Global Energy and Water Cycle Experiment

GEWEX NEWS

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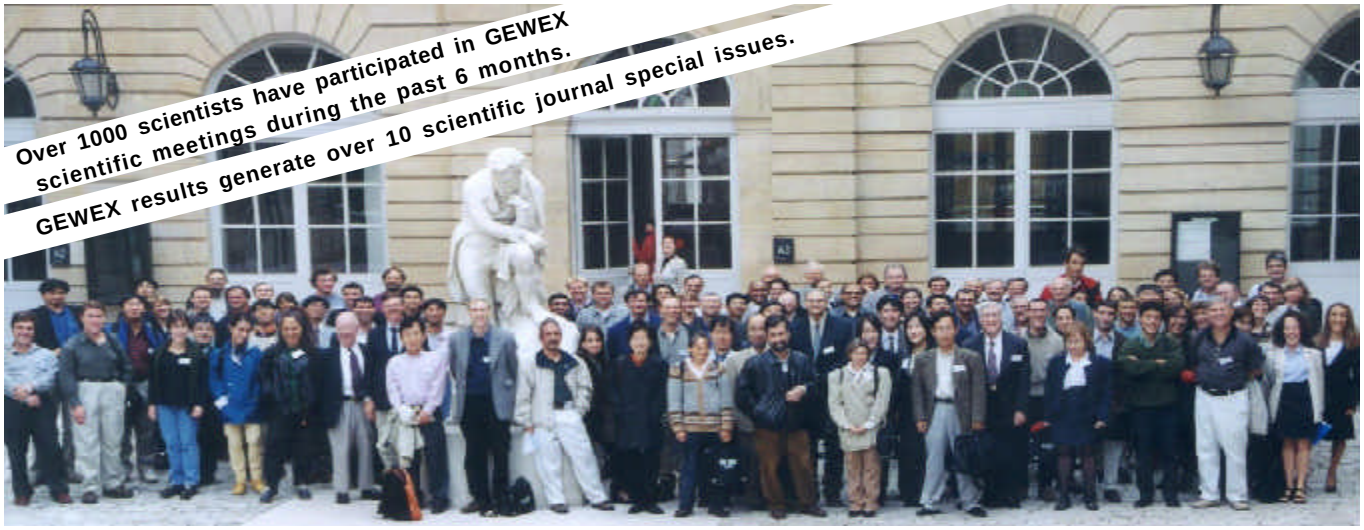
World Climate Research Programme–WCRP

GEWEX ACCOMPLISHMENTS AND PLANS REPORTED AT THE 4TH INTERNATIONAL SCIENTIFIC CONFERENCE ON THE GLOBAL ENERGY AND WATER CYCLE

(see page 7)



GEWEX participants at Collège de France on last day of the 4th Conference.

ENLARGING THE SCOPE OF BALTEX

Hartmut Graßl[1] and Hans-Jörg Isemer[2]

[1]MPI Hamburg, Germany
[2]GKSS Research Centre, Geesthacht, Germany

After the successful Phase I of the GEWEX continental-scale Baltic Sea Experiment (BALTEX), which brought major results in both science (such as coupled regional models for the Baltic Sea basin with the first water budget estimates established and new data sets assimilated) and also infrastructure (e.g. four dedicated data centres for meteorological, hydrological, oceanographic and radar data of the entire Baltic Sea basin), the BALTEX Community will now enlarge the scientific scope and strengthen its outreach. The achievements obtained and new evidence established in BALTEX now call for an intensive application to other fields where knowledge on water and energy cycles is of fundamental importance: Climate variability and climate change studies including scenarios of potential future climate, and environmental investigations, in particular, on transport and deposition of nutrients and pollutants. Also, carbon exchanges will be addressed, thus integrating contributions from the Nordic Pilot Experiment (NOPEX) project and strengthening WCRP-IGBP linkages at the regional scale in northern Europe. For BALTEX Phase II, it is envisaged that:

- Studies and modelling activities will include transport and deposition of nutrients and pollutants both in air and water;
- Climate records of the entire basin since 1800 will be evaluated jointly by all countries with a territory in the Baltic Sea basin;

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IGOS-P Endorses CEOP as First Element of the Water Cycle Theme (see back page)

CEOP Implementation Plan in Press and Available on the Web

COMMENTARY

GEWEX SCIENTIFIC RESULTS EXPAND – PRECIPITATION PROCESSES MAY DRIVE FUTURE

Soroosh Sorooshian, Chairman
GEWEX Scientific Steering Group

As GEWEX projects have matured, the scientific results have expanded across the broad spectrum of elements of the energy and water cycle that influence climate variability and change. You will note in this issue some examples of the scientific journal special issues, recent attendance and presentations at GEWEX scientific conferences, and citations related to many of the GEWEX data sets, continental-scale experiments and model intercomparison studies. GEWEX contributions to the broad spectrum of the key elements of climate prediction are significant and increasing: there are more than ten recent or soon-to-be published special issues comprising approximately 200 papers; five hundred to several thousand citations for some of the longer running projects (e.g., International Satellite Cloud Climatology Project, International Satellite Land Surface Climatology Project); over 4,000 requests for ISLSCP CD-ROMs; and 1,000 to 1,500 scientific presentations at GEWEX workshops/conferences within the last year.

While our scientific results are widely distributed and have had significant impacts in numerous areas (e.g., land-surface upgrades in numerical weather prediction models), it is often the end-to-end linkage and societal results that attract the most attention and prompt further funding. This requires us to consider, illustrate and even calculate the sensitivities and impacts at the applications level. Understanding these impacts is also critical, since the consequences feed back to the other elements of the processes driving the overall impact (as demonstrated by the current applications models). Nevertheless, as we address all elements of these linkages and focus on the resulting impacts, we must not forget the fundamental starting point and the current focus of many of our GEWEX projects: the improved scientific understanding of the processes that drive the models providing the predicted climate change and ultimate impact. How do we approach this dual responsibility?

Recent Intergovernmental Panel on Climate Change (IPCC) results have provided divergent precipitation predictions from different climate models. These variations in prediction emphasize the ongoing necessity to further improve our understanding of the processes that allow us to predict precipitation with the accuracy needed for application by water resource managers, who are a key link to the societal impact. **Nearly all GEWEX activities relate to the precipitation processes in some manner and provide us with a great challenge for the future: to significantly reduce the uncertainty in both the near- and long-term prediction of precipitation through improved understanding, and representation of the processes that drive precipitation.** The upcoming GEWEX Scientific Steering Group meeting will address this challenge and provide further direction as we continue into Phase II, in which we aim to improve our understanding of the wet processes and subsequent precipitation representation and prediction more collectively throughout our GEWEX components.

PROFESSOR RASCHKE HONORED

Professor Erhard Raschke was recognized at the September 2001 joint conference of the Meteorological Societies of Austria, Germany and Switzerland with the Georgi award from the Alfred-Wegener-Foundation for the Advancement of Geosciences. The citation read in part "...for his particular accomplishments in measuring and modeling atmospheric radiative transfer processes, for using satellite data in atmospheric research, for the his investigation of water cycles in the climate system, and for his initiation and performance in the BALTEX research program."

Contents

(Continued from page 1)

- Regional climate change scenarios using coupled models shall be presented;
- Predictability on time scales of weeks and months residing in soil water storage will be extracted;
- **Full integration into CEOP of GEWEX is planned.**

All activities are planned to be discussed with and applied by the larger user communities, beyond the WCRP science community, e.g. hydropower companies, water resource managers and intergovernmental bodies for the Baltic Sea and the land territories of its catchment.

As a first step towards creating infrastructure support for BALTEX Phase II, 50 institutions from 14 countries in Europe, including not only "traditional" representatives of the BALTEX Community, but also important institutions representing other relevant themes, have recently submitted a funding proposal for a thematic network *BALTNET* (see figure below)to the European Commission with the major objective to formulate a science agenda (including a problem catalogue, and a science and implementation plan) for "global change, natural variability and anthropogenic influences in the Baltic Sea basin". Users and stakeholders will be participants in *BALTNET* and have a platform to meet and communicate with the research community.

Initiation and coordination of steps towards BALTEX Phase II requires continuous and strengthened management activities. Dr. Hans-Jörg Isemer has been appointed as the head of the International BALTEX Secretariat (IBS) as of 16 October 2001. He had previously held this position from 1994 to 1999. IBS will continue to be housed within the GKSS Research Centre in Geesthacht, Germany, and GKSS's financial support for Dr. Isemer, another scientific officer, and a half-day secretary position is a substantial contribution to strengthening steps for the future enlargement of BALTEX. Dr. Isemer may be reached at either ***isemer@gkss.de*** or ***baltex@gkss.de.***

SPECIAL ISSUE PUBLICATIONS HIGHLIGHT GEWEX SCIENTIFIC CONTRIBUTIONS

GEWEX scientific results are being published routinely in scientific journals around the world and the following sample listing of recent or planned Special Issues of respected journals illustrate the extent and breadth of research results becoming available from Phase I of GEWEX. Throughout Phase I, we have over 20 special issues, some 10-15 review articles, over 5,000 CD-ROMs distributed, and over 5,000 citations referring to GEWEX results.

- GCIP – *J. Geophys. Res. Part 2*, Vol.104, D16, 1999
- GSWP – *J. Meteor. Soc. Japan*, Vol.77, No.1B, 1999
- BALTEX – *Meteor. Zeitschrift*., Vol. 9, No. 1+2, 2000

(4 past Special Issues and 2 Review papers)

- GAME – *J. Meteor. Soc. Japan*, Vol.79, No.1B, 2001
- GACP – *J. Atmos. Sci*.; scheduled for March 2002
- MAGS – *J. Atmosphere-Ocean* (early 2002)
- MAGS/CAGES – *J. Hydrometeorology*, in preparation
- ISLSCP – *J. Geophys. Res.*, BOREAS, in press

(7 past Special Issues, 240 papers, and nearly 4,000 citations)

- LBA – *J. Geophys. Res.*, (early 2002)
- GLASS/PILPS – *Global and Planetary Change*, in preparation

Also, ISCCP with two review papers and close to 500 citations, and several GCSS review papers combine with the results from all GEWEX project web pages (providing ftp and downloading of numerous data sets) to indicate the extent of GEWEX reporting and distribution of results and accomplishments.

ISLSCP BUILDS ON SUCCESS

The International Satellite Land Surface Climatology Project (ISLSCP) Initiative II builds upon the success of Initiative I, the five-volume CD-ROM collection of global data sets for 1987-1988, mapped to a common spatial resolution grid (1° x 1°) to support energy, water and biogeochemical cycling studies. Over 4,120 Intiative I CD-ROMs have been distributed, and about 53,000 FTP files downloaded from the web at ***http://eosdata.gsfc.nasa.gov/CAMPAIGN_DOCS/ISLSCP/islscp_i1.html*** by scientists around the world. Over 3,000 citations have referenced ISLSCP data or research results in the scientific literature.

Initiative II data sets cover the 10-year period from 1986 to 1995 at a spatial resolution of 1° for the meteorological data and 0.5° and 0.25° for topography, soils, and vegetation parameters.

The majority of ISLSCP Initiative II data sets will be submitted in December. As the data sets become available, they will be accessible via the web at ***http://islscp2.gsfc.nasa.gov/.***

THE ROLE OF SURFACE ENERGY BALANCE COMPLEXITY IN LAND SURFACE MODELS

A.J. Pitman[1] and B.J. McAvaney[1,2]

[1] Department of Physical Geography, Macquarie University NSW, Australia.
[2]Bureau of Meteorology Research Centre, Melbourne, Victoria, Australia

The surface energy balance (SEB) in land surface models (LSM) can range from very simple (e.g. Manabe, 1969) to rather more complex methods (see McAvaney et al., 2001). A series of intercomparisons of LSMs (Henderson-Sellers et al., 1996; Dirmeyer et al., 1999) have identified large differences between LSMs in the way they partition available energy and water (Pitman et al., 1999). Crossley et al. (2000) showed that these differences affected the changes in climate that result from doubled CO_2, which Gedney et al. (2000) attributed to the parameterization of hydrological processes. Desborough et al. (2001) found a similar result to Crossley et al. (2000) using the CHAmeleon Surface Model (CHASM) coupled to the Bureau of Meteorology Research Centre (BMRC) climate model (Colman and McAvaney, 1995).

We report here on the sensitivity the change in temperature (DT), precipitation (DP), evaporation (DE) and soil moisture (DW) that results from a doubling of CO_2, and the dependence of this sensitivity on the SEB complexity. We used the Atmospheric Model Intercomparison Project framework which includes prescribed sea surface temperatures and sea ice. For 2 x CO_2 we used temperature and sea ice changes from a transient run of the Hadley Centre climate model (see Crossley et al., 2000 for further details).

Simulations with five modes of CHASM are compared to ascertain the impact on ΔT, ΔP, ΔE, and ΔW of explicitly parameterizing temperature differentiation (for vegetated and non-vegetated surface fractions), canopy resistance, bare ground evaporation and canopy interception. CHASM's default mode (SLAM) includes all of these processes explicitly and its' SEB parameterisation becomes gradually simpler as explicit parameterisations for temperature differentiation (SLAM1T), variable canopy resistance (RSGI), bare ground evaporation (RSI) and canopy interception (RS) are removed and replaced by adjusting the surface resistance. Details are available from Desborough et al. (2001).

The seasonal variation in statistics proposed by Wigley and Santer (1990) are shown for ΔT (Figure 1) and ΔE (Figure 2). The data points shown here are only statistically significant at a 5% level if the p-value exceeds 0.95 or is less than 0.05 (see the horizontal axis on the figures). Occasional data points are therefore statistically significant indicating that the complexity of the SEB leads to differences in the simulations compared to SLAM. In the case of ΔT, there is no clear evidence that the impact of SEB changes are systematic and the months where the changes are statistically significant appear rather random. All tests show 0-3 months where statistically significant differences from SLAM exist for individual modes, leading us to conclude that at the monthly time scale, the complexity of the SEB does not lead to differences in the simulation of ΔT. A similar result is obtained for ΔP (not shown).

In the case of ΔE, a similar result is obtained for the point-by-point time mean (NT5), but the other statistics show an increased frequency of statistically significant differences. The point-by-point time variance test (NF5) shows half the months for mode RS are statistically significantly different from SLAM indicating that there is an impact on the temporal variance (Figure 2). The difference from SLAM in the overall temporal variance (SPRET1) and overall spatial variance (SPREX1) are statistically significant in 10 and 11 of the months for mode RS and are different from SLAM in 3-6 of the months for the other modes. This suggests that the SEB is affecting the overall spatial and temporal variance of evaporation. The p-values are commonly less than 0.05 for mode RS, suggesting a systematic underestimation in the overall temporal variance compared to SLAM. The high level of impact for mode RS compared to RSI or RSGI suggests that the difference in the spatial and temporal variances shown between RS and the control are caused by the lack of canopy interception which does not affect the mean, but does significantly affect the temporal and spatial variance statistics.

In the case of ΔW, there are few occasions where the SEB complexity affects NT5. As with ΔE, mode RS appears to affect ΔW in terms of the point-by-point spatial variance (NF5), the overall time variance (SPRET1) and the overall spatial variance (SPREX1) as would be expected. For the overall time variance and spatial variance, 7 and 9 months (respectively) show impacts of the SEB leading to statistically significant differences from SLAM, and a general tendency to underestimate variability compared to the control. However, ΔW shows frequent statistically significant differences in the point-by-point spatial variance in all modes with the exception of SLAM1T. This indicates that, in the modeling of the change in soil moisture variability the complexity of the SEB is important and that modes such as RSI and RSGI fail to capture the variability of SLAM. Since mode SLAM1T is not statistically different from the control, but RSGI is, the implication is that explicit bare soil evaporation is required to capture the spatial and temporal variability in ΔW.

FIGURE 1: TEMPERATURE

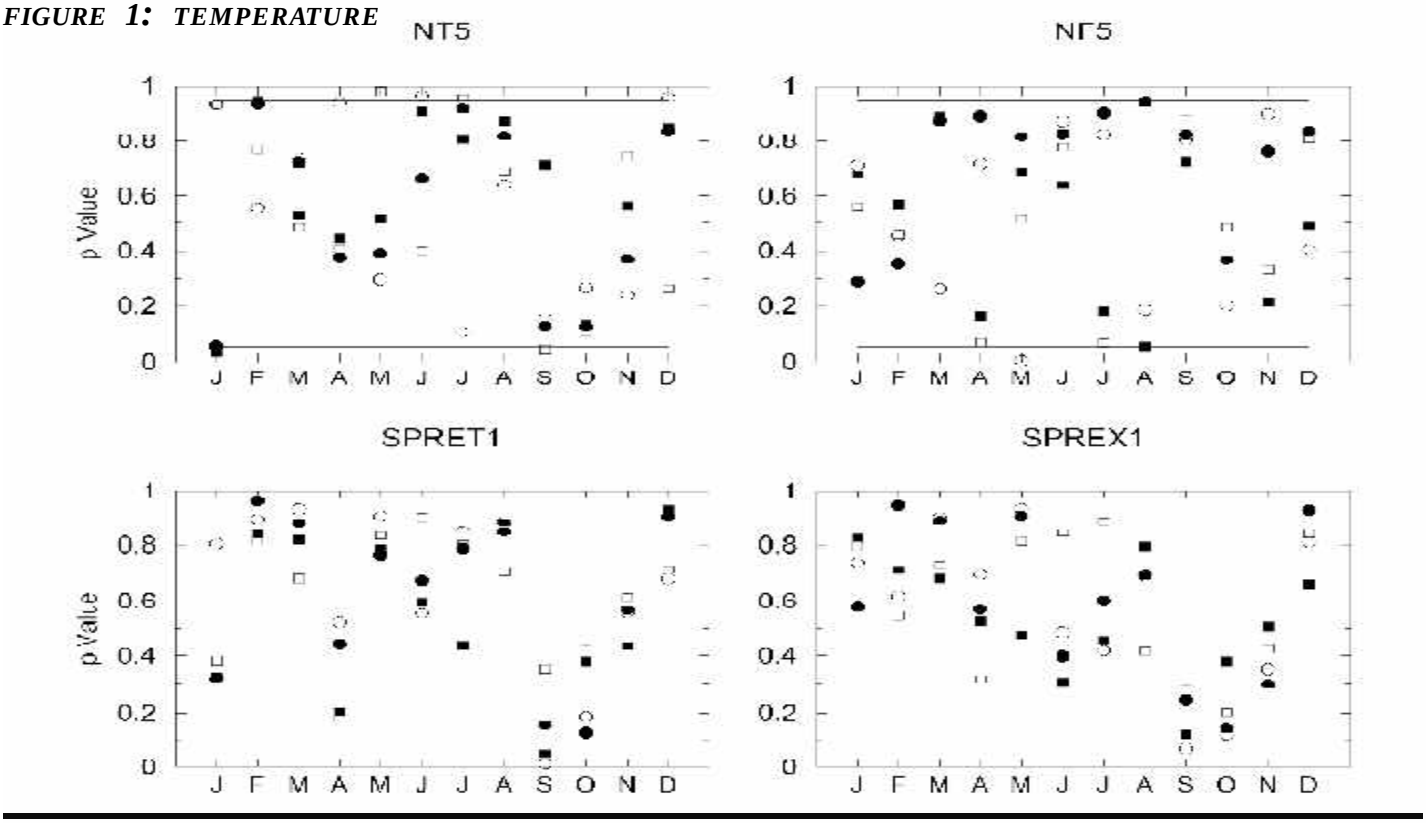
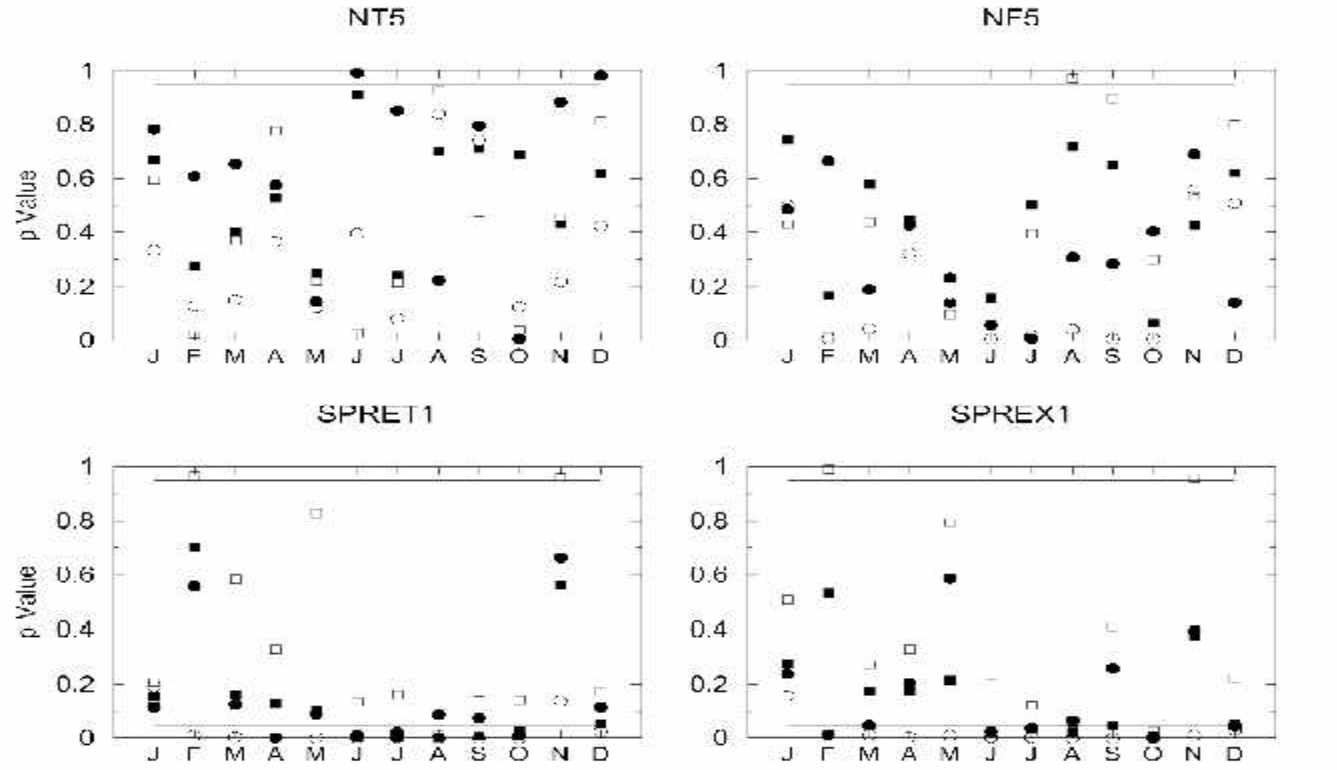


FIGURE 2: EVAPORATION



Results for the six statistics discussed in the text for DT for each mode of CHASM differenced from SLAM. NT5 indicates point to point time mean and NF5 is point to point time variance. SPRET 1 is overall temporal variance and SPREX 1 is overall spatial variance. Values greater than 0.95 or less than 0.05 are statistically significant at a 95% confidence level. SLAM1T-SLAM is shown with a closed circle (●); RSGI-SLAM is shown as a closed square (■); RSI-SLAM is shown as an open square (▪) and RS-SLAM is shown with an open circle (O).

Mode	Air Temperature			Precipitation		
	1 x CO_2	2 x CO_2	difference	1 x CO_2	2 x CO_2	difference
SLAM1T-SLAM	**0.04**	0.72	0.91	**0.01**	**0.04**	0.44
RSGI-SLAM	0.28	0.81	0.86	0.06	**0.02**	0.11
RSI-SLAM	**0.04**	0.33	0.83	0.41	0.06	0.13
RS-SLAM	0.26	0.85	0.83	0.08	0.16	0.71
	Evaporation			**Root soil moisture**		
SLAM1T-SLAM	**0**	**0**	0.67	**0.99**	**0.99**	0.23
RSGI-SLAM	**0**	**0**	0.63	**1**	**1**	0.61
RSI-SLAM	**0**	0.18	0.69	**0.95**	**0.99**	0.87
RS-SLAM	**0**	**0.04**	0.88	**1**	**1**	0.35

Globally averaged probability (p-values), calculated following Wigley and Santer (1990). The "T1" statistic is shown which assesses the statistical significance of changes between a mode of CHASM and the control (SLAM). Values which are statistically significant at a confidence level of 95% are bolded.

Discussion and Conclusions

We found no evidence that the mean ΔT, ΔP, ΔE or ΔW resulting from increased CO_2 were sensitive to the SEB. The Table above shows this most clearly, demonstrating that while the modes of CHASM may be statistically significantly different in the global mean from SLAM at 1 x CO_2, or at 2 x CO_2 the changes in these terms due to increased CO_2 were never statistically significantly different from SLAM. There was also little evidence that differences in the simulation of changes in variance in ΔT (Figure 1) or ΔP were statistically significant. There was, however, evidence that significant differences exist in the temporal and spatial variances for ΔE (Figures 2) and ΔW when simpler modes are compared to SLAM).

This result adds confidence to results reported by the Intergovernmental Panel on Climate Change (Houghton et. al., 2001) since it implies that uncertainties in how to model the SEB do not affect the simulation of the mean change in these quantities. We did find some sensitivity in the simulation of variance for ΔE and ΔW, but this was particularly evident in mode RS and most LSMs currently used in climate models would be more complex that this mode (McAvaney et al., 2001). **Thus, the simulations of both the mean and variance of DT, DP and DE are probably not affected significantly by uncertainties in the SEB parameterization. However, capturing the changes in the variance of soil moisture following a doubling of CO_2 appears to require a reasonably complex LSM including explicit bare soil evaporation.**

Our results also support the gradual refocus of effort within the land surface community from the SEB towards hydrology, the inclusion of more hydrologically focused models and changing from vertical complexity to horizontal complexity based on the catchment (Koster et al., 2000). The aims of GEWEX-GLASS, which is already leading initiatives to examine the performance of the hydrology component of LSMs in the Rhone Basin, are thus likely to be fruitful.

Acknowledgments

AJP was partly funded via an Australian Research Grant. BJM was supported by the Australian Greenhouse Office. We thank M. Zhao for help with the statistical analyses and J. Perrot who performed preliminary analyses of these results.

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REPORT ON THE 4TH INTERNATIONAL SCIENTIFIC CONFERENCE ON THE GLOBAL ENERGY AND WATER CYCLE

Two hundred and fifty scientists from 20 countries attended the Conference, which was held 10-14 September 2001, in Paris at the Collège de France.

Opening Session

Dr. D. Carson

Dr. David Carson, Director of the World Climate Research Programme, welcomed the participants and acknowledged the work of the local organizers, led by Dr. Jan Polcher, Laboratoire de Météorologie Dynamique du CNRS, and the host, Collège de France, in particular, Prof. Xavier Le Pichon. Dr. Jean-Louis Fellous, Centre National d'Etudes Spatiales (CNES), continued the welcome, noting the key role of satellites in the advancing knowledge of the global energy and water cycle.

Dr. J.-L. Fellous

During the introductory remarks, the relation to carbon in the atmosphere and vegetation to the energy and water cycle was discussed by Prof. Gérard Mégie, President du Council d'Administration du Centre National de La Recherche Scientific (CNRS), Co-Chairman of the Conference. Dr. Mégie was followed by Prof. Soroosh Sorooshian, Chairman of the GEWEX Scientific Steering Group and Co-Chairman of the Conference. Prof. Sorooshian presented an overview of GEWEX water resources application activities. Water management requires accurate regional forecasts of precipitation and intense rain events, including monsoon/ tropical storms. As an example of the complexity of water cycle science and management, he noted that there are 30 agencies involved in managing the Columbia River Basin.

Prof. G. Mégie

Prof. S. Sorooshian

In the keynote address, Dr. Andràs Szöllösi-Nagy, Director, Division of Water Sciences, UNESCO, cited GEWEX progress in bringing together scientists from around the world, in various scientific disciplines to investigate the Earth's water balance. However, with the knowledge gained, he noted, there remains a challenge to transfer this new knowledge to water resource managers, particularly, since the use of water has increased in the past 30 years at a rate twice that of population growth. He also commented that for water resources, the word "sustainability" is not defined, and to be defined, there is a need for more measurements and experiments.

Dr. A. Szöllösi-Nagy

Prof. P. Morel

Professor Pierre Morel, University of Maryland, continued the opening session with an invited presentation on how dynamically driven wet processes effectively govern energy and water fluxes. He listed a series of questions that need to be addressed if global temperature increases. What will be the resulting changes in:

- atmospheric general circulation?
- wet processes?
- amount and distribution of precipitation?
- P-E for oceans?
- soil conditions?

To answer these and similar questions will require new global measurements of wet processes from spaceborne lidar and microwave instruments, such as NASA's CloudSat and ESA's Soil Moisture and Ocean Salinity satellite.

Technical Sessions

During the week of this successful conference, there were many GEWEX accomplishments reported. Some are mentioned in the following paragraphs, however, there were several major accomplishments evident, but not necessarily stated. They include:

- bringing together diverse disciplines to work on the global water and energy cycle,
- transition of research results to operational prediction centers,
- applying global satellite measurements to processes studied, and
- new initiatives to transfer knowledge to water resource managers.

The presentations, oral and posters, on cloud topics included measurements, parameterizations, radiation effects, aerosol interaction, microphysics, modeling and precipitation. The cloud presentations provided new knowledge on the role of clouds in global precipitation and the distribution of water. It was clear that all scales of clouds are significant and that progress has been made to account for clouds in numerical models, including operational weather prediction models. Progress was also reported from multidisciplinary campaigns on clouds, precipitation and biosphere interactions that included surface, tower, aircraft and satellite measurements. An example of merging diverse disciplines and their observations was illustrated by the Tropical Rainfall Measuring Mission satellite and Large Scale Biosphere/Atmosphere Amazonian field campaign results. This combined project produces useful data sets for validating regional numerical models used to couple with large scale dynamics.

The presentations at the conference also addressed hydrology and water resources from small catchments to global scales. The nearly 40 presentations included the application of GEWEX science in linking streamflow and climate models to improve regional flood and drought prediction. Other hydrology and water resource presentations were on soil moisture, snowcover, biogeochemical, land data assimilation, and results from large river basin studies (GAME, MAGS, GCIP, LBA, etc.). **Accomplishments included the transfer of scientific results between projects and various activities for applying the progress in science to water resource management groups.**

The midweek presentations on the interaction of carbon and water cycles with the climate system reinforced a fundamental GEWEX activity of bringing together scientists to study feedback processes between carbon and water cycles with the biosphere, land surface, atmosphere boundary layer, and coupled models applied at different geographic locations. Examples include presentations on the evidence of a carbon sink in Eurasian forests, and the variability of carbon fluxes in Amazonia and over the Mackenzie River in Canada. Some of the flux presentation results were based on models; however, most others used *in situ* or derived measurements from aircraft and satellites. The reports on using seasonal and annual satellite derived data for the vertical structure of water vapor and the other greenhouse gases were of interest to those conducting carbon cycle studies. The comparisons of the satellite derived carbon dioxide measurements to model simulations were timely as a new era of satellites will soon be providing the carbon and water cycle scientists new information for developing inversion and data assimilation methods to improve model simulations.

The presentations in the sessions on the global water cycle and its sensitivity to climate change expressed the substance of GEWEX scientific objectives on the water cycle role in the Earth's energy balance. The presentations and discussions in these sessions include actual or hypothesized feedback mechanisms involving the atmosphere (e.g., water vapor, clouds), land (e.g., soil moisture, use), and ocean (e.g., thermodynamic, mechanical).

Key Results Presented At 4th Conference:

- Radiative effects of anthropogenic sources are believed to intensify the global water cycle and floods. Modelled quadrupling of CO_2 indicates increased probability of floods in some basins. However, it was also reported that analysis of an ensemble of climate-change experiments suggests flooding in the 20th century is within normal unforced variability.
- Anomalies in the atmosphere-land-ocean system can persist for decades.
- Disagreements in model presentations on radiative cloud feedback processes and water vapor simulation are unresolved.
- Sea surface temperature has no direct relation to specific humidity, but temperature of condensation level influences humidity.
- In mid-latitudes, large scale atmospheric dynamics are governed by the water cycle cloud, precipitation and evaporation processes.
- In permafrost regions, the evidence of changes in hydrological cycle lag by 2 years the precipitation based on subsurface frozen storage.

The overall impression from these excellent presentations is the need to improve understanding of feedback processes and not to draw conclusions from sometimes rather simplistic statistics on climate parameters.

On the final day of the conference, the theme was on the GEWEX core topics of remote sensing and land-surface processes. GEWEX is "global" and, thereby, requires global measurements. Presenters were from Asia, Europe, and the Americas with topics including new satellite observing systems and new analysis methods that are now, or planned to be, applied in different categories. There were presentations on measurements and the analysis of soil moisture data, snow, evaporation, vegetation, carbon, precipitation and moisture transport. These presentations included early surface emissivity results derived from the Advanced Spaceborne Thermal Emission and Reflectance Radiometers on the Terra

spacecraft that showed good agreement with laboratory measurements of soil emissivity spectra. Other reports noted the potential of the Advance Microwave Sensing Radiometer and difficulties in validating the spaceborne measurements of soil moisture. New satellite data assimilation procedures for CO_2 fluxes and vegetation of land surfaces were shown to correct previous errors in models.

The scientific findings reported at this conference indicate rapid advancement in the understanding of the global energy and water cycle and the application to climate prediction. The advancement is due to many factors, such as the new satellite capabilities, improved data assimilation methods, more realistic models and increased computer power. An overarching conclusion demonstrated at the Conference was the similarity within the international community on the attention being given to the integration of their research results into application activities such as water management and weather forecasting.

Group photograph on front page courtesy of Dr. François-Marie Bréon, Institut Pierre Simon Laplace. Photographs of speakers provided by J.-P. Martin, Collège de France.

WORKSHOP/MEETING SUMMARIES

3RD STUDY CONFERENCE ON BALTEX

Mariehamn, Åland, Finland
2-6 July 2001

Erhard Raschke and Jens Meywerk
GKSS Research Centre

The Third Study Conference on BALTEX was held on the island of Åland in the Baltic Sea. About 180 scientists, including students from most of the BALTEX countries, gathered in the assembly hall of the Åland parliament. The spectrum of subjects ranged from basic theoretical studies over several attempts to close the energy and water budgets over the Baltic Sea catchment to a large variety of applications, (e.g., in weather forecasting and water management).

The recent accomplishments of the GEWEX Continental Scale Experiment BALTEX were reported by the participants and a summary of the many BALTEX Phase I accomplishments – from basic research to established data collection systems and modeling – can be found in the *Bull. Amer. Meteor. Soc.* 82, 2389-2413 (Raschke; co-authors., 2001). Ehrhard Raschke, one of the founders of BALTEX, was recently honored for his accomplishments (see page _ of this issue).

GHP-7

UNESCO, Paris, France
6-8 September 2001

Ron Stewart
Meteorological Service of Canada

The 7th Session of GEWEX Hydrometeorology Panel (GHP) was hosted by the UNESCO Division of Water Sciences. According to Dr. Andràs Szöllösi-Nagy, Secretary, International Hydrological Programme (IHP), and Director, Division of Water Sciences, UNESCO, 160 countries are involved in IHP, UNESCO's intergovernmental scientific cooperative programme in water resources, which is open to all scientists in the world.

Dr. Sorooshian, Chairman, GEWEX Scientific Steering Committee, noted that it is important for GHP to define and provide more accurate and specific predictions using GEWEX studies that are useful to water management agencies. (e.g., the monsoon season will begin 2 weeks late; precipitation will be infrequent but intense, and will occur at night). The Water Resources Applications Project (WRAP) Working Group has the charge to facilitate a dialogue with the water resource community to inform them of GEWEX technologies and to obtain guidance on how these technologies can be modified to be of greater societal relevance. A white paper is being prepared to identify case studies related to water resource application issues and will include a list of hydrological products useful to the water resource management community.

A crucial aspect of the overall strategy for GHP has been to carry out a number of regional research activities as a first step towards global application. In this regard, five continental-scale experiments (CSEs) (GAPP, formerly GCIP (Mississippi River Basin), BALTEX (Baltic Sea region), MAGS (Canadian Mackenzie River Basin), LBA (Amazon region) and GAME (Asian monsoon region), as well as one affiliate experiment (CATCH) have been initiated. A strong proposal for a new CSE in the Murray-Darling Basin (Austrialia) was given at this meeting and will be presented to GEWEX SSG at their next meeting in January 2002. Two efforts with strong ties to CLIVAR are also in the planning stages including Rio de la Plata Basin Study and the North American Monsoon Experiment (NAME). This collectively brings together an international group of about 500 researchers to address water and energy fluxes and reservoirs over various land areas.

The transferability of regional models between regions and/or the validation of global models over continental-scale experimental regions and other regions is being addressed. A list of models being used in different regions continues to be updated each year and made available through the GHP web site. The first transferability study will be over the BALTEX region for the PIDCAP period (August-October 1995). The Max-Planck-Institute for Meteorology in Hamburg and the GKSS Research Centre in Geesthacht will host this study.

A proposal by LBA was presented for a study that would assess the seasonal-to-interannual predictability for each CSE region and provide linkages to global (monsoon) circulation. CSE data sets could be used for verification of skill and validation. CPTEC volunteered a post-doc to carry out some of the studies in liason with the CSEs using seasonal predictability experiments from ECMWF and CPTEC.

The Water and Energy Balance Study (WEBS) is a critical effort within GHP that strives to collectively assess our ability to develop observations of basic climate variables, assess our ability to simulate those observations with atmospheric and hydrologic models, assess our ability to develop budgets from observations and models, and clarify levels of uncertainty in these budgets at annual, seasonal, diurnal, interannual and longer time scales over the various continental-scale experiments of GEWEX, as well as other areas. Many WEBS-related activities are taking place within GCIP/GAPP to understand the water and energy balance for the Mississippi River basin. Initially, it was thought that observations alone could be used to describe and close the CSE budgets. However, global and regional models and analyses, as well as hydrologic models provide a framework for integrating sparse observations into a coherent description of water and energy budgets. An atlas now exists of geographical, seasonal and temporal characteristics of all the major components in the GCIP/GAPP WEBS and we have learned which processes are easier to simulate, observe, and even acquire data.

A review of contributions to GHP/GEWEX by various national and international projects and organizations including those within and outside the GEWEX framework was given by representatives of such activities as the International Hydrological Programme (IHP); the International Association of Hydrological Sciences (IAHS); the International Satellite Land-Surface Climatology Project (ISLSCP); and the Global Precipitation Climatology Center (GPCC).

SIXTH GAME INTERNATIONAL SCIENCE PANEL MEETING

1-2 October 2001
Kenji Nakamura

Hydrospheric Atmospheric Center, Nagoya University

The Sixth GEWEX Asian Monsoon Experiment (GAME) International Science Panel meeting (GISP) was held at the Aichi Trade Center in Nagoya, Japan, under the auspices of the Ministry of Education, Culture, Sports, Science and Technology, WCRP, the National Space Development Agency of Japan (NASDA), Center for Climate System Research (CCSR) in University of Tokyo, and the Hydrospheric Atmospheric Research Center (HyARC) in Nagoya University. A total of 59 participants including observers/experts from 13 countries participated in this meeting.

The main subject of this GISP was future plans for GAME. At the last GISP meeting, it was agreed that GAME would continue for a few more years to complete the GAME objectives. Current GAME results were presented and received generally positive reviews. it was pointed out that GAME needs further effort on cross-cutting issues and synthesis of data to understand the monsoon system. According to the reviews, GAME Phase-II was approved. Current results of GAME will appear in GAME Newsletters No. 3 and No. 4, and reviews of these will appear in following GAME Newsletters.

To deal with the issues pointed out in the reviews and considering that (1) the objective of GISP changes from coordination, implementation and data distribution policy, to synthesis and analysis of data, data distribution, model study for the original GAME objectives, and (2) some regional study groups have already accomplished the observations, a reorganization of GISP was proposed. The reorganization would include establishment of an advisory board and new working groups. The new working groups will discuss the Water and Energy Budget Study (WEBS), land surface processes/atmospheric boundary layer/AAN, precipitation processes, monsoon system study (analysis /diagnostic study), monsoon system modeling, re-analysis, satellite utilization, GAIN, GAME-Siberia, and the Water Resources Application Project (WRAP). The new memberships will include chairpersons of working groups and a reduced number of country representatives with liaisons to WCRP and the Coordinated Enhanced Observing Period (CEOP). The proposal was adopted although details such as the number of members remain to be determined.

The follow-on of GAME was another issue and CEOP was the focus of this discussion. Considering that CEOP is a big new project, GISP agreed that the GAME-related CEOP or CEOP Asian Monsoon Project (CAMP) science panel should be separate from GISP.

Following the GISP meeting, the Fifth International Study Conference on GEWEX in Asia and GAME was held at the same location for 3-5 October. About 190 participants from 15 countries joined the conference. Oral and poster presentations were given and the three-volume proceedings were delivered at the conference.

GEWEX LAND PROCESSES DATABASE MAP SERVER

A joint GCIP, UNEP/GRID and USGS EROS Data Center project has assembled databases for each of the GEWEX study areas consisting of AVHRR NDVI, land cover, elevation, drainage basin and population data extracted from global databases and is available at http://grid2.cr.usgs.gov/gewex/

GEWEX/WCRP MEETINGS CALENDAR

For calendar updates, see the GEWEX Web site: *http://www.gewex.com*

13-17 January 2002—82ND AMERICAN METEOROLOGICAL SOCIETY ANNUAL MEETING, Orlando, Florida.

28 January-1 February 2002—14TH SESSION OF THE GEWEX SSG, European Centre for Medium-Range Weather Forecasts, UK. (Invitation)

6-8 March 2002—COORDINATED ENHANCED OBSERVING PERIOD, SCIENCE STEERING COMMITTEE, Tokyo, Japan.

18-23 March 2002—WCRP JOINT SCIENTIFIC COMMITTEE MEETING, Hobart, Tasmania, Australia.

25-27 March 2002—GABLS WORKSHOP AT ECMWF: FOCUS ON STRATIFIED BOUNDARY LAYERS OVER LAND, ECMWF, United Kingdom.

13-17 May 2002—MISSISSIPPI RIVER CLIMATE AND HYDROLOGY CONFERENCE, New Orleans. Contact Rick Lawford at lawford@ogp.noaa.gov

13-17 May 2002—16TH GPCP-WGDM MEETING, Tokyo, Japan. (Invitation)

20-24 May 2002—GCSS-ARM WORKSHOP ON THE REPRESENTATION OF CLOUD SYSTEMS IN LARGE-SCALE MODELS, Kananaskis Village, Alberta, Canada.

7-10 July 2002—2ND LBA SCIENCE CONFERENCE, Manaus, Brazil.

15-19 July 2002—15TH AMS BOUNDARY LAYERS AND TURBULENCE CONFERENCE, Wageningen University, The Netherlands.

12-15 November 2002—2ND INTERNATIONAL ATMOSPHERIC MODEL INTERCOMPARISON PROJECT (AMIP) CONFERENCE, Meteo-France, Toulouse, France.

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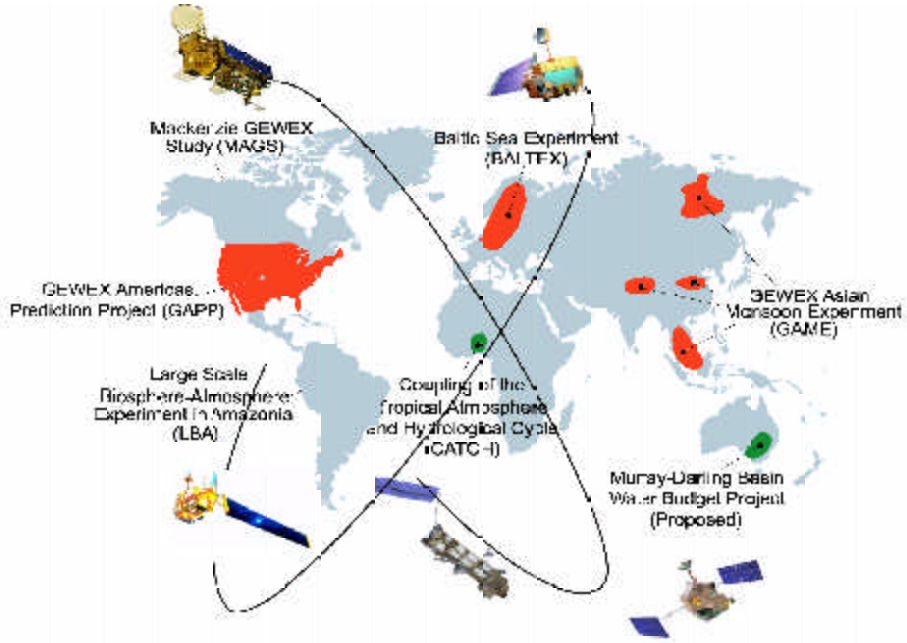
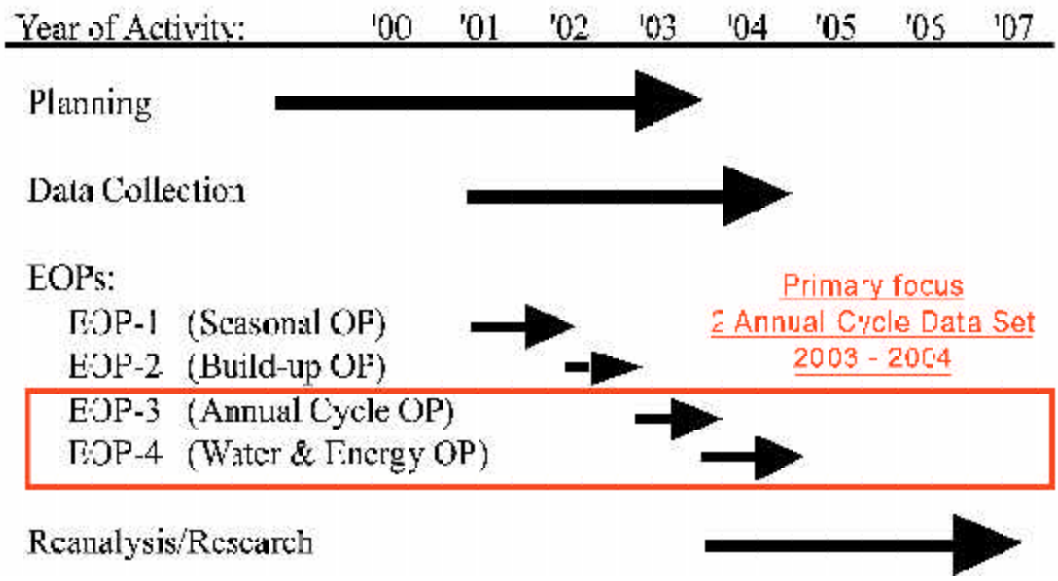
CEOP ON TRACK AS INITIAL REFERENCE SITE DATA FROM CSEs ARRIVE AT DATA CENTER



The timing of the Coordinated Enhanced Observing Period (CEOP) is coupled to the GEWEX Continental Scale Experiments and the new series of Earth observing satellites. This will also take advantage of additional planned activities such as those in CLIVAR and other WCRP projects. See figure on the left and below. The primary focus of CEOP is to develop a 2-year data set for 2003-2004 to support research objectives in climate prediction and monsoon studies. CEOP has been endorsed as the first element of the new Integrated Global Water Cycle Observations (IGWCO) theme approved by the Integrated Global Observing Strategy-Partners (IGOS-P).

CEOP Data Collection and Analysis Schedule



The CEOP Implementation Plan is available on the GEWEX web site: http://www.gewex.com/ceop.htm

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Dr. Paul D. Try, Director

Editor: Dr. Paul F. Twitchell
Mail: International GEWEX Project Office
1010 Wayne Avenue, Suite 450
Silver Spring, MD 20910, USA

Assistant Editor: Dawn P. Erlich
Tel: (301) 565-8345
Fax: (301) 565-8279
E-mail: gewex@cais.com

WWW Site: http://www.gewex.com