

292 Presentations Given at the Third International Scientific Conference on the Global Energy and Water Cycle in Beijing, China (see page 6)



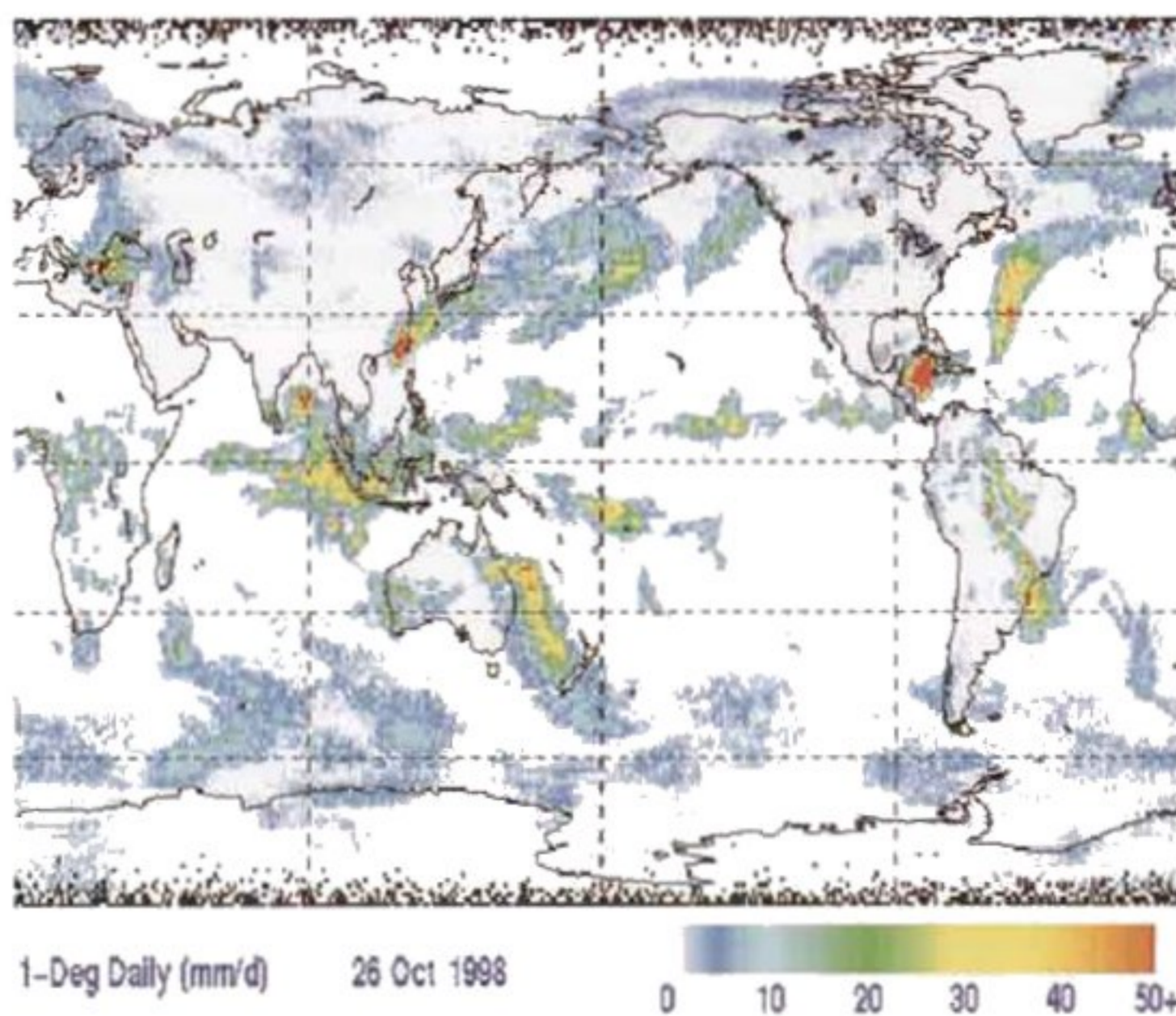
HOW WELL CAN WE MONITOR AND PREDICT AN INTENSIFICATION OF THE HYDROLOGICAL CYCLE?

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It has been suggested that warmer temperatures associated with increasing greenhouse gas emissions will increase precipitation intensity and result in a more vigorous hydrologic cycle (IPCC, 1996). Given the potential social, environmental, and economic consequences of such a scenario, developing a better understanding of the mechanisms that force changes in the hydrologic cycle and assessing the current skill of climate models in predicting such changes are of obvious importance. Unfortunately, current predictions of the change in global-mean precipitation resulting from increasing CO₂ range by roughly a factor of 5 (Covey et al., 1999). Relatively little attention has been given to understanding global variations in precipitation. Consequently, the skill of existing climate models in reproducing observed variations in the hydrologic cycle intensity and its

(Continued on page 4)

GPCP Developing a 1 x 1 Degree Product



In this example, Hurricane Mitch is visible in the western Caribbean, while Typhoon Babs is poised off the coast of China. The suppressed ITCZ and westward-shifted South Pacific Convergence Zone reflect the onset of the 1998-1999 La Niña (see page 8).

WHAT'S NEW

- *Third International GEWEX Conference a Success*
- *GEWEX Expands Collaboration in Phase II (see Commentary, page 2)*
- *ISLSCP Initiative II Funded*
- *New GPCP and SRB (see back page) Data Sets in Development*
- *Nearly 100 Scientists Attended GCIP Principal Investigators Meeting*

GEWEX MOVING FORWARD AND EXPANDING COLLABORATION

**Soroosh Sorooshian, Chairman
GEWEX Scientific Steering Group**

For the near future, the GEWEX Scientific Steering Group (SSG) will have the challenging task of directing GEWEX into its second phase. This is where we will exploit the new and more diverse measurements of the new Earth Observing System platforms and apply our improved regional process understanding derived from the GEWEX Continental-Scale Experiments (CSE) to the global applications needed to improve climate prediction capabilities. This era may be characterized by the concept of "taking GEWEX process and modeling efforts global." This also will require that we participate actively in the validation/application of global data from the new Earth Observing Systems of ESA/NASA/NASDA and in the improvement of global weather and climate prediction models. Therefore, the SSG is committed to advancing our efforts along the three main scientific areas of atmospheric radiation physics, including clouds and precipitation, hydrometeorology, and modeling and prediction. The unique organizational structure of GEWEX places us in a comfortable position to address the call by the Joint Scientific Committee (JSC) for WCRP for enhanced scientific outreach and interdisciplinary associations.

The main thrust areas of GEWEX designed to achieve the required scientific progress will remain the same. However, the research foci that have been developed to unify the efforts of the individual elements in meeting their main objectives will need to be refined and/or modified to better integrate the emerging global scale initiatives. Development of the global application and transferability strategies necessary to plan and implement these initiatives will become the main challenge for this phase of GEWEX, carrying us well into the new millennium. This challenge can be met most effectively by cooperation and collaboration with the other elements of WCRP, including CLIVAR, ACSYS, and SPARC. This also must extend beyond WCRP to encompass activities in association with parts of the International Geosphere/Biosphere Project (IGBP) and ultimately with components of the International Human Development Project (IHDP). Hence, it is pleasing to note that concrete steps were taken toward this type of cooperation at the January 1999 meeting of the GEWEX SSG in Tucson, Arizona, USA. Using such a collaborative, interactive framework will enhance GEWEX's ability to address a broad range of scientific problems, including support for seasonal to interannual predictions,

and defining the variability of both the hydrological cycle and the long-term climate change as a contribution to the overall success of WCRP.

The new global initiatives to meet the goals of the second phase of GEWEX are already beginning to take form. These include the following:

- Development of new global data sets of key climate parameters;
- GEWEX radiation studies aimed at producing accurate energy fluxes in the entire atmospheric column;
- Continued improvement of coupled land-surface/atmosphere models and parameterization of cloud and atmospheric processes in regional and global weather and climate models;
- Promoting the participation of the hydrological modeling community and supporting operational environmental services in their efforts to develop improved and more accurate hydrometeorological predictions;
- Continued participation in studies related to changes in surface snow cover, mid-winter processes, and other cold region phenomena; and
- Coordinating the future activities and participation of the CSEs in the Coordinated Enhanced Observing Period (CEOP).

The above-listed activities will involve all land and ocean areas of the Earth and will include experiments in association with CLIVAR in the Asia-Australia and Americas regions. Other WCRP projects in the Arctic and West African regions, which will connect with parts of IGBP and perhaps IHDP, also will contribute to the overall global scientific objectives for GEWEX. Based on experience already gained in the first phase of GEWEX, it will also be necessary, as an element of the third phase of GEWEX, to begin planning immediately for the promotion of specific missions to fill gaps in current space agency plans for global observations of energetic and hydrological processes in the climate system.

In future issues, the development of these and other GEWEX global scale activities that will arise in the new millennium will be explored. The success of these activities will depend on cooperative work with all other components of WCRP and the entire global climate system research community.

STATUS OF THE LBA EXPERIMENT

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The field implementation of the Large-Scale Biosphere Atmosphere Experiment in Amazonia (LBA) experiment picked up speed starting in early 1999. The first Intensive Observing Period of LBA (LBA-IOP1) was carried out in southwest Amazonia (Rondonia) from January through March 1999. Over 200 scientists, technicians and students from Brazil, the United States, Holland, Germany, United Kingdom, France, and Italy participated in the campaigns. It comprised meteorological and atmospheric chemistry measurements at and over tropical forest and grassy vegetation covers. Simultaneously a number of continuously measuring flux towers and ecological sites are being established along the LBA transects.

The **meteorological campaign** in LBA-IOP1 brought together two narrowly coupled experiments: the Wet Season Atmospheric Mesoscale Campaign (WETAMC-LBA) and the ground validation experiment in Amazonia of the Tropical Rainfall Measuring Mission (TRMM-LBA). An impressive array of meteorological and atmospheric instrumentation was deployed in the field to provide a detailed 3-D picture of the mesoscale atmospheric circulations over Rondonia, including vegetation-atmosphere interactions and convective cloud and precipitation processes. It included two advanced research atmospheric radars, an array of upper air soundings and surface meteorological measurements, atmospheric boundary layer measurements with tethered balloons, four flux towers measuring surface fluxes of sensible and latent heating and CO₂ over forest and pasture. Additionally, two research aircraft were used: the high-altitude flying NASA ER-2 with airborne sensors which simulated the rainfall and cloudiness sensors on board the TRMM satellite and the University of North Dakota Cessna Citation II for cloud microphysical measurements.

The LBA **atmospheric chemistry component** is operating in two modes: through short-term intensive campaigns and a long-term measurement program. Two large sampling campaigns were conducted in 1998-1999. The LBA-CLAIRE experiment in March-April 1998 near Manaus measured several trace gases and aerosol particles, as well as aerosol optical properties such as aerosol scattering and absorption and cloud condensation nuclei measurements. Also, sun-photometers have measured aerosol optical thickness, and remote sensing of aerosol helped to observe several events of long-range transport.

A second campaign was carried out in January-May 1999 in Rondonia. This experiment was coupled with the TRMM-LBA and LBA-WETAMC experiments. In addition to trace gases and detailed aerosol measurements, rainwater chemistry was also performed. The full integration of the data collected is underway, and the combination of meteorological and atmospheric chemistry measurements proved to be a very powerful tool for the study of undisturbed rainforest atmospheric chemistry.

Over 50 scientific investigations involving over 250 investigators comprising the **ecological component** of LBA have started. The core of this research on carbon and nutrient cycle dynamics, trace-gas fluxes, water biochemistry, land use and land cover changes is taking place along the two LBA ecological transects of ecoclimatic and land use intensity gradients. One transect runs from the very moist rainforest of Northwest Amazonia through the central basin to the east, and then south across the transition forests to the savanna (cerrado) at about 17°S. The other transect runs from southwestern Amazonia towards the southeast ending again in the cerrado area, and cuts across a region of intense land use change in Rondonia. Individual or clusters of flux towers have been established in Southwestern Amazonia (Rondonia), central Amazonia (Manaus), and eastern Amazonia (Santarém and Caxiuanã), complemented by an array of ecological measurements. These sites will collect data continuously for several years to sample the seasonal and interannual climate variability.

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Scientific training of South American young scientists and capacity building are key endeavors of LBA. So far over 50 young scientists and students from Brazil, Bolivia, Peru, Ecuador, and Venezuela have been involved in two training courses. The first course dealt with carbon dynamics and was organized by National University of Brasilia (UNB) and the other on operations of LBA sites organized by the Brazilian National Institute for Amazonia Research (INPA). A number of further training courses are planned to take place in 1999 and 2000 on atmospheric chemistry, isotopic studies and biogeochemical modeling. Additionally, the

(Continued on next page)

effort of encouraging local student involvement in LBA is bearing fruits as more and more graduate and post-graduate students from Amazonian institutions become involved in LBA research.

LBA data policy calls for open dissemination of all LBA data and information. As data becomes available from the scientific teams, it will be disseminated through the LBA Web Page <http://www.cptec.inpe.br/lba> and LBA mirror sites in the USA and Europe and through the publication of selected data sets on CD-ROMs. The first set of CD-ROMs—the Pre-LBA Data Sets Initiative—was published recently and contains data collected in a number of scientific experiments prior to LBA. It can be obtained through the LBA Central Office lba@cptec.inpe.br.

INTENSIFICATION OF THE HYDROLOGICAL CYCLE?

(Continued from page 1)

coupling to other components of the energy budget is not well known. Indeed, determining “the extent to which the intensity of the hydrological cycle can be measured, monitored, and predicted” represents a key challenge for GEWEX (Chahine, 1997).

Several studies have demonstrated that ENSO modulates the intensity of the tropical hydrological cycle (Graham, 1995). Climate variability associated with ENSO provides coherent changes that, while not a surrogate for global warming, do serve as a useful testbed for examining the coupling between various components of the hydrologic cycle and for evaluating climate model performance. Consider Figure 1 (adapted from Soden, 1999) which compares the tropical-mean (30°N – 30°S) interannual variations in several key hydrologic variables. Results are shown from both observations (thick-line) and GCM simulations (thin line) of: (a) precipitation (Spencer, 1993), (b) total-column water vapor (Wentz, 1997; Wentz and Francis, 1992), (c) 200 hPa temperature (Oort, 1983), (d) outgoing longwave radiation (Barkstrom et al., 1984), and (e) net downward surface longwave radiation (Darnell et al., 1996). The model results are based on simulations from 30 different GCMs integrated with observed SSTs for 1979–1988 as part of the Atmospheric Model Intercomparison Project and are presented in terms of the multi-model ensemble-mean (thin line) with the range encompassed by ± 1 intermodel standard deviation delineated by the vertical bar.

The observations indicate that as the tropical oceans warm (cool) during an El Niño (La Niña) event, the precipitation increases (decreases) and the resulting changes in latent heating warm (cool) the atmosphere by ~ 1 K (Figure

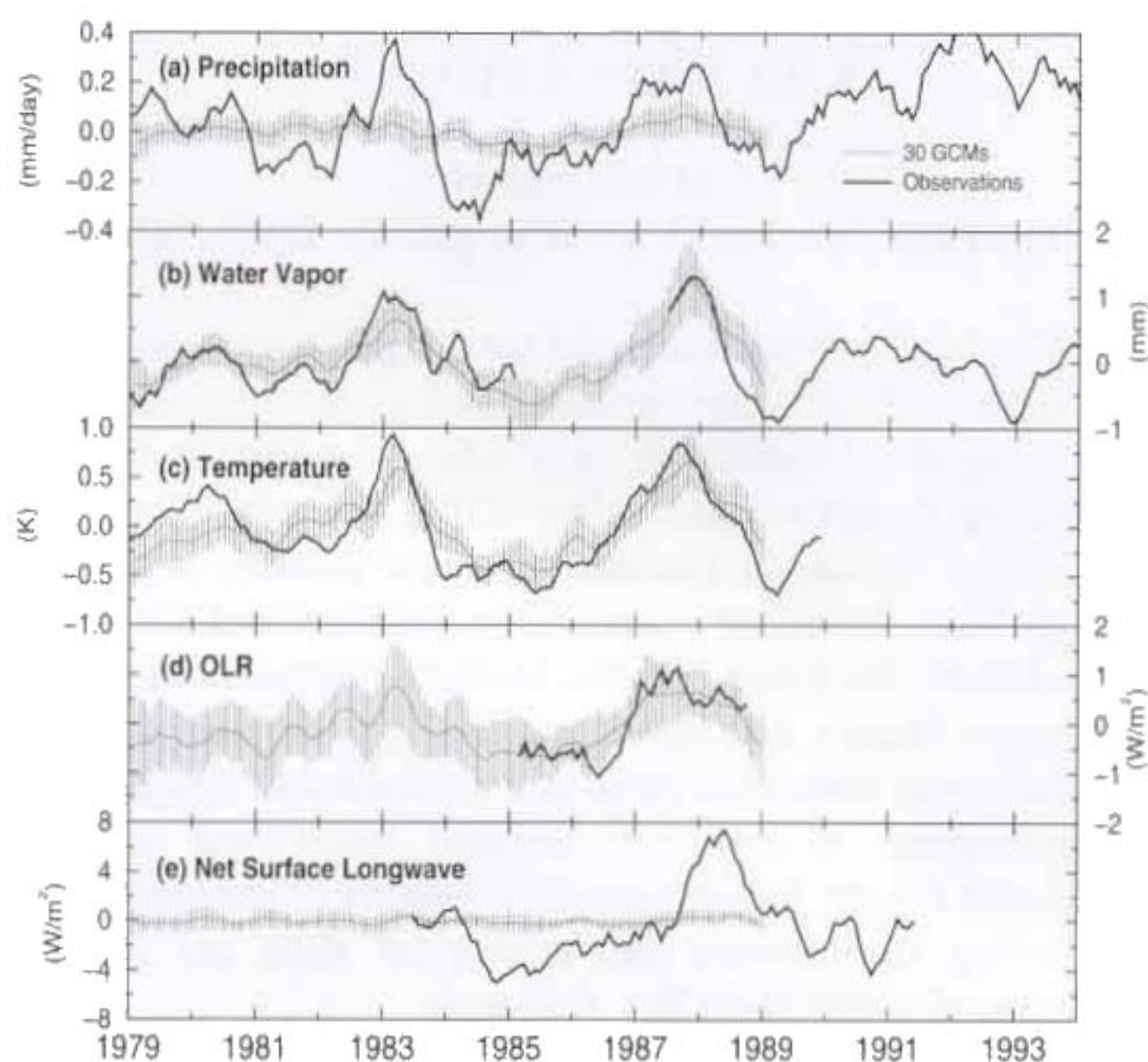


Figure 1. Time series of the tropical-mean (30°N – 30°S) interannual variations of observations (thick solid line) and multi-model ensemble-mean of AMIP GCM simulations (thin solid line) for precipitation rate (a), total precipitable water vapor (b), 200 hPa atmospheric temperature (c), outgoing longwave radiation (d), and net surface longwave radiation (e). The range bounded by ± 1 intermodel standard deviation is represented by the vertical lines centered on the multi-model ensemble-mean GCM value. Adapted from Soden (1999).

1c). Associated with this warming is an increase in total column water vapor of ~ 1 mm (Figure 1b). **On average, the GCMs accurately reproduce the observed changes in atmospheric temperature and water vapor. However, assuming the observations are reliable, the changes in precipitation simulated by the GCMs are underestimated by roughly a factor of 3. Moreover, if the models are wrong, the diversity of GCMs considered here suggests that this discrepancy is not sensitive to their differences in physical parameterizations, but reflects a more fundamental flaw common to all models.** This raises an obvious question—how can GCMs exhibit such a large discrepancy in the latent heating (i.e. precipitation) yet correctly simulate the changes in atmospheric temperature?

If we accept, for the time being, that the precipitation observations are correct, then the coupling between the hydrologic and energy cycles implies that there must be an additional error in the GCMs energy budget which compensates for the dampened latent heat release and enables the models to yield the correct temperature response. To first order, the release of latent heat during El Niño is largely balanced by an increase in atmospheric

radiative cooling and the resulting temperature tendency is primarily determined by the residual between these two fields (Graham, 1995). Thus, errors in the GCMs radiative cooling are an obvious place to look for a compensating error. The model-predicted changes in outgoing longwave radiation agree well with the observations (Figure 1d), indicating that the radiative cooling to space is not part of the problem. However the simulated anomalies in the net longwave radiation absorbed at the earth's surface (Figure 1e) are, like precipitation, noticeably weaker compared to the observations. Note that the magnitude of latent heating can be estimated by scaling the precipitation rates in Figure 1a by $\sim 30 \text{ (Wm}^{-2}\text{)/(mm day}^{-1}\text{)}$, resulting in anomalies of $\sim 6\text{--}9 \text{ Wm}^{-2}$. Thus the errors in net surface longwave radiation are of roughly the correct magnitude and sign to offset the discrepancies in precipitation, although some differences in phasing are apparent. What could be responsible for such a discrepancy in all 30 models? One possibility is low cloud cover which plays a key role in regulating the net surface longwave radiation and is known to be problematic in many GCMs.

Another possibility, however, is that both the observations of surface longwave radiation and precipitation are wrong, and the similarity of the sign and magnitude of the anomalies is simply coincidental. Indeed, of the five quantities examined, precipitation and surface longwave are certainly the most difficult to measure globally and the most uncertain. While relative consistency is noted between the MSU and SSMI precipitation products (Soden, 1999), the potential for systematic biases to contaminate these retrievals are many. **Consequently, it is unclear whether the observations, particularly at these space and time scales, are trustworthy and our present ability to measure changes in the intensity of the hydrological cycle, both for long-term monitoring and for model evaluation, is handicapped by such uncertainty.** Indeed, if the observations are wrong, then any attempt to monitor global intensifications of the hydrological cycle based upon such observations would have to be viewed skeptically if not dismissed entirely.

There is room for optimism, however. Satellite programs, such as TRMM and CERES, combined with the upcoming launch of CLOUDSAT, will provide unprecedented capabilities for deriving precipitation and surface longwave radiation from space. Understanding the error characteristics of such retrievals, particularly at the large space and time scales, will be crucial to achieving a definitive evaluation of the sensitivity of the GCMs' hydrological cycle. **Fully utilizing such observations will require a more comprehensive research effort, particularly one that acknowledges the coupled nature of the hydrologic and energy budgets rather than considering either one**

in isolation. It should be a priority within GEWEX to insure that this happens.

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ANNOUNCEMENT

The book "Global Energy and Water Cycles" edited by Keith Browning and Robert Gurney is now available from Cambridge University Press. This book provides a single source of knowledge of the global energy and water cycles and problems remaining for those researchers in meteorology, oceanography, hydrology and related scientific disciplines addressing the role of the three phases of water in the application to models. The book was in part developed from the presentations at the First International Scientific Conference on Global Energy and Water Cycles held in 1994 at the Royal Society, London, UK.

THIRD INTERNATIONAL SCIENTIFIC CONFERENCE ON THE GLOBAL ENERGY AND WATER CYCLE

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The Third International Scientific Conference on the Global Energy and Water Cycle was held jointly with the Fourth International Study Conference on GEWEX Asian Monsoon Experiment (GAME) in Beijing, China on 16–19 June 1999, under the auspices of the China Meteorological Administration (CMA), the World Climate Research Programme (WCRP) and the GAME International Science Panel (GISP). Cooperating organizations included the International GEWEX Project Office (IGPO), GAME International Project Office (GIPO), National Aeronautics and Space Development Agency of Japan (NASDA), U.S. National Oceanic and Atmospheric Administration (NOAA), Korea Meteorological Administration (KMA), China GEWEX Working Committee, National Natural Science Foundation of China, American Meteorological Society, Korean Meteorological Society, Chinese Meteorological Society, the Meteorological Society of Japan and Japan Society of Hydrology and Water Resource. The conference was co-sponsored with financial support by National Natural Science Foundation of China, WCRP, GIPO and CMA. Two hundred eighty scientists and officials attended this conference, coming from 24 countries including the United States, Japan, China, Canada, Korea, the United Kingdom, Germany, Russia, France, Australia, Switzerland, the Netherlands, Sri Lanka, Thailand, India and others. The participants included some important officials and well-known scientists of WCRP and GEWEX, such as Prof. H. Grassl, Director of WCRP Office, S. Benedict, Project Official of WCRP, Dr. P. Try, Director of International GEWEX Project Office, and Prof. T. Matsuno, Director of



Frontier Project of Japan, as well as the principal investigators of five Continental-Scale Experiments under GEWEX.

This conference provided a timely opportunity for the scientists and organizations to exchange scientific results related to the advancement of knowledge on the global energy and water cycle, particularly relevant to GAME and the Asian/Australian monsoon system. The focus of this conference was on the contribution of the coupled land-atmosphere system to climate predictability through soil memory, surface characteristics, and radiation processes. The conference was structured into the following scientific themes: (1) The variability and predictability of the Asian/Australian and African monsoons, and associated flood and drought predictions; (2) Heavy precipitation and cloud systems in the tropics and subtropics; (3) Radiation processes within the atmosphere and at the surface considering clouds, water vapor and aerosols; (4) The water and carbon cycle connection and its role in global and regional hydrological cycles; (5) High-latitude and high-altitude hydrology and ocean-atmosphere-ice/snow exchanges; (6) Climate change and its impact on water resources and on the recycling rate of the hydrological



cycle on global and regional scales; (7) Observations, data analysis and modeling studies related to GAME-IOP; (8) Satellite remote sensing and TRMM-related studies; and (9) Global soil wetness project and related studies.

On the morning of June 16, Mr. Kegang Wen, Administrator of China Meteorological Administration announced the opening of the conference with a welcoming speech. The former Chairman of GEWEX Scientific Steering Group (SSG), Prof. Moustafa T. Chahine, Deputy Chairman of Chinese Association of Science and Technology and Chairman of China WCRP Committee, Prof. Qingcun Zeng, current Chairman of GEWEX SSG, Prof. Soroosh Sorooshian and Chairman of GAME International Science Panel, Prof. Tetsuzo Yasunari also addressed the opening session. In the following plenary session, Prof. Bolin Zhao introduced the GEWEX-related activities in China. A brief overview of the present state of climate modeling research in Japan was given by Prof. Taroh Matsuno. A preliminary study on the climate background and the large scale atmospheric circulation prior to and during the severe flooding in the Yangtze River Valley in 1998 was presented by Prof. Shiyao Tao. Prof. Soroosh Sorooshian summarized the tropical rain estimation over the Pacific Ocean region using geostationary imagery combined with the TRMM rain data and Dr. Hartmut Grassl introduced the goals of GEWEX Phase II and its close cooperation with other WCRP projects. On Wednesday afternoon the scientific presentations began with three parallel sessions and continued to Saturday afternoon. Two hundred and ninety-two papers relevant to the nine scientific themes were presented at the conference, of which 224 were oral presentations and 68 were posters.

The five GEWEX Continental-Scale Experiments (CSE) have obtained extensive meteorological and hydrological observations. New facts and findings based on these observations were presented at the conference. Studies on the physical features of and interactions between cloud and radiation processes have resulted in new physical parameterization schemes by means of analysis of satellite



remote sensing data, especially TRMM data. Further developments of the hydrological model and the land surface process model were reported at the conference. These models have shown their ability to be coupled with the global and regional climate model so as to promote the improvement of prediction performance. The quantitative assessment and numerical simulation of the physical processes in relation to the global and regional energy and water cycles have made significant progress, including the water cycle in high latitudes and over permafrost landscapes. The interactions between energy and water cycle and climate anomalies were also discussed at the conference, especially in relation to significant drought and flooding events. Also reported were the interactions among multi-scale systems, hydrological cycle in land surface process and bio-geophysical-chemical (or physical) process, multi-scale coupling of meteorological and hydrological models, the inverse technique of satellite remote sensing and the four-dimension data assimilation.

During the conference, there was a common recognition of the importance of a global observing system with multiple objectives—coordinating comprehensive field experiments over different regions—which is being considered as part of CEOP. To benefit from this effort, the new generation of satellite development should play a key role. In addition to the coordinated enhanced observation on scales of two to three years, long-term monitoring and observing systems should be developed. Presentations at the conference showed that research on the global energy and water cycle can lend considerable support to the development of climate and hydrological predictions on monthly, seasonal and interannual scales in effort to meet the demands from water resources management that will be the major GEWEX goal for the next phase.



ISLSCP INITIATIVE II RECEIVES FUNDING

Initiative II of the International Satellite Land Surface Climatology Project (ISLSCP) has been funded by NASA and a kick-off meeting is set for October 1999. The planned 10+ year data set of 1x1 degree co-registered surface and near-surface land and atmospheric gridded data sets will provide an extension of the 2-year Initiative I data sets designed and used for interdisciplinary and model investigations. Not only have the physical and biogeochemical communities found Initiative I useful (distribution of over 7000 CD-ROMs based on requests only) but a significant element of the educational community has also found great use for these data sets in support of a variety of environmental courses.

Initiative I data sets provided the key forcings that were a major factor in the establishment of the Global Soil Wetness Project (GSWP) under ISLSCP, a project to provide global gridded representations of soil wetness indices (an indicator of global soil moisture) to provide initializing and boundary condition data for global model development and climate research. The early success of the ISLSCP Initiative I and GSWP products and research led to the support for Initiative II.

documentation may be accessed at <http://rsd.gsfc.nasa.gov/912/gpcp/> or through anonymous ftp to [rsd.gsfc.nasa.gov \(cd to pub/1dd\)](http://rsd.gsfc.nasa.gov(cd%20to%20pub/1dd)). (Courtesy of G.J. Huffman, Science Systems and Applications/NASA Goddard Space Flight Center.)

WORKSHOP/MEETING SUMMARIES

GLOBAL PRECIPITATION CLIMATOLOGY PROJECT WORKSHOP

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The Global Precipitation Climatology Project (GPCP) hosted a workshop on the "Use of Precipitation in the Study of Global and Regional Climate Variability, Modeling, Surface Hydrology and Water Resources" in Silver Spring, Maryland from May 10-12, 1999. The goals of the workshop were: (a) Review the utility and uses of climate scale (monthly average, 2.5 degree latitude/longitude precipitation data; (b) Discuss the evolving needs of the climate community for precipitation data; and (c) Provide guidance to GPCP for developing future precipitation data sets.

To achieve these goals, experts were invited to participate in one of five sessions; Data Sets, Regional and Global Water Balance, Surface Hydrology and Water Resources, Diagnostics and Monitoring, and Modeling. Each session concluded with a discussion aimed at eliciting information to help achieve the workshop goals.

The session on Data Sets concentrated mostly on GPCP products such as the satellite and gauge merged data sets, as well as individual components such as microwave precipitation and gauge analyses. Included in this session were discussions on the development of 1 x 1 degree data sets which only depend on observations.

It was pointed out during the discussion that the data set would be more useful if some statistical information was provided about the spatial and temporal variability of the data within the grid box and month, and greater efforts should be made to reduce the errors.

The Regional and Global Water Balance session tended to focus more on regional scales rather than the global scale. There were presentations on regional water balances and precipitation analysis over some of the GEWEX Continental Scale Experiments such as GCIP, MAGS and LBA, as well as the application of GPCP data in land

GPCP Developing a 1 x 1 Degree Product (Continued from page 1)

The GPCP Global Merge Development Centre new One-Degree-Daily (1DD) global precipitation product only depends on observational data. In the zone 40°N-40°S (see figure on page 1) a GPI-like IR-based estimate is made in which the IR brightness temperature threshold and conditional rain rate are set locally from SSM/I-based precipitation frequency and the GPCP satellite-gauge (SG) combined monthly precipitation estimate. At higher latitudes the 1DD features a rescaled TOVS precipitation estimate based on TOVS precipitation estimates, the SG, and the frequency of rain days at the data boundaries. Preliminary evaluation shows very high RMS errors for individual gridbox values and better statistics for spatial and temporal averages, as expected. The figure on page 1 shows the global estimate for 26 October 1998 in mm/d. Black gridboxes (at high latitudes) denote areas that lack data, mostly due to the transformation from satellite to grid coordinates. The overall appearance of the image is typical of 1DD fields, with only minor discontinuities at the data boundaries (40°N and 40°S). The 1DD dataset covers the period 1 January 1997 - (delayed) present, where each new month is computed a few months after real time. The beta version of the data set and additional

GCIP PRINCIPAL INVESTIGATORS MEETING AND GCIP FOLLOW-ON

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GCIP Project Office

surface schemes. The discussion following this session emphasized the need for higher spatial and temporal resolution with minimum error. It was pointed out that even in GCIP, with its high resolution radar data, we are still unable to fully quantify the best spatial scales and errors.

The Surface Hydrology and Water Resources session, much like the Water Balance session, focused on regional or even smaller scale applications such as applications of precipitation data to surface run-off models and the disaggregation of monthly mean precipitation observation to statistical representation on shorter time scales. It was suggested that scaling studies are required to determine the appropriate scales (time and spatial) that need to be resolved. It was stressed that the users need to work with the available data to determine how best to apply to their surface hydrology problems. The idea of GPCP doing a regional project for high space and time scale precipitation was also discussed.

The Diagnostics/Monitoring Session was concerned with the applications of monthly mean, 2.5 x 2.5 degree data for diagnostic studies, such as the atmospheric residence time of precipitable water vapor, and validating NWP and reanalysis precipitation estimates. Also, papers were presented on how one might use model output data to fill gaps in the observed precipitation and providing estimates of rain intensity and frequency from the satellite record. With regard to the production of a long-term global daily merged gauge and satellite analysis it was stressed that one has to overcome the difficult challenge of differing definitions of a day by the national groups that provide gauge observations.

The session on Modeling dealt with disaggregating GPCP data to drive land-surface models to using GPCP data to validate climate system models. Some items raised during the discussion were the need for longer records so that more stable statistics can be generated for comparison to GCM statistics. The extension back in time to 1979 and the planned continuation of GPCP to 2005 will provide at least 25 years of global precipitation data for evaluations of climate system models. At the other end of the time space spectrum, there was a recommendation to provide access to the GPCP gauge data, so that regional users could look at time series of individual stations for validation exercises. Overall, the workshop provided GPCP with insights on the variety of applications of the data, the need for higher spatial and temporal resolutions, and the usefulness of additional statistical information along with the mean and error estimates. Many of these items will find their way over the next several years into the GPCP.

Approximately 100 GCIP Principal Investigators and interested scientists met at the University of Maryland on May 17 and 18 to discuss the most recent findings from GCIP research and to discuss the future of the GCIP program. A sampling of the GCIP highlights included promising preliminary results of predictability studies, the release of new soil moisture data sets from Oklahoma and a demonstration of the capabilities of the newly developed NOAA/NASA Land Data Assimilation system. A Program and Abstracts volume for this meeting is available on request. The meeting was followed by a one-day workshop dealing with water and energy budgets in the Mississippi River Basin.

An extension of GCIP, known as the GEWEX American Prediction Project (GAPP) and planned for the 2001 to 2007 timeframe, was also discussed at the meeting. Although many of GCIP's objectives have been realized, new technologies, modeling capabilities and programs (such as CLIVAR) will enable GAPP to work more effectively to achieve its overall mission of "demonstrating a capability to predict changes in water resources on time scales up to seasonal, annual and interannual as an integral part of a climate prediction system." GAPP not only extends GCIP in time but also extends it in space by considering all of the United States (except Alaska and Hawaii) and northern Mexico, and by placing a greater emphasis on prediction. Building on the GCIP legacy, GAPP will address two objectives, namely: (i) to develop and demonstrate a capability to make reliable monthly to seasonal predictions of precipitation and land surface hydrologic variables as part of a global prediction system; and (ii) to interpret and transfer the results of improved seasonal forecasts to appropriate agencies and organizations for the optimal management of the nation's water resources.

The program will have four main components that are mutually supportive and will work towards the delivery of a climate prediction capability based on a better understanding of hydrometeorological and land surface processes in the 2005-2007 time frame. The first component involves land memory studies. GAPP will examine the contributions to prediction at monthly and longer time scales of various processes including soil moisture, snow cover, orography and vegetation. The second component addresses the need to integrate the community's understanding of larger scale processes with continental-scale processes,

(Continued on page 10)

and to study the integration of land and ocean effects in monsoonal systems. In addition to utilizing existing GCIP data sets, GAPP will focus on two regions in the southern USA and emphasize the role of land in the North American Monsoon and the North American Low Level Jet. These studies will be carried out in close collaboration with the Variability of American Monsoon System and the Pan American Climate Studies. The third component will fulfill many of the ambitions of the GEWEX Hydrometeorology Panel. In particular, it will study the transferability of process understanding and land surface models developed in the GCIP program and build data bases needed for comprehensive global land studies including the GEWEX Coordinated Enhanced Observing Period (CEOP). The fourth component will contribute to hydroclimatology and water resource assessments by the development of integrated hydrology prediction and assessment systems that can effectively meet the needs of tomorrow's water resource managers.

The plans for GAPP are documented in a prospectus available through the GCIP Project Office. It can also be viewed on the GCIP Home Page at <http://www.ogp.noaa.gov/gcip/>. The plan has been presented to a number of review panels. A process for preparing science and implementation plans is currently being initiated.

SPRING AMERICAN GEOPHYSICAL UNION (AGU) MEETING

**1-4 June 1999
Boston, Massachusetts**

Session topics at the Spring AGU Meeting included Radiation and Remote Sensing, South China Monsoon, Remote Sensing and Precipitation, Surface Hydrology and Hydroclimatology, Modeling of Chemistry-Aerosol-Climate Interactions, Air-Sea Exchange and others related to GEWEX. Not surprisingly, the GEWEX community was well represented and referenced by presenters. For example, there were several presentations regarding the status and results of the Tropical Rainfall Measuring Mission (TRMM) such as the close agreement between TRMM products with Global Precipitation Climatology Project (GPCP) analysis. Also, a presentation was given on the measurements acquired in Brazil as part of the Large-Scale Biosphere-Atmosphere Experiment in Amazonia (LBA), and the plan is to compare the LBA data to TRMM measurements. This study will provide insight to the morphology, diurnal variation of precipitation and convective intensity of clouds.

Professor Soroosh Sorooshian presided at the Langbein Lecture where the honored speaker, John Bredehoeft opened his lecture on the use of ground water models by saying "ground-water models, like all models are an abstraction of reality." His message to hydrologists and all modelers was to use caution in claiming validation and prediction capability of complex models. He concluded that lawyers are very successful in destroying models in court cases.

The Jule Charney lecturer at the Spring AGU Meeting was John Michael Wallace, who was the 1999 recipient of the prestigious Roger Revelle Medal for his work on the relationship of radiative effects on ozone and changes in the Northern Hemisphere atmospheric circulation. At the Charney Lecture Professor Wallace discussed the "Arctic Oscillation" (AO) and its relationship to the "North Atlantic Oscillation." His lecture traced the literature on the AO and NAO from the early 1900s to present. His findings on the Arctic polar vortex at 50 hPa influence on mid-tropospheric circulation and land-ice-sea features may well be a key to improve understanding of the intraseasonal, interannual and interdecadal changes of the AO as manifested by surface atmospheric pressure modulations and the coupling to global atmospheric circulation at all scales up to climate scales.

10TH CONFERENCE ON ATMOSPHERIC RADIATION/ TRIBUTES TO VERNER E. SUOMI HIGHLIGHT GEWEX ACTIVITIES

**28 June - 2 July 1999
Madison, Wisconsin**

The theme of this American Meteorological Society conference, of more than 250 participants, was a "tribute to Professor Verner E. Suomi." Essentially every conference speaker related his or her talk to a science contribution of Professor Suomi or a personal experience, and many presentations were related to GEWEX. One example was the first technical presentation of the conference by Gary Gibson, NASA Langley Research Center. He digressed from his prepared talk on the Clouds and the Earth's Radiant Energy System (CERES) instruments scheduled to be launched in mid 1999 as part of the Earth Observing System (EOS) by noting Professor Suomi proposed in 1957 an experimental satellite to measure the Earth's radiation budget. It was 1984 when the first Earth Radiation Budget Experiment (ERBE) satellite was launched and provided data for 14 years.

Another noteworthy example of how the speakers related their presentation to Professor Suomi was by Lennart Bengtsson, Max-Planck Institute, Hamburg, Germany. Professor Bengtsson told a story of how he met in 1986 with Professor Suomi and Professor Morel in Madison, Wisconsin. They discussed the need for a global experiment to build upon the knowledge gained from the Global Atmospheric Research Programme (GARP). He recalled that several ideas were proposed for getting scientists from various disciplines to work together and how to apply technology advances, particularly, the emerging global measurements from satellites to the study of global energy and water cycles. The vision of Professor Suomi for advancing science by the global experiment being discussed also included candidate names for this new effort, one of which was the Global Energy and Water Cycle Experiment (GEWEX). Professor Bengtsson continued with an explanation of regional experiments like the Baltic Sea Experiment as necessary steps to advance understanding of the global energy and water cycles. Another example of connecting Suomi's vision of global experiments to GEWEX was the mention by Dr. Joanne Simpson on the relationship to GEWEX of the Tropical Rainfall Measuring Mission follow-on missions for measuring precipitation and latent heat.

PILPS LEADER RECEIVES RECOGNITION DURING IUGG

In a separate ceremony, during the International Union of Geodesy and Geophysics (IUGG) Assembly in Birmingham, UK, 19–23 July 1999, Professor Ann Henderson-Sellers was awarded the degree of Doctor of Science by the University of Leicester, recognizing her 21 years of contributions to climate model predictions. Prof. Henderson-Sellers, whose first degree is in mathematics from the University of Bristol, graduated from Leicester University in 1976 with a Ph.D. in Astronomy and Atmospheric Science. She is currently the Environment Director at Australia's Nuclear Science and Technology Organization in Sydney and retains an Adjunct Professorship at Macquarie University in Sydney, where she established the Climatic Impacts Centre in 1988.

Professor Henderson-Sellers also has made significant contributions to land-surface schemes in her position as leader of the Project for Intercomparison of Land-surface Parameterization Schemes (PILPS). At IUGG, the PILPS results and plans on international cooperation were discussed. The IUGG-1999 Assembly Meeting Report on GEWEX-related sessions and activities will be published in the November issue of GEWEX News.

WCRP/GEWEX MEETINGS CALENDAR

*For calendar updates and listing of GEWEX reports,
see the GEWEX Web Site:
<http://www.cais.com/gewex/>*

23–27 August 1999—2ND INTERNATIONAL REANALYSIS CONFERENCE. Wokefield Park, Mortimer, Reading, U.K. For further information see <http://www.ecmwf.int/conf/index.html>.

14–17 September 1999—GEWEX HYDROMETEOROLOGY PANEL MEETING, GKSS, Geesthacht, Germany.

27–30 September 1999—GEWEX RADIATION PANEL MEETING, NASA/GISS, New York City, New York.

29 September – 1 October 1999—GEWEX AEROSOL CLIMATOLOGY PROJECT – SECOND SCIENCE TEAM MEETING, NASA/GISS, New York City, New York.

4–8 October 1999—GEWEX/INSU INTERNATIONAL WORKSHOP ON MODELLING LAND-SURFACE ATMOSPHERE INTERACTIONS AND CLIMATE VARIABILITY, Gif-sur-Yvette, France.

4–6 October 1999—GEWEX CLOUD SYSTEM STUDY WORKING GROUP 4 (PRECIPITATING CONVECTIVE CLOUD SYSTEMS) with Department of Energy Atmospheric Radiation Program Single Column Model Working Group at NOAA/GFDL, Princeton, New Jersey, USA.

12–26 October 1999—WATER VAPOR AND CLIMATE SYSTEMS/AMERICAN GEOPHYSICAL UNION, CHAPMAN CONFERENCE, William F. Bolger Conference Center, Potomac, Maryland, USA. For information, Tel: 202-462-6900; Outside USA 1-800-966-2481; E-mail: jehansen@agu.org.

25–29 October 1999—WGNE/GEWEX MODELING AND PREDICTION PANEL, Naval Research Laboratory, Monterey, California, USA.

21–24 November 1999—5TH MAGS WORKSHOP, Edmonton, Alberta, Canada. For information, see <http://www1.tor.ec.gc.ca/GEWEX/meetings.html>.

6–9 December 1999—GEWEX/GCSS, AUSTRALIA

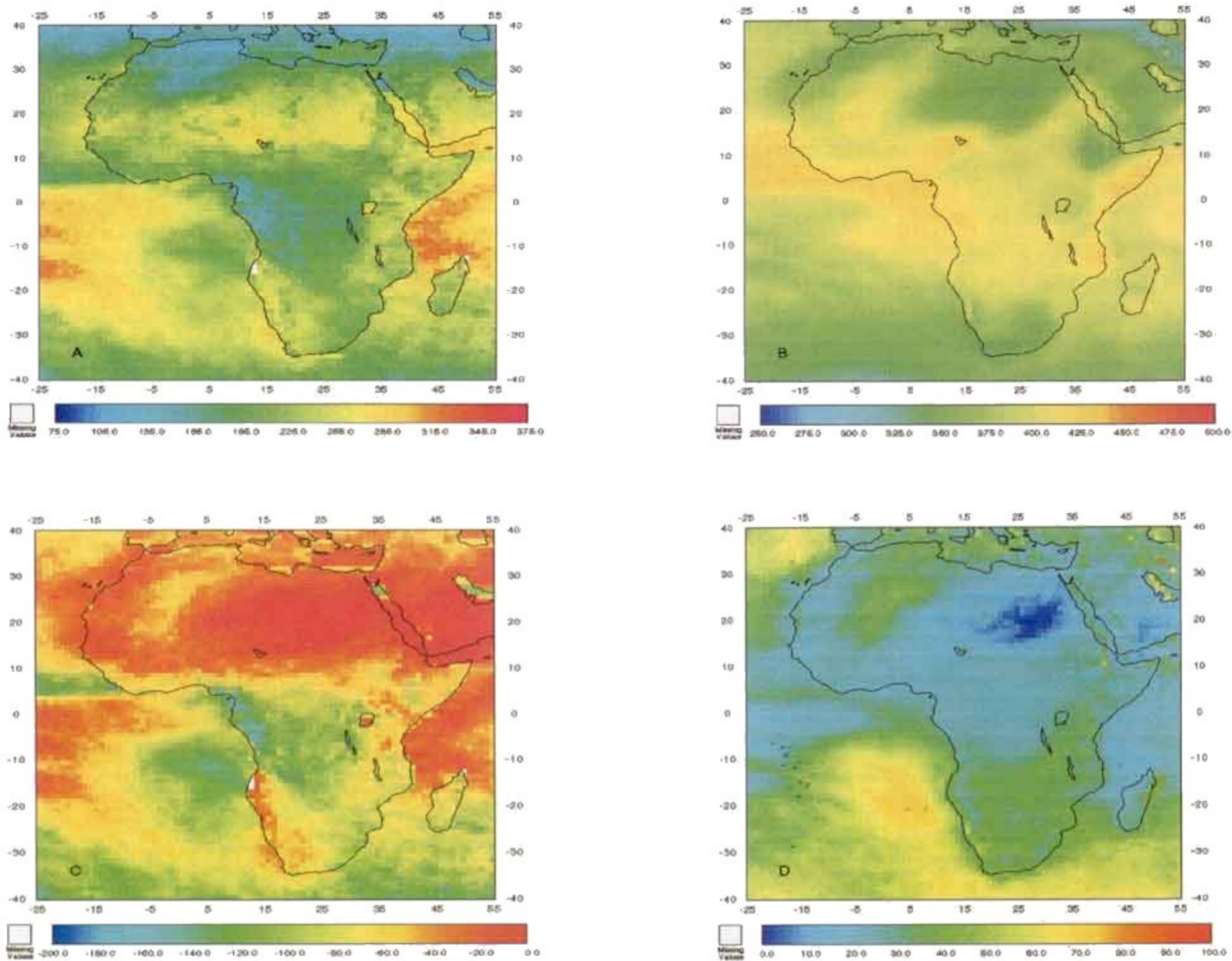
7–9 December 1999—AMERICAN GEOPHYSICAL UNION FALL MEETING, Moscone Center, San Francisco, California, USA. For information E-mail: meetinginfo@agu.org, Fax: 202-328-0566; or AGU Web Site: <http://www.agu.org>.

9–11 January 2000—AMERICAN METEOROLOGICAL SOCIETY ANNUAL MEETING, Long Beach, California, USA. For information E-mail: meetings@ams.org or Website: <http://meteor.org>.

*For complete listing of GEWEX reports and
documents, consult the GEWEX Web Site:
<http://www.cais.com/gewex/>*

Release 2 GEWEX Surface Radiation Budget Project Data Set Planned for Early 2000

The Release 2 GEWEX Surface Radiation Budget data set is scheduled to begin being archived at the NASA Langley Research Center's Atmospheric Sciences Data Center (or Langley DAAC) starting in early 2000. In the Release 2 data set, surface and top-of-atmosphere radiative fluxes are computed using two SW and two LW algorithms applied to ISCCP DX cloud parameters that are gridded to 1 degree resolution. These fluxes and relevant input parameters will be provided globally for the 3-hourly data and for averages of daily, monthly 3-hourly (diurnal cycle), and monthly. The LW algorithms require atmospheric profiles which are inferred from the NASA Goddard Data Assimilation Office Goddard Earth Observing System-1 (GEOS-1) reanalysis.



Examples of the monthly averaged shortwave (A) and longwave (B) downward fluxes at the surface are plotted over Africa for October 1986 from the GEWEX SRB Release 2 data set at 1 degree global resolution. Panels (C) and (D) show the shortwave and longwave cloud radiative forcing relative to the surface (positive is increase to downward flux) for the same case.

GEWEX NEWS

Published by the International GEWEX Project Office (IGPO)

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