validation?
5. How to measure progress (requires proper diagnostics and data for validation)? (input from U.Schumann)

It is pointed out that it might be useful for GCSS to observe (copy and improve) the SPARC strategy for process-oriented improvement of models (see Eyring, V. et al., A strategy for process-oriented validation of coupled chemistry-climate models, BAMS in press). This strategy is based on a table of GCMs, a table of processes with diagnostics (which is a set of data analyzed from the model results) and validation tools. In fact, in the past the success of models was often measured by the overall model result - but we want the right answer for the right reason, hence the individual processes need to be identified. By focussing on processes, models can be more directly compared with measurements. GCSS should identify a set of core validation processes structured around the major topics (such as Land-Surface interaction, PBL, deep convection, Cirrus, etc.). Each process should be associated with one or more model diagnostics (including a set of variables) and with relevant datasets that can be used for validation. This approach would provide a coherent framework for validating GCMs and can be used as a basis for future assessments.

In addition it may be recommended to develop a strategy to improve the base models. This should include a list of parameterizations that have the chance to be implemented in the base models. This should also help to increase the manpower dedicated to improving GCM parameterizations.

5.7. GHP will develop proposals for SWING and Transferability activities that will engage all of the CSEs. (ACTION: John Roads with assistance of CSEs and GHP Working Group Chairs)

5.8. WRAP will prepare a more focused plan of activities for the GEWEX 2006 meeting outlining specific projects to undertaken in collaboration with IAHS PUB. (ACTION: Lawrence Martz)

6. ISLSCP

6.1. ISLSCP will develop a science plan for its third phase. (ACTION: P. Kabat, F. Hall)

6.2. A report on the ISLSCP Initiative II Workshop will be developed and presented at the 2006 GEWEX SSG meeting. The report will address issues raised during this SSG-17 meeting. (ACTION: P. Kabat)

7. CEOP

7.1. GEWEX will recommend to the JSC that CEOP report directly to the JSC on its main achievements, actions and plans but also maintains a review process through the GEWEX SSG. (ACTION: Soroosh Sorooshian)

7.2. Letters of appreciation and requests for continued support will be prepared and sent to agencies providing support to CEOP. (ACTION: Toshio Koike, Gilles Sommeria, David Carson)

7.3. CEOP will submit its Phase II plan to the GEWEX Executive meeting for review and approval. (ACTION: Toshio Koike)

8. GRP

8.1. Letters to the Swiss ETH will be prepared asking them to continue support for the BSRN archives. (WCRP: Gilles Sommeria; GEWEX: Bill Rossow, IGPO, Soroosh Sorooshian)

8.2. A proposal for a cross-cutting activity on land surface fluxes will be developed. (ACTION: Bill Rossow, Yann Kerr, Paul Dirmeyer, and others)

8.3. The use of data from precipitation radar networks should be explored as part of the precipitation cross-cutting theme. (ACTION: Bill Rossow)

9. OTHER INFORMATION GATHERING AND SHARING ACTION ITEMS

9.1. The possible linkages between GEWEX and NEESPI will be reviewed and commented on at the next SSG. (ACTION: Zoran, IGPO)

9.2. Possible linkages between GEWEX (including WRAP) and TIGER will be reviewd and results will be reported to the GEWEX summer Executive meeting. (ACTION: Peter van Oevelen, Lawrence Martz)

9.3. The possible benefits to GEWEX of the NCEP Climate Testbed will be reviewed and possible followup activities will be proposed. (ACTION: IGPO)

9.4. The THORPEX plans will be reviewed and possible opportunities for joint GEWEX/THORPEX collaboration will be brought to the attention of appropriate GEWEX researchers. (ACTION: IGPO, Panel Chairs)

9.5. The possible linkages between European Mediterranean activities and GEWEX will be explored and reported at the next GEWEX summer Executive meeting. (ACTION: Paval Kabat, Peter van Oevelen)

9.6. Linkages between IRI and GEWEX will be explored. (ACTION: IGPO, Soroosh Sorooshian)

9.7. The SOLAS science plan will be distributed to GEWEX SSG members and Panel chairs for comment. (ACTION: IGPO)

9.8. GCOS requirements for research support will be reviewed and a plan outlining GEWEX contributions will be prepared for the 2006 GEWEX SSG meeting. (ACTION: Panel Chairs, IGPO)

9.9. An inventory of European GEWEX activities will be developed. (ACTION: Peter van Oevelen)

1. INTRODUCTION AND OVERVIEW

This report summarizes the main developments in GEWEX during the year 2004 and includes the main items and recommendations from the 17th session of the GEWEX Scientific Steering Group.

With the advice and support from Dr Guoxiong Wu, the 17th session of the GEWEX Scientific Steering Group was held in Kunming, China, from 31 January to 4 February 2005. The meeting was hosted by the Kunming University and the efforts regarding organizing the local arrangements by Dr Cao Jie, Ms Chen and Ms Chu amongst others are greatly appreciated.

In addition to the annual review of GEWEX activities, this SSG was an opportunity to establish new links with the Chinese GEWEX community, including satellite observations by the Chinese Meteorological Agency, modelling work by the Chinese Academy of Sciences and field projects organised by the National Science Foundation of China. The overall strategy of GEWEX was reviewed in mid-year and at the SSG, with emphasis on potential contributions to COPES and the development of cross-cutting activities responding to the general objectives of WCRP. Outlined below are a summary of how GEWEX relates to the COPES strategy, general programmatic issues and a summary of the three panels' activities.

The year 2004 was a year where many of the activities initiated in 2003 were consolidated and the transition from GEWEX Phase I to the implementation of Phase II is being finalized. The finalization of the Phase I accomplishments will be ready before the 2005 JSC. In October 2004 the IGPO was strengthened with Peter van Oevelen in a 50% position as the European GEWEX Coordinator funded by ESA.

All panels and most sub-projects held meetings or workshops during the past year. In addition to the annual SSG meeting, the GEWEX Executive held a summer meeting at UMBC in July. This meeting was accompanied by a one-day briefing on GEWEX held at the US National Academies of Science.

A number of scientific sessions were held at science conferences. These included GEWEX and GSWP (Global Soil Wetness Project) sessions at the January 2005 AMS meeting and CEOP and Water Cycle sessions at the Spring AGU meeting in Montreal.

A few GEWEX Milestones worth highlighting for GEWEX in 2004 are:

- The Analyses Multidisciplinaires de la Mousson Africaine (AMMA) was endorsed as a new CSE at the January 2005 GEWEX SSG meeting.
- A European GEWEX coordinator, funded by ESA, was hired to work on the development and coordination of GEWEX activities in Europe.
- The BSRN is now the baseline radiation network within GCOS
- Publications promoting the GEWEX program including a publication in BAMS on GHP (Lawford et al., 2004), and a manuscript on GEWEX for the WMO Bulletin (Sorooshian et al., 2005)
- IPILPS (Isotopes in the Project for Intercomparison of Land-Surface Parameterisation Schemes) has been initiated to contribute to an international intercomparison of current state-of-the-art isotope parameterization efforts in coupled climate, atmospheric and earth system models by promoting comparison among land-surface schemes that incorporate isotopic representation under the auspices of GLASS.
- The previous GHP working group on predictability has now become part of WRAP and will work with WRAP and the Hydrologic Experimental Prediction Ensemble Experiment (HEPEX).
- GRP initiated four Data Product Assessment activities for global, long-term precipitation, clouds, aerosols and radiative fluxes. Working groups have been established and draft assessment plans have been completed for all four working groups.
- The first phase of CEOP (for data collection) was completed on 31 December 2004.

- The GEWEX Asian Monsoon Experiment (GAME) formally ends. Possible follow-on project being developed.

Two pre-proposals were submitted to the International Polar Year (IPY): one dealing with an enhancement in the number of northern stations in CEOP during IPY and a second GEWEX/CliC pre-proposal dealing with aerosols, clouds and precipitation at high latitudes.

The GHP has established a project to look at extreme events. The Worldwide Integrated Study of Extremes (WISE) has been established with the goal of advance our understanding of extremes including their distributions, trends, and inter-connections and to contribute to their better prediction. The initiative is chaired by Dr Ron Stewart.

GRP research indicated good agreement between three top-of-atmosphere radiative flux products, one based on the continuous ERBE non-scanner instrument record over the past two decades and two different products produced by SRB and ISCCP.

Land based processes have a major impact on the local and regional circulation patterns over the Amazonia. Differences between forested and deforested areas are seen in the cloud patterns while the extensive bias bringing associated with land use change in the dry season produces a signal in the atmospheric chemistry (concentrations of aerosols, carbon, etc) and influences cloud microphysics and the distribution of precipitation and lightening.

The ISLSCP Initiative II data collection containing 50 global time series spanning the 10-year period 1986 to 1995 (selected data sets span even longer periods) is complete and can be accessed at http://islscp2.sesda.com. In early May 2005 a final workshop on ISLSCP Initiative II will be held in Maryland presenting the achievements and discussing a possible continuation in some form.

During the coming year the major scientific meeting will be the 5th International GEWEX Science Conference to be held in Orange County California, June 20-24, 2005. All JSC members are encouraged to attend. A total of 309 abstracts have been submitted. Three long-term contributors to GEWEX will be honoured at the conference banquet. A special evening townhall meeting will be held on COPES. During the week before, GEWEX and CLIVAR are collaborating in the organization of a pan-WCRP monsoon workshop. Plans for a joint approach for addressing monsoon modelling will be worked out at this meeting.

GEWEX collaborated with IGWCO and UNESCO in a workshop held in Paris on November 3-5, 2004 to review what is known about trends in the global water cycle variables. The purpose of this workshop was to provide background information for use in the next IPCC/WGI report and to identify observational issues for IGWCO and research needs for GEWEX. There was a consensus on a clear need for the reanalysis of current long-term global data records derived from satellites for climate purposes.

CEOP is progressing well and most activities are on schedule. Still some data requests for the CEOP sites towards space agencies, in particular ESA, need to be addressed. Again is confirmed by the WCRP JSC representative that although CEOP is a cross-WCRP activity it still remains strongly linked to GEWEX. A clear position from the JSC on the exact status of CEOP and to whom to report to is desirable.

2. REVISION OF GEWEX OBJECTIVES AND PLANS IN RELATION WITH COPES

GEWEX principals have been reviewing the COPES strategy and have been consulting with Dr Eric Wood, the GEWEX representative on the COPES Task Force. Panel Chairs and SSG members have been asked to comment on the COPES proposal and to consider present and potential future contributions of GEWEX to COPES. This led to constructive discussions at the SSG.

The main contributions expected from GEWEX relate to the high scientific value of its observational component which needs to be better taken into account in the COPES strategy, to its modelling capabilities which need to be fully used in the improvement of climate models, and to its concern for applications already under development in the context of the management of water resources.

A general feeling with respect to the COPES strategy as presently outlined is the bias felt by some of the GEWEX community towards the use of complex integrated climate models as the only mean to make progress in climate variability and climate change research. As the global observational records from satellite remote sensing (combined with key surface-based observations) have grown longer and new applications, particularly with respect to the land surface, have gained credibility, other pathways to critical climate products and services become more viable. These pathways are applied climatology and climate monitoring, both of which have been somewhat underappreciated lately as modelling has eclipsed these more traditional uses of observations in climate applications. Improved climate monitoring is possible using satellite remote sensing, blended with in situ and surface-based remote sensing data, and the value of these data is improving due to the longer records and continued work with the data sets to improve their quality. Applied climatology is defined as the scientific analysis of climatic data records for applications with operational purposes. Operational in this sense does not simply describe the routine production of the data sets, but also entails the routine analysis and application of the data to specific endeavours such as agricultural climatology, industrial climatology, bioclimatology, etc. This pathway is becoming an increasingly important use of remote sensing data. In reformulating the World Climate Research Program into COPES, all three pathways from observations to applications should be given equal weight. The more direct uses of observations can realize benefits sooner if these data products are prepared with the end-use in mind. These direct uses also provide a baseline against which to measure the progress made by the developing model-based prediction systems.

A second point is the importance of the modelling work within the GEWEX community, including the regional model developments as part of the Continental Scale Experiments and the efforts of the modelling panel to link process studies with the development of climate models. GEWEX regional models are entering a mature phase where their transferability from basin to basin becomes feasible and a large effort is developed to compare the various modelling approaches in standard case studies. One the main goals is to fill the existing gap between the GEWEX CSE community focusing on the interpretation of field experiments and the regional climate community which favours a modelling approach largely inspired from Global Climate Modelling techniques. One example of progress in this field is the Max Planck Institute for Meteorology collaborative community modelling effort “COSMOS” (Community Earth System Models), will represent physical, chemical and biological processes in the atmosphere, ocean and on land. The COSMOS program will include the development of a global Earth system model and a regional component, the Baltic Sea catchment, enabling BALTEX to serve as a regional pilot component to COSMOS. The second main aspect of GEWEX modelling activity is the long term effort dedicated to the development of parameterization schemes for global models, starting from process studies and the direct simulation of those processes, and developing a close cooperation with the whole GCM community. A good part of a day was dedicated at Kunming to presentations and discussions on parameterizations for GCMs, noting achievements and new developments. The GEWEX boundary layer and cloud modelling community is already mature and its results should be considered as a highlight in WCRP’s activities. The land surface modelling community

has also established a sound basis for land surface parameterizations and displays a range of activities, several of which being directly relevant to COPES objectives. This community should in particular contribute to the assessment of the role of land surface properties and soil moisture in climate variability and change.

The third major point in relation to COPES is the development of applications for society. GEWEX, through the WRAP (Water Resources Applications Project) has initiated this approach several years ago by developing the use of Continental Scale Experiments data and model results by hydrologists and water resource managers. This is done essentially through dedicated workshops, and the SSG has encouraged the development of more integrated pilot projects in this area. Closer contacts with UNESCO and the PUB (Predictability of Ungauged Basins) project are also recommended. It is suggested that the WRAP community be directly involved in the definition of COPES approach to the development of application projects.

Following the COPES initiative, Phase II objectives for GEWEX have been revised and GEWEX proposes the following minor revisions to these objectives:

(1) Produce consistent research quality data sets complete with error descriptions of the Earth's energy budget and water cycle and their variability and trends on interannual to decadal time scales, and for use in climate system analysis and model development and validation;
(2) Enhance the understanding of how energy and water cycle processes function and quantify their contribution to climate feedbacks;
(3) Determine the geographical and seasonal characteristics of the predictability of key water and energy cycle variables over land areas and through collaborations with the wider WCRP community determine the predictability of energy and water cycles on a global basis;
(4) Develop better seasonal predictions of water and energy cycle variability through improved parameterisations encapsulating hydro-meteorological processes and feedbacks for atmospheric circulation models;
(5) Undertake joint activities with operational hydro-meteorological services and hydrological research programmes to demonstrate the value of new GEWEX prediction capabilities, data sets and tools for assessing the consequences of global change.

3. CEOP

A key achievement of CEOP has been the establishment of an integrated observation system formed by combining deferent types of observations, in-situ and satellite. In addition, the numerical weather prediction model outputs are merged with the observed data to provide spatially and temporally continuous coverage in a complementary way. The coordinated enhanced observation and model output generation were carried during the first Enhanced Observing Period (EOP-1) [July-September 2001], the EOP-3 [October 2002-September 2003] and the EOP-4 [October 2003-December 2004] time periods.

CEOP, therefore, can be considered as a unique opportunity to improve the scientific foundation needed to achieve overall water cycle documentation and prediction goals, based on coordination among the WCRP/GEWEX Continental Scale Experiments (CSEs), the Committee on Earth Observation Satellites (CEOS) members, including space agencies, and the numerical weather prediction (NWP) centers affiliated with the World Meteorological Organization (WMO).

Since the last reporting period CEOP has formally constituted two sets of unique functional components:

- components to integrate observations based on coordination among field science groups, space agencies, and numerical weather prediction centers in the local, regional and global scales;

- components required to exchange and disseminate observational data and information including data management that encompasses functions such as Quality Assessment/Quality Control, access to data, and archiving of data, data integration and visualization, and information fusion.

At the time of GEWEX SSG, data had been received from 33 of 35 Reference Sites and over 750 Mb of finalized data were on-line from 24 Reference Sites. The full EOP-3 annual cycle is available for 9 sites. A great deal of the data has been quality checked. Most of the satellite data had been requested and considerable amounts were already in the archive. The observational phase was being concluded and the results going to be presented at the CEOP workshop in February in Tokyo.

An extension of CEOP in a phase II is now proposed. It is intended to proceed in two stages (2005-2007; 2007-2010) that run from 1 January 2005 to 31 December 2010, with the following objectives:

Period I (2005-2006)

- A Process and analyse CEOP Phase I datasets in order to accomplish the CEOP Research and Analysis Goals associated with WESP and the CEOP Inter-Monsoon Model Study (CIMS) that were articulated in the CEOP Implementation Plan;
- Build an expanded framework for a Water Cycle Observation and Data System based on the results of CEOP Phase I that can meet the needs of the IGOS-P Water Theme, COPES and targets set in the GEOSS Water Cycle Observation and Data System component of the GEOSS 10-Year Implementation Plan

Period II (2007-2010)

Implementation of the CEOP-II Integrated Observation and Data System for the Global Energy and Water Cycle as planned in Period I above;

- Submit CIMS Results as a Contribution to WCRP Pan Monsoon Study;
- Apply WESP results to an Extension of Down-scaling and transferability Studies and, thereby, as a contribution to the Integrated Water Resources Management (IWRM) process which is designed to assist countries in their endeavour to deal with water issues in a cost-effective and sustainable way;
- Undertake and conclude a Cold Region Study in Cooperation with the WCRP Climate and Cryosphere (CliC) Project and the International Polar Year (IPY) effort;
- Undertake and advance scientific goals related to understanding and defining Extreme Event Mechanisms;
- Undertake and advance knowledge of the interactions between Aerosols and the Water Cycle.

The expected potential contributions of CEOP to COPES are the following:

(i) Cooperation, Coordination and exploitation of data from GEWEX Continental Scale Experiments on a broad global scale;
(ii) International participation by a number of weather prediction and modeling centers interested in seasonal to interannual time periods;
(iii) Involvement of space agencies through broad international groups e.g. CEOS and IGOS-P;
(iv) Advancement of an active data integration process with real and valuable tools for visualization of satellite, in-situ and model data and products;
(v) A timely emphasis on water cycle research;
(vi) An evolving notion of the characterization and implementation of an international climate observations reference network with prototypical land and water observations available to a broad set of users; and

(vii) Initial Implementation of actual Long-term archive quality datasets.

The GEWEX Scientific Steering Group (SSG) acknowledged in its January 2005 session the achievements of the CEOP main observational phase and welcomed the first scientific results. SSG acknowledged that the CEOP dataset under completion was a particularly important accomplishment and represented a very useful tool for further improvements in prediction of variations of the global water and energy cycle. The continuation of CEOP in a Phase II has been endorsed by the CEOP Advisory and Oversight and Science Steering Committees (AOC, SSC). However SSG thought it was still early to approve a Phase II with the information available and suggested to have a more extensive discussion on this issue at its next executive meeting during summer.

4. HYDRO-METEOROLOGY

4.1 Overview

GHP coordinates intrinsically regional continental scale experiments (CSEs) of which more details can be found in the next paragraphs. The GHP also has an affiliated large-scale experiment, the Analyses Multidisciplinaires de la Mousson Africaine (AMMA), which is striving to reach CSE status and this has now been requested (and has been approved). There are also a few hydrometeorologically relevant projects such as the Global Runoff Data Center (GRDC), the International Satellite Land Surface Climatology Project (ISLSCP), Global Precipitation Climatology Project (GPCC) and the Coordinated Enhanced Observing Period (CEOP) making contributions to GHP activities. The International Association of Hydrologic Sciences (IAHS) and International Atomic Energy Agency (IAEA) are an organization and agency that are making substantial contributions to GHP activities.

The GHP held its annual meeting in the fall (see meeting summary at the end of this overview), where GHP CSE's, affiliated experiments, global projects, organizations, and agencies reported on their progress and contributions to GHP goals. Summary reports are provided as appendices to this report.

The GHP is especially interested in moving affiliated regional experiments toward full CSE status. Requirements for the affiliated global projects, organizations, and agencies (and affiliated regional experiments) are considered on a case-by-case basis for GHP membership.

Finally, besides providing a hydrometeorological focus for the GEWEX CSE's and affiliated global projects, organizations, and agencies, the GHP has formed various working groups to focus on specific issues described in more detail in the next paragraphs.

2004 Milestones

- 2004/01 LPB accepted as 7th CSE to GEWEX SSG
- 2004/02 SWING began its intercomparison at IAEA sponsored meeting
- 2004//04 TWG meeting of regional model intercomparison study representatives
- 2004/09 10th GHP meeting in Montevideo, Uruguay
- 2004/11 TWG presentation at WGNE/GMPP meeting in Exeter, England
- 2004/12 GHP Summary Article published in BAMS
- 2004/12 GAME CSE formally ends. Possible follow-on project being developed.
- 2004/12 WISE working group formed
- 2004/12 Former PWG merged with WRAP

2005 Plans

- 2005/01 AMMA to be proposed as 8th CSE to GEWEX SSG
- 2005/09/26-30 11th GHP meeting in Melbourne, Australia
- 2005/12 MAGS CSE will formally end. Possible follow-on project being developed.

- 2005/12 LBA Phase I to end. LBA phase II to begin with a focus on Carbon issues.

4.2 GHP Projects and CSE's

Continental Scale Experiments

African Monsoon Multi-disciplinary Analysis (AMMA)

Has requested the CSE status during this SSG-17 and has been approved. AMMA-EU is an EU financed integrated project and one of the three pillars of the AMMA experiment. The other two are AMMA Africa and AMMA-US. These are or will be funded through different resources.

The Baltic Sea Experiment (BALTEX)

BALTEX is currently continuing its activities through national and institutional funding. Despite lack of EU funding it is still actively contributing to CEOP and adhering to its objectives. New plans have been formulated to continue the activities on the longer term.

GEWEX Asian Monsoon Experiment (GAME)

GAME is working on follow-up activities to continue its efforts as a CSE within GEWEX and under WCRP in the Asian region with the same scientific objectives under the tentative name Coordinated Observation and Prediction of the Asian Monsoon Climate (COPAM). A new and third objective will be the understanding of the impact of global warming and other anthropogenic forcing on climate and hydrology in the Asian monsoon region. An additional focus will be to contribute to understand and propose solutions for regional hydrological problems, particularly through modelling efforts.

The 9th GAME International Science Panel (GISP) meeting was held in December, 2004 in Kyoto along with a International Study Conference on GEWEX in Asia. From these meetings it was clear that although the summer monsoon remained the main focus, the winter monsoon will be expected to draw more attention in the future. The ocean plays a big role in the winter monsoon and hence the relationship between GEWEX and CLIVAR will be important in tackling the research questions at hand.

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

The North American Regional Reanalysis during the period of 1979–2003 has been finished. GAPP has made great progress in the Land Data Assimilation System (LDAS) on various aspects of the system. Furthermore GAPP has co-supported the North American Monsoon Experiment which was successfully completed in 2004.

The GAPP Science and Implementation plan is currently under review by the National Research Council. Furthermore a special JGR issue on GCIP/GAPP is completed.
NOAA CPPA program funded 7 new projects (for the 2005 fiscal year) of which 6 are aimed at supporting GAPP science objectives.

Large-scale Biosphere Experiment in Amazonia (LBA)

The LBA phase I (1996-2005) had two major field campaigns successfully concluded and for which the data are now being analysed. The first was the LBA-DRY-TO-WET field campaign in Rondonia (9Sept.-Nov 2002) and the second one was the SALLJEX-Brazil campaign in the summer of 2003.

Six of the LBA reference sites have been included in CEOP and they have started to report data for particular periods (EOP-1 and EOP-3)

LBA Barca will be the new name for the LBA Phase II which will deal with the regional Atmospheric Carbon Budget in Amazonia. Major field campaigns are planned for 2005.

La Plata Basin (LPB)

LPB is coordinated in its initial stages by the PLATIN Science Study Group.

Currently work is carried out successfully regarding the characterization of the hydrology of the Uruguay River with an emphasis on flood modelling and prediction.
The EU project CLARIS kicked off in September 2004 and aims at the development of a network in South America for Climate Change assessment and impact studies.

The SALLJEX project (see also LBA) aims at better understanding of the Low Level Jet.
Funding has been requested from the Global Environmental Facility (GEF) to support planning and implementation of strategic actions to be taken by the respective governments in the La Plata Basin. PLATIN is participating in this effort.

An implementation plan for the LPB CSE is currently under development.

The Mackenzie River GEWEX study (MAGS)

The MAGS project will be ending its observation activities in 2005. No continuation of the coordinated activities is foreseen due to lack of funding. The MAGS project funding under the Natural Science and Engineering Research Council (Canada) Research Network Grant program ends Dec. 31, 2006.

MAGS has contributed strongly to GHP activities such as WEBS, WRAP etc. The MAGS mid term review stated that impressive progress has been made. Close to 300 refereed publications have resulted from MAGS research since the beginning of the project.

Murray Darling Basin (MDB)

The MDB CSE is working on the finalization of the implementation plan. A MDB website is currently being set-up and a multi-agency project to achieve the MDB objectives is being developed and expected to finalise in 2005.

Other projects, activities and affiliates

Water and Energy Balance Studies (WEBS)

The goal of WEBS 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 1996-2000-time period. The initial steps are to define the CSE regions, gather the available global and regional data, and to then develop global and regional data sets. Gridded as well as station data will be gathered for this comparison. Our goal is to define global and regional means similar to what was previously done for GCIP WEBS (Roads et al. 2002,2003). Parallel WEBS activities are also taking place in the other panels (GRP and GMPP) and GHP WEBS will eventually be coordinated with these other panels.

Water Resources Applications Project (WRAP)

WRAP, chaired by L. Martz, has been successful in opening a dialogue with the water resource community through a series of workshops. However, it has not been as effective in meeting other aspects of its mandate, particularly, in demonstrating the application of GEWEX knowledge, models and data to water resource problems. WRAP recognizes that its program should be

reconsidered to build on the positive outcomes of its workshops, to more fully execute its mandate and to link more effectively with other components of GEWEX. Discussion of the white paper initiative suggested that this could be an excellent mechanism for developing a refereed journal article on the need and potential for the application of GEWEX science, data and technology to water resource planning and management issues. The previous GHP working group on predictability has now become part of WRAP and will work with WRAP and the Hydrologic Experimental Prediction Ensemble Experiment (HEPEX).

Data Management Working Group (DM)

The goal of DM, chaired by S. Williams, is to develop coordinated hydrometeorological data sets from all of the CSES, affiliated GHP projects, and other GEWEX projects. In that regard, DM focused this past year on building the in situ data base for CEOP as well as providing a key site for linking to model output and remote sensing data.

SWING

The general purpose of the SWING project is an international intercomparison of current state-of-the-art water isotope general circulation models and related observational isotope data. It brings together scientists with a common wide range of interest in both modelling and measuring stable water isotopes (H218O, HDO) and its application to the Hydrological Cycle and Earth System problems.

SWING believes that stable isotopes of water could provide some quantification about the sources and sinks of atmospheric and land surface water. Recycled moisture exhibits a distinct isotope signature that results from surface evaporation. An intercomparison of isotope models has thus been started by SWING.

Experimental Design

Phase I (2004/2005):

First SWING simulations and analyses will focus on model-data-intercomparison for the present-day climate. Two new simulations (one climatology control run and one transient simulation spanning the last century) with all available isotope GCMs will be performed using identical boundary conditions

Phase II (start in 2005):

The second SWING phase will focus on model-data-intercomparison for selected future scenarios and paleo time slices. Several periods of interest (2xCO2, LGM, YD) were already identified and agreed on.

In addition to performing isotope GCM intercomparison analyses, another key activity of the SWING project is setting up a common database of observational isotope data sets to be used for in-depth model-data comparison.
Outlook: Planned SWING Milestones during 2005:

- Perform detailed analyses of available observational records and model simulation output focusing on the differences in the simulated Deuterium Excess as an indicator labeling different water vapor source regions and recycling events;
- Define and perform the second common SWING simulation, covering changes of the present-day hydrological cycle and its isotopic signature for the period 1870-2000;
- Collect model output of present-day control simulations of the different isotope GCMs in a common database, available to the public;

- Build up a pool of available forward proxy isotope models (e.g. for coral records, foram records, lake carbonate, tree-ring cellulose) to close the gap between global isotope simulations and (more) local observational data.

WISE (R. Stewart)

There is considerable interest in a newly developing Worldwide Integrated Study of Extremes (WISE) being developed within GHP. R. Stewart chairs this group. Of particular interest has been the CEOP period. The goal of this working group is to advance our understanding of extremes including their distributions, trends, and inter-connections and to contribute to their better prediction.

TWG (G. Takle)

TWG's goal, chaired by G. Takle, is to provide a framework for systematic evaluation of regional simulations of dynamical and climate processes arising from different climatic regions. TWG will perform a "meta-comparison" 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. An organizational meeting was developed at the Lund workshop (April 2004) to bring together representatives of major regional climate modeling laboratories and current and past intercomparison programs as well as representatives of the continental scale experiments. TWG has been requested to participate more actively in newly developing GMPP regional modeling activities and is now considering the nomination of a suitable candidate.

Global Runoff Data Center (GRDC)

GRDC helps the CSEs to gather streamflow and land surface hydrologic features. Again besides gathering the streamflow data, GRDC helps to provide data quality control and quantification of observation and analysis errors.

Global Precipitation Climatology Center (GPCC) [1]

GPCC helps the CSEs to gather precipitation and snow data obtained from observations by hydrometeorological networks worldwide. Besides gathering the data, GPCC helps to provide data quality control and quantification of observation and analysis errors and will be working with the Water and Energy Budget Synthesis working group described below.

ISLSCP

ISLSCP provides basic data about the land, including soils, vegetation from remote sensing and in situ measurements. In addition, they provide estimates of surface fluxes from various models and remote sensing algorithms. ISLSCP I focused on the 87-88 timeframe, and ISLSCP II focused on the 89-95 timeframe. The ISLSCP Initiative II data collection is now complete and can be accessed at http://islscp2.sesda.com. The ISLSCP Initiative II data collection contains 50 global time series spanning the ten-year period 1986 to 1995 (selected data sets span even longer periods) considered by members of the GEWEX community as required to support investigations of the global carbon, water and energy cycle. A science and evaluation workshop is being planned to

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[1] **See Also under GRP Projects**

present and discuss the results on May 4th, 5th and 6th of 2005 in the Greenbelt, MD area. At that workshop the DVD set will be released and a journal special issue organized to publish the science results. The Initiative II collection will be augmented in the months following the workshop with findings from the workshop. GEWEX community members are particularly encouraged by GEWEX management to participate in the evaluation of the Initiative II data collection.

IAHS

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 interacts with the Water Resource Applications Project (WRAP described below) to better utilize GEWEX products for various applications. Following endorsement of WMO's Operational Hydrology Programme at the recent Commission for Hydrology meeting for support of GEWEX and the Hydrological Ensemble Prediction Experiment (HEPEX), use of WMO's direct links to operational hydrological agencies will assist in the application of GEWEX products to water resources. The IAHS is also interested in helping CEOP to become more relevant to various catchments.

IAEA

The IAEA has an Isotope Hydrology Program, 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/SWING efforts to develop models capable of simulating and predicting these isotope measurements.

5. RADIATION

5.1 Overview

I. Goals of the GEWEX Radiation Panel

The GEWEX Radiation Panel oversees a group of data processing projects, working groups and study groups to develop measurements of and interpret the variations of the global energy and water cycle, primarily but not exclusively from remote sensing measurements, and to foster research on the key climate feedback processes linking the atmosphere, ocean and land components of the climate system that involve clouds, aerosols, radiation and precipitation.

II. Highlights (status, significant changes, accomplishments)

All of the GRP data projects continued routine collection and processing of their data products. The global clouds, precipitation, aerosol and radiation products now (or will soon) cover a period of at least 20 years. GPCP launched new studies of precipitation retrieval methods, focusing on snowfall and higher resolution products. GPCC has begun analysis of a much longer record of gauge precipitation from a much larger number of sites. ISCCP released two new data products, a comprehensive radiative flux profile product and a mesoscale convective lifecycle survey. GACP completed a revised, state-of-the-art aerosol climatology and has begun combined studies with SAGE to separate tropospheric and stratospheric aerosols. Notable events for Earth Radiation Budget studies were the release of the first advanced CERES products with improved angle models useful for cloud-type studies and the beginning of analysis of GERB measurements of top-of-atmosphere radiative fluxes with unprecedentedly high time resolution. The SRB completed processing of its products for 1983-1995 and should extend its record to the present day later next year. The BSRN data set contains 2788 station months of data from 36 sites with 19 more sites in various stages of development; work has begun on developing a world reference standard for diffuse solar measurements. SeaFlux completed a compilation of *in situ* observations of ocean surface turbulent fluxes and fostered the re-processing of two global, decadal satellite products.

Last year the GRP initiated four Data Product Assessment activities for global, long-term precipitation, clouds, aerosols and radiative fluxes. Working groups have been established and draft assessment plans have been completed for all four working groups. The Precipitation WG has had two planning meetings and the Radiation WG has conducted its first assessment workshop. The intent of these activities is to evaluate the main data products of GRP by exploitation of new satellite and field experiment data and by comparison with other extensive (nearly global coverage and/or decadal-length time records) products of the same quantities.

One important achievement for the radiation research community has been that BSRN, while remaining a GEWEX project, has been endorsed by GCOS as the baseline surface radiation network for climate monitoring. This follows the endorsement by GCOS of GPCC (the Global Precipitation Climatology Centre) and demonstrates the value of WCRP projects as initiators of long-term climate observing systems.

The Working Group on Data Management and Analysis (WGMDA, the combined working groups for all the data projects) held its second meeting just prior to the GRP meeting. In addition to project-specific topics, this group is making plans to create a more integrated set of products by examining the physical consistency of these results (including the assessment activity) and exploiting new measurements to expand the information obtained from satellite and other observing systems. If the continuation of the projects beyond 2005 is approved, then this working group will prepare a coordinated re-processing plan for all of the projects. New activities with regard to surface remote sensing are also being discussed.

The Working Group on Clouds, Aerosols Profiling (WGCAP, formerly CPROF) held its second meeting and is planning during the next year to release a common set of products from all the sites (about 8 sites) collected during the same time period. Together with a linked set of web sites, these data will serve to illustrate the value of this type of measurement set (long-term, continuous measurements from cloud, aerosol and atmospheric profilers) and to prepare for more extensive operations during the flights of CloudSat and Calipso (due to launch in spring 2005).

The study project, Inter-Comparison of Radiative Codes in Climate Models (ICRCCM), has reached a turning point. Comparison of calculations of shortwave fluxes have been extended to consideration of 3D effects; 3D radiation codes agree with each other and helped verify new parameterizations used in 1D flux codes. Longwave flux comparisons are now considering scenes with more complex cloud vertical structure after verifying the accuracy of clear sky calculations against detailed field experiments. A recently completed survey demonstrates the significant advances made in GCM radiative transfer codes that now handle multiple cloud and aerosol microphysical properties, including parameterizations for scattering by non-spherical particles; this survey is being prepared for publication. To capture these advances and to provide both a theoretical and empirical basis for testing new radiative transfer codes, the ICRCCM group has merged with a group from the ARM program, the Broadband Heating Rate Profile (BBHRP) group, to form the Continuous Intercomparison of Radiation Codes (CIRC) group that has plans to establish a web site (supported by ARM) that will have two kinds of test cases for radiative transfer models: one set, like those developed by ICRCCM, will provide comparisons with the state-of-the-art line-by-line and scattering codes, as well as some 3D codes and the second set will provide comparisons to very-well-documented observational cases, where both the input parameters and the surface and top-of-atmosphere radiative fluxes are measured and consistent with state-of-the-art calculations. Together with the documentation of these cases (all input and output parameters specified for a variety of situations) and the reference codes or measurements, this web-based facility will provide a permanent reference for development and improvement of radiative transfer codes used in atmospheric models.

One **scientific highlight** reported during this past year is the excellent agreement of three top-of-atmosphere radiative flux products, one based on the continuous ERBE non-scanner instrument record over the past two decades and two different products produced by SRB and ISCCP. This assessment is an important step to justify the continuation of those activities, supported by a letter sent by WMO SG to all participating countries.

III. New Directions for GRP: Precipitation Cross-cut, GWEBS and COPES

Discussions at the last GRP meeting highlighted four areas where new efforts are needed.

(a) Precipitation: GRP is leading one of the GEWEX cross-cutting activities with other panels, for a better coordination of research on precipitation observation and modelling. In this domain, one should emphasize the large effort deployed by the GEWEX community to have the space agencies continue TRMM operations (this effort has been at least partly successful and is still on-going).

The largest questions about satellite measurements of precipitation concern light precipitation, solid precipitation and orographic precipitation. All of these require much better *in situ* datasets than routinely available, so a pan-GEWEX effort is needed. The Precipitation Cross-cut must tackle these issues aggressively. However, GRP plans two specific activities: investigating what heretofore un-used and soon-to-fly satellite measurements can contribute (especially new passive and active microwave instruments) and organizing information that can be obtained from surface precipitation radar networks.

(b) Aerosols-Clouds: The focal point of cloud-climate issues now seems to have shifted from clouds-radiation to cloud formation-decay processes, including precipitation. This topic naturally brings in aerosols, since clouds form on and alter aerosols. Most aerosol studies have focused on the properties and transport of aerosols and the optical properties of aerosols, but not on the cloud-aerosol interaction per se. The GRP role would seem to be in joining efforts to organize an aerosol monitoring network to ensure that an effective combination of measurements are made to allow for progress on the aerosol-radiation (and remote sensing) problem and to work on the evolution of the surface active sensor/profiling sites to see if a combination of instruments can be used to study cloud-aerosol interactions. In addition, GRP will collaborate with GCSS to foster modeling studies and observational analyses that address cloud-aerosol interactions.

c) SeaFlux: Although progress has been made in improving the accuracy of satellite-based estimates of the surface sensible and latent heat fluxes and revised products have resulted, there are still some important improvements that have not been implemented. This work will be re-activated to finish these tasks. Funding is being sought.

(d) LandFlux: There are two topics under this heading. One is the question of organizing and systematizing of land surface remote sensing products. There is a lot of new activity in this area using new satellites but systematic production of long-term records is an unfinished task. This is particularly true of the use of combined observations to deal better with the complexities of vegetated surfaces and snow-ice covered surfaces. The GRP plans to move ahead to get activity going in this area in collaboration with CLIC and GSWP. The second topic is how to estimate the land surface sensible and latent heat fluxes. Here GRP plans to join in evaluating the GSWP-2 products, especially to determine what remote sensing data products (and/or their improvements) would best serve to improve these results.

All of the above new directions, together with ongoing GRP efforts, are conceptually organized around the idea of completing a set of data products that quantifies the complete energy and water cycle (state variables and exchange rates) over the whole globe for the past two decades resolving weather-scale to climate-scale variability. This is the same goal as for the cross-cut called GWEBS. Also, this goal is the core of goal of understanding the climate since variations of the global atmospheric energy and water cycle couple all components of the climate and mediate all

climate changes in the form of the fast feedbacks that determine the radiation budget. Hence, more coordinated and larger scope versions of this concept have been proposed for adoption by the whole WCRP by the Working Group on Satellite Matters which has now been subsumed under the Working Group on Observations and Assimilation (WGOA) as part of the COPES reorganization. In other words, the GWEBS concept is the heart of the new COPES concept.

IV. Future Plans

GRP plans for next year include:

(1) a review of the GRP strategic plan (considering all of the above topics), particularly with regard to defining its role in cloud-aerosol research activities;
(2) a review of plans for CIRC, WGCAP, SeaFlux and new land activities (in collaboration with GSWP and CLIC), as well as the desirability of forming a new international working group to coordinate precipitation radar networks, and
(3) the evaluation of the results of the four data product assessments.

A key emphasis of the revision of the GRP strategic plan will be to identify specific collaborations with several other GEWEX and WCRP groups that will be needed to advance the goals. Lastly, if the continuation of the data processing projects is approved, planning for exploiting new satellite observations and an eventual coordinated re-processing of the products will begin. During this year a special effort will be made to obtain more direct participation of satellite agency representatives in these projects and assessments and to involve more of the smaller satellite agencies in GRP activities.

The next meeting of the GRP will be in the fall of 2005 in Paris, hosted by the Paris Observatory. A review of this year's meeting format (joint meeting of WGDMA and GRP) led to the decision to have two separate and longer meetings next year. The WGDMA meeting will occur shortly after the GRP meeting at place yet to be determined. All projects will prepare specific plans for the extended projects, including how the assessment results will be employed to support algorithm improvements and how to conduct a coordinated re-processing of all the data products.

5.2 GRP Projects

Global Precipitation Climatology Project (GPCP)

The GPCP is moving forward routinely: data are being collected and precipitation products are being produced on schedule. Currently there are three products available from NOAA NCDC: a monthly/2.5^{o}and a 5-day/2.5^{o} product covering the period 1979 to present and a daily/1^{o} product from 1997 to present. The GPCP noted plans to cosponsor with the International Precipitation Working Group a comparison of satellite algorithms for producing higher time resolution precipitation data products; these methodologies will be evaluated, in part, by comparison with daily-time-resolution gauge datasets. The following discussion highlighted the need to create a common version of the SSM/I, SSM/T1 and SSM/T2 microwave radiances that is uniform across all archives. GPCP plans no new versions of its products before 2006. Important improvements that could be incorporated if the project is extended beyond 2005 are: improve gauge datasets (higher time resolution, rain/snow separated, more collections accounting for complex terrain), update and improve the microwave algorithms anchored on TRMM results, switch to the denser ISCCP B1 infrared radiance dataset to obtain 3-hr resolution further back in time, and modernize the merging procedure (e.g., using proposed objective analysis methods).

Global Precipitation Climatology Center (GPCC)

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

International Satellite Cloud Climatology Project (ISCCP)

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

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

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

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

NOAA reported the recurrence of the scan motor problem on the NOAA-16 AVHRR starting at the beginning of 2004 so they have called up the launch of NOAA-N in Feb05. Otherwise processing of B2 and BC datasets has been routine. The ISCCP Central Archives (NOAA NCDC) completed a major refurbishment of the ISCCP B1 dataset (spatial sampling at 10 km) and its transformation into a uniform data product: prototypes are being tested now. This accomplishment makes possible an enhancement of the density of the ISCCP products during the planned re-processing in 2007.

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

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

GEWEX Global Aerosol Climatology Project (GACP)

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

Earth Radiation Budget (ERB)

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

Surface Radiation Budget (SRB)

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

mean differences + 6 and +2 Wm^{-2} for upwelling shortwave and longwave fluxes, respectively. SRB is planning a complete re-processing in 2006 using new, improved aerosol data products.

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

Baseline Surface Radiation Network (BSRN)

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

GEWEX Water Vapor Project (GVAP) and SeaFlux

These two activities are currently inactive but there have been some relevant developments that were reported. IPCC-sponsored activities and the new US Climate initiative led to a workshop where it was recommended that all the available extensive (long-time record and/or global coverage) temperature datasets be re-processed to obtain the most complete understanding of the 3-D structure of temperatures changes and that such an analysis include a re-analysis of water vapor as a key complement. So, re-analysis of global water vapor measurements for GEWEX may be superceded by other activities. The WCRP JSC has formed a working group to take up the subject of surface energy and water fluxes with an initial focus on ocean surface fluxes; however, this group does not yet have any specific plans to produce data products, so the GRP's SeaFlux activity probably needs to be re-activated.

6. MODELLING AND PREDICTION

6.1 Overview

Pan GMPP activities

The GMPP panel coordinates the activities within GEWEX which aim at improving the representation of the global water and energy cycle within Earth system models. Particular attention is being paid to cloud systems, land-surface processes and the atmospheric boundary layer (ABL).

GMPP keeps a close link with the Atmospheric Model Intercomparison Project (AMIP) in order to ensure that the activities within the panels are relevant to atmospheric models and that the global modeling community is aware and can take advantage of the improvements proposed in cloud, land-surface and ABL conceptual models. The annual meeting with WGNE allows a close collaboration with the numerical weather prediction community.

Summary of activities in 2004

The original plans called for a pan-GMPP workshop on the diurnal cycle in 2004. In March 2004 it was felt that this workshop was too early for the GMPP panels as they did not yet have time to prepare the topic. Furthermore, there was not enough lead-time to ensure a broad participation for this workshop.

Still, stronger collaboration between the 3 panels remains the top priority for GMPP and the diurnal cycle will be the theme which will achieve this. A new strategy was devised during the WGNE/GMPP meeting in October 2004 in Exeter.

Planned activities

During the Exeter meeting the identity of GMPP within the WCRP was again on top of the agenda. It is felt that the fact that GMPP is the only group within WCRP dedicated to the development of the conceptual models needed to represent cloud, land surfaces and the ABL within global models is not properly recognized. The activities of GMPP are crucial to ensure that the global models used by other WCRP programs simulate a credible water and energy cycle. This lack of recognition of GMPP activities becomes more critical with the creation of the modeling group within COPES.

It was decided during the GMPP meeting that closer collaboration between the three panels was the most productive way of strengthening the identity of GMPP. In the current functioning of GMPP there is no opportunity for the full panels of GCSS, GLASS and GABLS to meet and exchange ideas on collaborative projects. It is thus decided to propose to the GEWEX-SSG to change the meeting agenda of GMPP. The new agenda should allow meetings between the 3 panels, keep the link with WGNE and not overburden the travel plans of the panel chairs. The proposed new scheme calls for a pan-GMPP panel meeting in even years while in odd years the common WGNE/GMPP meeting would be maintained. In this plan the first pan-GMPP panel meeting would take place in autumn 2006.

At the 2004 GMPP meeting the link between the regional modeling activities of GHP in the Transferability Working Group (TWG) and GMPP were discussed. It was decided to ask GHP/TWG to nominate a person who would ensure the link between both groups. GMPP feels that this person should preferably be somebody with a model development background to facilitate the transfer of parameterization improvements to regional climate models. It is hoped that this link will promote parameterization development within regional climate models and produce a closer collaboration between field experiments carried out under GHP and model inter-comparisons conducted by GMPP.

GMPP Projects

GEWEX Cloud System Studies (GCSS)

Overview

Dr Christian Jakob has taken on the leadership of the GEWEX Cloud System Studies (GCSS). Dr Jakob plans to focus on making the work of GCSS more relevant to the GCM community through the development of a systematic model evaluation approach, as a complement to parameterization developments. 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 current main tools to achieving this aim are case studies in which Cloud Resolving Models and Single Column Models (1-d versions of full GCMs) are compared to observations and with each other. While very successful, it has been recognized that this approach alone is insufficient to develop model and parametrization improvements (see Jakob, November 2004 GEWEX Newsletter).

The subject of identifying better ways to make GCSS and its outcomes even more useful to the GCM community was a major discussion point at the last meeting of the GCSS Science Panel in New York from 21-23 September 2004. The meeting was kindly hosted by the NASA Goddard Institute for Space Studies. The reorganized GCSS panel now consists of 8 members and the 5 GCSS Working Group (WG) leaders. As part of the reorganization of the panel, each of its members is now holding a portfolio for which she/he carries responsibility in the GCSS programme.

Panel meeting

At the panel meeting several important issues were discussed:

- To align GCSS more directly with GCM developments each WG has been tasked to design a study that involves full GCM and or NWP simulations that are aligned with the current case studies undertaken by the group. Furthermore it was decided to attempt to involve the GCM evaluation community as well as broader parts of the data community more directly into the GCSS process. This is aimed at covering the full model evaluation process, as recently described in Jakob, November 2004 GEWEX Newsletter, within GCSS. The panel sees the forthcoming 3rd Pan-GCSS meeting in Athens in May 2005 (see below) as an excellent opportunity to foster this closer collaboration;
- A new summary of the role of GCSS based on its current scientific activities as well as challenges identified by the community will be prepared by the panel for discussion at the Pan-GCSS meeting in May 2005;
- To increase the visibility of GCSS in the community it was decided to publish an electronic GCSS Newsletter on regular basis (3 to 6 monthly);
- The panel supported the cross group activity of the GCSS Pacific Cross Section Intercomparison (GPCI, see www.gewex.org/gcss.html for more details). This activity compares and evaluates GCMs along a cross section from the coast of California to the ITCZ, encompassing many major tropical and sub-tropical cloud systems. This activity is lead by Dr Joao Teixeira (NRL);
- The panel supported the establishment of an across-WG microphysics effort. Dr Ulrike Lohmann (ETH Zurich) will be organizing this effort. The first meeting of this group will take place during the Pan-GCSS meeting in Athens. Its first focus will likely be the microphysics of mixed-phase clouds.

Activities and plans

The organization of the 3rd Pan-GCSS meeting on "Clouds, Climate and Models" is now well underway. The meeting will take place from 16-20 May 2005 in Athens, Greece. Sponsorship from several funding organizations has been secured. The sponsoring organizations as of 9 December 2004 are NASA, the US Department of Energy's ARM program, NSF, the University of Athens, and WCRP through GEWEX. GCSS is extremely grateful for the generous support by these organizations. The meeting will host plenary sessions as well as meetings of all GCSS WGs and cross-WG activities. The rationale for such a meeting is not only to bring the entire GCSS community together but also to rationalize travel in particular for the small GCM parametrization groups. The latter can usually not afford to attend separate annual meetings of the individual WGs, which are usually held in different locations. The common meeting period for all groups should ensure a closer direct involvement of the GCM community in GCSS, a major goal expressed over recent years. The plenary sessions of the meeting will cover the subjects of "Perspectives on the importance of clouds in the climate system", "Methodologies and metrics in assessing models", "The fundamental role of precipitation in cloud systems", and "Progress in the representation of clouds in large-scale models".

The work of the GCSS working groups is progressing well. The WG on boundary layer clouds led by Dr Christopher Bretherton (University of Washington) is continuing its investigation of marine stratocumulus clouds and is currently in particular focussing on the role of drizzle in such clouds. The WG on cirrus has mad only limited progress and the new chair of the group, Dr Steven Dobbie (Univ. of Leeds) is currently devising a new case study for the group, most likely based on observations taken with a suite of instruments at the UK radar / lidar observatory in Chilbolton. The WG on extra-tropical layer clouds chaired by Dr George Tselioudis (NASA GISS) is continuing their analysis of model performance during the March 2000 Intensive Observation Period at the ARM SGP site in Oklahoma. New model evaluation techniques developed in this group show great promise in disentangling the causes for the model errors identified by the group. The WG on deep convective system is continuing their work on the diurnal cycle of deep convection. The group will soon switch to the study of the transition from shallow to deep convection over the tropical oceans using data from TOGA COARE. While geographically separate this study will have a close physical relationship to that on the diurnal cycle. In both case clouds grow gradually from shallow to deep convection, a process GCMs are currently only poorly representing. The WG on polar clouds chaired by Dr James Pinto (NCAR) will focus on understanding and modelling mixed-phase clouds that frequently exist on the top of stable boundary layers in the Arctic. The simulation of such clouds is a challenge from both the cloud-dynamical and microphysical viewpoint. Data recently collected during the Mixed-Phase Arctic Cloud Experiment (MPACE) will be a major source of activities for this working group. Meetings of the WGs took place throughout the year usually in conjunction with larger conferences.

Overall the work of GCSS is progressing well. The suggested small changes in focus as well as the more direct inclusion of the larger GCM and observation communities while building on our strengths in conducting detailed cloud process studies should make GCSS an even more relevant group of GMPP

GEWEX Global Land-Atmosphere System Study (GLASS)

Overview

The goal of GLASS is to encourage the development of the next generation of Land Surface Schemes (LSS) by coordinating their evaluation and inter-comparison, and applying them to scientific queries of broad interest. Membership of the Panel is as follows: Luis Bastidas, Martin Best, Paul Dirmeyer (chair), Ann Henderson-Sellers, Paul Houser, Randy Koster, Taikan Oki, Christa Peters-Lidard, Andy Pitman, Bart van den Hurk, and Nicolas Viovy.

Status

GLASS is divided into four actions that constitute a two-by-two matrix; one axis being coupled (land-atmosphere) versus offline (land-only) modeling, and the other being local (point, plot and catchment scale) versus large-scale (continental to global) modeling. There is also a data management and software component called ALMA (Advancing Land-surface Modeling Activities). The GLASS science panel met in Kyoto, Japan on 15-17 September 2004. The meeting was held in conjunction with a workshop on the Second Global Soil Wetness Project (GSWP-2). Current information on GLASS projects can be found at: http://hydro.iis.u-tokyo.ac.jp/GLASS/.

Community: GLASS is having an increasing number of direct interactions with other elements of GEWEX and the broader scientific community. The components of GMPP are becoming more closely knit, and the local coupled action (LoCo) is pursuing a close collaboration with GABLS. With GHP there is continuing significant interaction with ISLSCP (mainly through GSWP), CEOP (ALMA and potentially LoCo) and AMMA. There are plans for GSWP-2 to contribute to GRP efforts to compile global energy and water cycle datasets over land (LandFlux), particularly for those components that are not well observable by satellite. Beyond GEWEX, GLASS has been involved in early planning for COPES, particularly in its modeling strategy. Also, the active component of the local coupled action (GLACE) is a joint project with the CLIVAR Working Group on Seasonal-Interannual Prediction (WGSIP). There is also coordination with the new IGBP Integrated Land Ecosystem – Atmosphere Processes Study (iLEAPS), as the GLASS chair is the designated GEWEX liaison to that effort. GLASS has also become active in the current IPCC efforts, including lending our expertise to model output analysis efforts in Working Group 1, and a proposal (by A. Pitman) of a multi-model study into the global impacts of land use change on the climate signal. A second phase of SnowMIP is beginning, and we have been approached by that community seeking guidance and perhaps membership in GLASS. GLASS continues to be closely aligned with the various operational efforts in land data assimilation in Europe and the U.S. NASA's Land Information System (LIS) has used GSWP-2 as a testbed for its attempts to run multiple LSS in a common framework for land data assimilation. Finally, interaction is beginning with the urban modeling community as an important frontier for weather and climate prediction, as the resolution of forecast models continues to increase.

PILPS: The San Pedro experiment (PILPS-SP) has been delayed, and a new timeline has been set. Poor communication resulted in the project being underpublicized, but that has been corrected and participation now appears to be good. Several groups have submitted results of step 1 (uncalibrated simulations over the Arizona sites), and steps 2 and 3 (release of validation data and multi-criteria algorithms for calibration) are underway. The website for the experiment is http://www.sahra.arizona.edu/pilpssanpedro/.

PILPS C-1 (Carbon) is concluding its analysis phase, other past PILPS projects are still generating publications (see accomplishments), and an Isotope-PILPS has been approved and is moving ahead in 2005. Collaboration in the AMIP project continues (AMIP2 DSP-12) generating publications as results from AGCMs are released through PCMDI.

GSWP: The Second Global Soil Wetness Project (GSWP-2) is wrapping up its main modeling phase, and is now moving into the analysis phase. 16-18 models are participating. Baseline simulations and sensitivity studies have been completed by most of the modeling groups and have been sent to the Inter-Comparison Center (ICC) at the U. Tokyo for QC, inter-comparison and redistribution. There is no final deadline for submissions, but late entries are less likely to be included in multi-model analyses or publications. A multi-model analysis (monthly and daily data) for the 10-year period is currently being produced, and should be released about the time the SSG meets. Papers on the application of a forward microwave brightness temperature model to LSS output to simulate L-band sensor measurements has been completed (Gao et al. 2004), and a paper on the issues of multi-model averaging techniques and transferability of calibration parameters is in preparation. The 19th Conference on Hydrology at the AMS Annual Meeting in San Diego has a full session on GSWP-2. The ICC has launched a web site giving the scientific community accesses to images and data from all of the participating models at http://haneda.tkl.iis.u-tokyo.ac.jp/gswp2/. See http://www.iges.org/gswp/ for more information on the project.

GLACE: The Global Land-Atmosphere Coupling Experiment (GLACE) is the principal multi-model project underway in the large-scale coupled action. The experiment has produced a paper in the journal *Science* (Koster et al. 2004) which has brought considerable attention to the role of the land surface in climate predictability and variability, and the spatial variability of the strength of land-atmosphere coupling. Two additional papers will have been submitted to *J. Hydrometeor*. describing the experiment results in more detail, including a breakdown of the separate contributions of the terrestrial and atmospheric components of the hydrologic cycle to the overall coupling between soil moisture and precipitation. Two more papers are in preparation that will describe results from a subset of models that performed the experiment with multiple version of their models, and an assessment of the real-world land-atmosphere coupling strength and the models' ability to represent it correctly. A full description of the experiment is available online at http://glace.gsfc.nasa.gov/.

Local Coupled Action: The local coupled action (LoCo) now has a plan and intention to collaborate strongly with GABLS to pursue the role of land-PBL interaction though local coupled modeling. The next GLASS panel meeting is being planned for September in De Bilt jointly with GABLS, to be hosted by Bart van der Hurk and Bert Holtslag (chair of GABLS), to foster interaction between the two communities. In 2005 LoCo will conduct limited preliminary modeling studies with an eye towards improved simulation of the diurnal cycle of surface fluxes, linking with GABLS to also study growth of the daytime boundary layer.

Pan-GLASS Issues: GLASS is also addressing cross-cutting issues in the climate modeling community. One involves the continuing problem of initialization of soil wetness in climate models, and the lack of transferability of soil moisture data sets from one model to another. Proof-of-concept work with the ECMWF and Hadley Centre models has been completed at last, and GLASS is preparing a summary paper on the issue to educate the broader modeling community as to the pitfalls of treating soil moisture as a uniformly defined quantity across models.

Future Plans

PILPS: The aim of the *IPILPS* (Isotopes in PILPS/GLASS) initiative is to contribute to an international inter-comparison of current state-of-the-art isotope parameterization efforts in coupled climate, atmospheric and earth system models by promoting comparison among land-surface schemes that incorporate isotopic representation under the auspices of GLASS. Isotopic data exist and, so far, there has been no tuning of models to these data. However, as databases become more prevalent, schemes will be tested against, and tuned to fit, isotopic measurements. There is, therefore, some urgency in establishing an international intercomparison. IPILPS comprises the land-surface modelling component of this GEWEX-wide effort.

PILPS-C1 is considering extending the study to more sites which include different vegetation types (more than 30 sites potentially available) to understand how the inter-biome variability compares with the inter-model variability, and to find which biomes are correctly/incorrectly simulated. There is particular interest in including the year 2003, available for most of European sites, because of the extreme drought over Europe. This will provide a test of model response to high hydric stress and high temperature and can serve as a test of how models simulate vegetation response to climate change similar to those expected by the end of the 21st century.

GSWP: The most tedious parts of GSWP-2, preparation of forcing data and integration of the models, is largely complete. The scientifically rewarding part of the project is now ramping up. The multi-model analysis will result in not only a new climatology of the land surface, but also an assessment of uncertainties as quantified by model spread. A GSWP-2 overview paper centered on the multi-model analysis should be submitted in Spring 2005. Model comparison work will continue, and evaluation of the models with a variety of in situ and remote sensing data will begin in earnest. The suite of sensitivity studies will provide a spectrum of interesting investigations, including the role of uncertainly in precipitation measurements on our estimation of the land surface component of the hydrologic cycle, the role that surface radiative fluxes play in linking the surface energy balance to the water cycle, an assessment of the quality of the major reanalysis products as they relate to global surface hydrology, how differences in the specification of global vegetation coverage by the various global products available impacts the simulation of land surface

climate, and what role is played by interannual variations of vegetation in surface hydrologic variability and climate feedbacks. Studies of model uniqueness (are all these LSSs redundant?) and transferability are also planned. There is strong interest within the HYDROS and SMOS communities to use GSWP-2 output data in the continued planning and development of those satellite missions.

Finally, production, application and evaluation of the forcing data for the baseline simulation has revealed where we can do better, and a new baseline forcing data set will be prepared in 2005. All current studies will continue with the runs produced using the original forcing data, but it is likely that improved baseline LSS integrations and a better multi-model analysis will result from this effort.

GLACE: A proposal to NASA has been submitted to expand on the intriguing results of GLACE and cross-couple three LSSs with three AGCMs, so that the separate roles of land model, atmosphere model, and coupled interactions in determining land-atmosphere coupling strength can be examined more thoroughly. Also, as mentioned previously, a proposal for a multi-model land-use change experiment has been proposed. Results would not be complete in time for the current IPCC assessment, but it could still answer the question of whether land use change is as important a signal trend as changes in atmospheric composition.

LoCo: The Local Coupled Action is the most logical point of interface with other GMPP studies, as they tend to operate primarily at this scale. LoCo plans to begin with modeling experiments based on data from the CASES site, HAPEX-Sahel and for transects across one or more of the "hot spots" found in GLACE. Later studies might move to CEOP reference and FluxNet sites. CASES would be a preliminary inroad to GABLS, which has complete a nocturnal boundary layer study for that location. Full convergence of joint planning between LoCo and GABLS will occur with the joint meeting in September 2005. In time, LoCo would also interface with efforts in GCSS and couple current LSSs to LEMs and CRMs.

Pan-GLASS: A synopsis paper on GLASS for a broad audience (e.g. in EOS) is being considered for submission in about one year's time. The purpose is to bring to the attention of the broader earth science community the important issues in land surface modeling, and its implications for a growing range of research areas.

Summary

Overall GLASS has enjoyed a very fruitful and productive year, with noteworthy progress in many areas and wide recognition of our specific efforts in coupled land-atmosphere modeling. The success of GLASS lies in its appeal to participants in a broad range of interests from operational, research and educational institutes. Participants feel they have something to gain beyond what they can accomplish individually, and we all reap the rewards. Its multi-model multi-institutional approach gives its efforts a credibility, applicability, and degree of oversight that increases the quality of science produced. There is still much to be done, but our first five years have laid a sound base for future efforts.

GEWEX Atmospheric Boundary Layer Study (GABLS)

Overview

The objective of GABLS is to improve the representation of the atmospheric boundary layer in regional and large-scale models for weather and climate studies. For additional information see http://www.met.wau.nl/projects/Gabls/index.html. The first focus of GABLS is on stable boundary layers (SBLs) over land. At the moment about forty scientists are active participating within GABLS, including members of university groups seeking for international cooperation.

Background and Achievements in 2004

In 2002, a first GABLS 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 was 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). The findings were presented and discussed at a workshop at the University of the Balearic Islands in Mallorca, September 22-26, 2003.

Overall the 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. It appears that this is very strongly related to the choice of the turbulent length scale and/or the stability functions in the turbulence schemes, and not so much to the vertical resolution. Overall the results for the different LES models are much more closely than for the 1D models.

Interestingly the models in use at operational weather forecast and climate centres typically allow for enhanced mixing resulting in too deep boundary layers, while the typical research models show less mixing in more in agreement with the 'Large Eddy Simulation' results for this case. Because of the enhanced mixing in weather and climate models, these models tend to show a too strong surface drag, too deep boundary layers, and an underestimation of the wind turning in the lower atmosphere. At the other hand, by decreasing the mixing and surface drag, a direct impact on the atmospheric dynamics ('Ekman pumping') may be noted. Consequently, cyclones may become too active, corresponding in too high extremes for wind and precipitation, et cetera. When the models with enhanced mixing are coupled to a surface energy balance, they also produce too high surface temperatures.

On basis of the first GABLS benchmark case, eight articles have been compiled and submitted to a special issue of Boundary Layer Meteorology on GABLS. This includes two papers with summary results for the LES and the 1D models, as well as six additional papers highlighting specific issues. So far two papers are accepted, and the others are under review or have been re-submitted after review. It is expected that the special issue will appear in 2005.

Given the GABLS findings, there is a clear need for a better understanding and a more general description of the atmospheric boundary layer under stably stratified conditions in atmospheric models for weather and climate. As such a summary report on the GABLS findings was written for the new IPCC report of working group 1 (Chapter 8). In August 2004, several GABLS related papers were presented at the '16th Boundary Layers and Turbulence Conference', in Portland, USA. In addition a GABLS workshop was held afterwards discussing the state of art and setting up a second GABLS benchmark case.

Future Plans

The second GABLS benchmark case will be based on a realistic boundary-layer case covering three diurnal cycles over land within the CASES99 data set. This case has been studied and prepared by the Meteorology group at Wageningen University (Steeneveld, Van der Wiel and Holtslag, J. Atmos. Sci., 2004, Submitted). Detailed observations for three nights are available with rather different characteristics (fully turbulent, intermittent turbulent and non-turbulent). Steeneveld et al use a one-dimensional model with prescribed advection and full physics, e.g. first order turbulence closure, a grey body approximation radiation scheme and refined descriptions for the coupling of the atmosphere to the land surface and soil processes. Despite the totally different characteristics of the three nights, the column model was able to predict the major quantities and the evolution of the stable boundary layer. Especially the evolution of the vegetation temperature,

soil heat flux and the sensible heat flux during the transition from day to night is simulated rather well.

It is proposed to use this case for the inter-comparison of different column models within GABLS using prescribed surface temperature. For an intercomparison of LES models probably only one night will be selected (currently in preparation). The focus of the next intercomparision of column models is again on the behavior and performance of the various boundary layer parameterizations, this time both for day and night conditions. In addition, the proposed intercomparison case has received interest from the GLASS/LOCO community as a suitable case to study also the interaction of the ABL with the land surface. A combined LOCO/GABLS workshop on this is planned for 19-23 September 2005 in De Bilt, NL (hosted by Bart van den Hurk and Bert Holtslag).

Atmospheric Model Inter-comparison Project (AMIP)

For over a decade the Atmospheric Model Intercomparison Project (AMIP) has served the climate modelling community as benchmark experiment. Although important modifications in the experiment were made between AMIP1 and AMIP2, the basic experimental protocol has remained unchanged. Support for AMIP has waned in recent years in favor of furthering progress of the Coupled Model Intercomparison Project (CMIP). Nevertheless, the WGCM, WGNE and GMPP continue to recognize the AMIP experiment to be an essential complement to CMIP and other modeling activities. There are circumstances when examination of the less complex (no atmosphere-ocean feedback) system reveals important information, and AMIP has the additional advantage of being more directly comparable to observations (e.g., the years in which ENSO events arise are predetermined).

At the October 2004 WGNE/GMPP in Exeter, Peter Gleckler (LLNL/PCMDI) explained that efforts are underway to conclude the AMIP2 exercise. PCMDI will continue archiving new AMIP2 simulations until mid 2005, but beyond that AMIP (and CMIP) have essentially been overtaken by events unfolding in preparation for the Fourth Assessment of the IPCC. In support of the WGCM, PCMDI has begun archiving an unprecedented collection of new simulations requested by the WGCM Climate Simulation Panel. In addition to a spectrum of climate change scenarios, this ambitious list of simulations includes both AMIP and CMIP simulations. Information on this endeavor is available at: http://www-pcmdi.llnl.gov/ipcc/about_ipcc.php, including details on how the anticipated 40Tb database is being served to the research community. It is expected that the future of coordinated climate modeling intercomparisons will morph out of this endeavor, and that the AMIP effort will somehow be re-invigorated as a companion exercise to future coupled model experiments.

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)
KUNMING, CHINA
(Expo Garden Hotel, Second Floor, Aiwan Building)
SEVENTEENTH SESSION, 31 JANUARY-4 FEBRUARY 2005

Monday, 31 January 2005:

8.00-8.30: **REGISTRATION**
8.30-8.45: **OPENING BY HOST -** P. Lemke/S. Sorooshian
8.45-9.00: **GROUP PHOTOGRAPH** (Gate of Aiwan Building)

09.00-10.30 **1. OVERVIEW OF ACTIVITIES AND PLANS**

1.1: Introductory remarks, WCRP news (P. Lemke/G. Sommeria)
1.2: Chairman's report (S. Sorooshian)
1.3: International GEWEX Project Office report and review of actions from the last GEWEX SSG and GEWEX executive meeting (R. Lawford)
1.4: Overview of opportunities for European GEWEX activities (P. van Oevelen)

10.45-11.00: **BREAK**

11.00-12.30: **2. RELATIONS WITH SPACE AND CLIMATE RESEARCH FUNDING AGENCIES**

2.1: ESA (E.-A. Herland)
2.2: JAXA (T. Tanaka)
2.3: NASA (H. Maring)

12.30-14.00: **LUNCH**

14.00- 15.00 2.6: GEWEX and WCRP activities in China (Xueli Shi (CMA) and Shihua Lu (NSFC))

15.00-15.30: **BREAK**

15.30 – 18:00: **3. RELATION WITH OTHER PROGRAMMES**

3.1: WGNE (A. Beljaars)
3.2: IGBP/ILEAPS (P. Kabat)
3.3: GWSP (R. Lawford)
3.4: IGOS Water Cycle Theme (R. Lawford)
3.5: THORPEX (includes short brief on German COPS experiment (U. Schumann)
3.6: Discussion on interface between GEWEX and other programmes
[2.4: NOAA/NESDIS (K. Mooney) (transfer from session 2)]

18.30: **WELCOME COCKTAIL RECEPTION**

Tuesday, 1 February 2005:

08.30-9.00: *[2.5: Discussion on Chinese activities in relation with GEWEX (Zhang Wenjian) (transfer from session 2)]*

9.00-10.30: **4. MAPPING GEWEX ONTO COPES**

4.1: Overview of the COPES Concept (P. Lemke/G. Sommeria/S. Sorooshian)
4.2: Views on what GEWEX could contribute to COPES (General discussion)

10.30-11.00: **BREAK**

11.00-12.30: **5. GEWEX MODELLING AND PREDICTION PANEL (GMPP)**

5.1: Overview of GMPP activities (J. Polcher)
5.2: GCSS Activities (C. Jakob)
5.3: GLASS (J. Polcher)
5.4: Summary and Actions needed by the SSG

12:30-14:00 **LUNCH**

14:00-15:30 **SPECIAL SCIENTIFIC SESSION**

6. PRESENTATIONS ON PARAMETERIZATIONS

6.1: GMPPs strategy in developing and improving parameterizations (J. Polcher)
6.2: Parameterizations and Cloud resolving Models (C. Jakob)
6.3: Parameterizations used in Land Surface Models (J. Polcher)

15:30-16.00 **BREAK**

16.00-18.00 **6. PRESENTATIONS ON PARAMETERIZATIONS (Continued)**

6.4: Parameterizations in hydrologic models (S. Sorooshian)
6.5: Super-parameterizations (D. Randall)
6.6: Parameterizations used in NWP Models (A. Beljaars)
6.7: Discussions on whether a new modeling thrust is needed in GEWEX

Wednesday, 2 February 2005:

08.00-10.00: **7. CEOP**

7.1: CEOP Update (T. Koike)
7.2: WESP and connection with GHP
7.3: CIMS (J. Matsumoto)
7.4: Overview of CEOP Data Activities (S. Williams)
7.5: International Co-ordination (T. Koike)
7.6: CEOP II proposal (T. Koike)
7.7: CEOP Issues for the GEWEX SSG (including hydrologic data set collection

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Wednesday, 2 February 2005: (Continued)

10.00-10.30 **BREAK**

10.30-12.30: **8. GEWEX RADIATION PANEL (GRP)**

8.1: Status of Projects (W. Rossow)
8.2: Specific GRP Issues, Successes
8.3: Actions needed from the SSG

12.30-13.30: **LUNCH**

13.30: **Excursion to Nationality Village of Yunnan Province** (we meet at Gate 7)

18.15: **Banquet offered by local host** (at Yunnan Jixin Cross-bridge rice noodle Garden)

Thursday, 3 February 2005:

8.00-10.30: **9. FIRST EXECUTIVE SESSION**

(Review of action items, reports by SSG members)

10.30-11.00 **BREAK**

11.00-12.30: **10. GEWEX HYDROMETEOROLOGY PANEL (GHP)**

10.1: Overview of the GHP (J. Roads)
10.2: GAPP (Jin Huang)
10.3: BALTEX (B. Rockel)
10.4: MAGS (L. Martz)
10.5: GAME (T. Yasunari)

12.30-14.00: **LUNCH**

14.00-15.30: **10. GHP (Continued)**

10.6: LBA/La Plata Basin (M. Silva Dias)
10.7: AMMA (J. Polcher)
10.8: WRAP and WMO/UNESCO semi-arid workshop (L. Martz)
10.9: TWG (B. Rockel)
10.10: SWING (J. Roads)
10.11: WEBS (J. Roads)

15.30-16.00: **BREAK**

Thursday, 3 February 2005: (Continued)

16.00-17.00: **10. GHP (Continued)**

10.12: NEESPI (R. Lawford)
10.13: Summary and actions needed by the SSG
10.bis All panels: ISLSCP (P. Kabat)

17.00-18.00: **11. INTERACTIONS WITH OTHER WCRP CORE PROJECTS**

11.1: CLIVAR (A. Busalacchi)
11.2: Discussion on interactions with SPARC and CliC
[3.7: IAHS PUB (K. Takeuchi) (transfer from section 3)]

Friday, 4 February 2005:

8.30-10.30: **12. HORIZONTAL ACTIVITIES AND GEWEX STRATEGIES**

12.1: The GEWEX Roadmap and Phase II strategy (R. Lawford)
12.2: GEWEX position on Monsoons and preparation of WCRP Monsoon Workshop (panel chairs – T. Yasunari)
12.3: Precipitation cross-cut (panel chairs)
12.4: Global WEBS (panel chairs)
12.5: The diurnal cycle (panel chairs)

10.30-11.00 **BREAK**

11.00-12.30: **12. HORIZONTAL ACTIVITIES AND GEWEX STRATEGIES (Continued)**

12.6: Data Management Issues (W. Rossow, S. Williams)
12.7: Discussion on Opportunities and Strategies for long-term space observation (includes GEO issues introduced by G. Sommeria)
12.8: Preparation of GEWEX 2005 Conference (R. Lawford)

12.30-13.30: **LUNCH**

13.30-16.00: **13. SECOND EXECUTIVE SESSION**

(Action items, membership, administrative issues, input from SSG members)

16.00: **ADJOURN**

Saturday, 5 February 2005:

8.30-18.00: **EXCURSION TO THE STONE FOREST**

APPENDIX C

LIST OF SCHEDULED MEETINGS CONCERNING GEWEX

Date	Meeting	Location	Attendance
2005			
31 Jan - 4 Feb 2005	GEWEX SSG-17	Kunming, China	By invitation
28 Feb - 4 March 2005	CEOP/IGWCO joint meetings	Tokyo, Japan	By invitation
14-18 March 2005	26th session of the Joint Scientific Committee	Guayaquil, Ecuador	By invitation
18-21 April 2005	Joint WCRP-UNESCO workshop on the Applicability of Climate Research and Information for Water Resource Management in the Semi-Arid Regions	Alexandria, Egypt	By invitation
24-29 April 2005	European Geosciences Union General Assembly	Vienna, Austria	Open
3-5 May 2005	ISLSCP Initiative II Science Workshop	Greenbelt, MD, USA	Open
16-20 May 2005	Pan GCSS meeting	Athens, Greece	Open
24 May 2005	Mid-Year Meeting of CEOS Principals	Geneva, Switzerland	By invitation
26 May 2005	IGOS Partners meeting	Geneva, Switzerland	By invitation
1-3 June 2005	First session of the WCRP Observation and Assimilation Panel	NASA/GISS, New York, NY, USA	By invitation
15-17 June 2005	Pan-WCRP Monsoon Workshop	Irvine, CA, USA	By invitation
20-24 June 2005	**5th International Scientific Conference on the Global Energy and Water Cycle**	**Orange County, CA, USA**	**Open**
2-11 Aug 2005	IAMAS Scientific Assembly	Beijing, China	Open
24-26 Aug 2005	GEWEX Executive Meeting	New York, NY, USA	By invitation
19-21 Sept 2005	Joint GABLS/GLASS Workshop on Local Coupled Land-Atmosphere Modeling	De Bilt, The Netherlands	By invitation
19-23 Sept 2005	LOCO/GABLS workshop	De Bilt, The Netherlands	By invitation
21-23 Sept 2005	6th GLASS Panel meeting	De Bilt, The Netherlands	By invitation
26-30 Sept 2005	11th session of the GEWEX Hydrometeorology Panel	Melbourne, Australia	By invitation
3-6 Oct 2005	16th session of the GEWEX Radiation Panel	Paris, France	By invitation
6-7 Oct 2005	First session of the WCRP Modelling Panel (WMP)	Exeter, UK	By invitation
7-11 Nov 2005	21st session of the CAS/JSC Working Group on Numerical Experimentation (WGNE)/9th session of the GEWEX Modelling and Prediction Panel (GMPP)	St. Petersburg, Russia	By invitation
14-17 Nov 2005	WGDMA meeting	Darmstadt, Germany	By invitation
28 Nov - 2 Dec 2005	AMMA 2005 Dakar-First International AMMA Conference on the West African Monsoon	Dakar, Senegal	Open
5-8 Dec 2005	AGU Fall Meeting	San Francisco, CA, USA	Open

Date	Meeting	Location	Attendance
2006			
9-13 Jan 2005	GEWEX SSG-18	Dakar, Senegal	By invitation
21-26 Jan 2006	First iLEAPS Science Conference	Boulder, CO, USA	Open

APPENDIX D

PUBLICATIONS AND REPORTS 2004-2005

2004

Informal Reports

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, 26-30 January 2004

2005

Informal Reports

3/2005 Report of the GRP Working Group on Data Management and Analysis (WGDMA), 18-19 October 2004 and of the fifteenth session of the GEWEX Radiation Panel (GRP), 20-22 October 2004, Kyoto, Japan

4/2005 Report of the eighth session of the Baseline Surface Radiation Network (BSRN) Workshop and Scientific Review, Exeter, UK, 26-30 July 2004

5/2005 Report of the tenth session of the GEWEX Hydrometeorology Panel (GHP), Montevideo, Uruguay, 13-16 September 2004