GEWEX WCRP
Global Energy and Water Cycle Experiment
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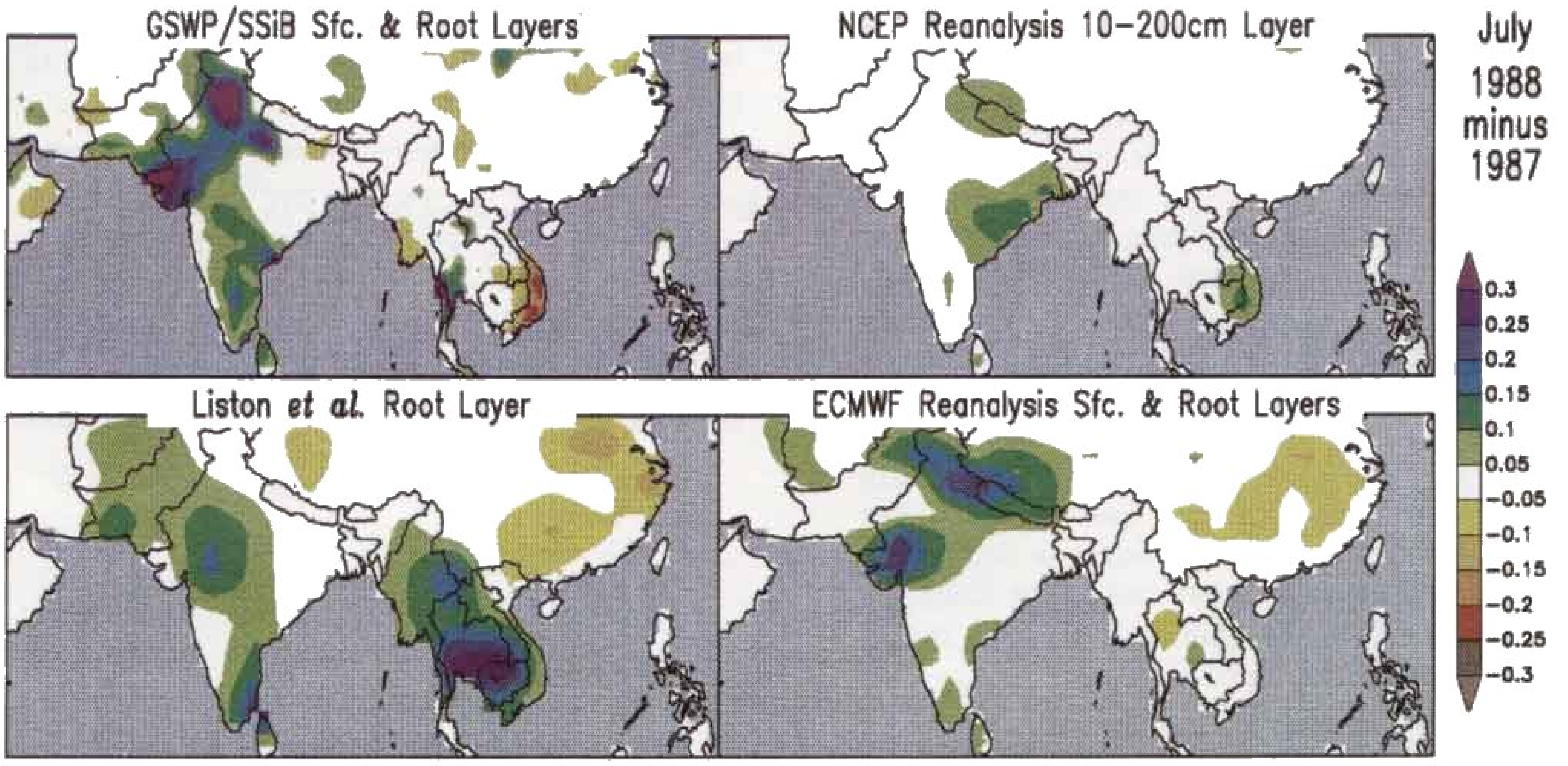
GLOBAL SOIL WETNESS PROJECT (GSWP) SHOWS FIRST RESULTS!



July 1988 minus July 1987 soil wetness (fraction of saturation) in the surface and root layers from land surface models, NCEP reanalysis, and ECMWF reanalysis. See Global Soil Wetness Project article on page 3 for explanation.

PRECIPITATION ESTIMATION FROM REMOTELY SENSED INFORMATION USING ARTIFICIAL NEURAL NETWORK MODELS (PERSIANN)

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The University of Arizona

There has been a growing interest in obtaining accurate and high-resolution global precipitation estimates for studying climate variability and change. From a hydrologic perspective, estimation of precipitation is particularly crucial for better prediction of floods and other water resources management concerns.

A number of research groups have been developing algorithms for precipitation estimation from satellite data (i.e., Arkin and Xie, 1994; Adler and Negri, 1988; and others) in support of the Global Precipitation Climatology Project (GPCP) and for other applications. For the past several years, researchers at the University of Arizona have been developing an Artificial Neural Network (ANN) modeling approach for the estimation

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WHAT'S NEW IN GEWEX

COMMENTARY

ACCELERATING THE HYDROLOGICAL CYCLE

Moustafa T. Chahine, Chairman
GEWEX Scientific Steering Group

The IPCC Second Assessment Report (1995) has drawn attention to the impact of climate change on the hydrological cycle. Specifically, the Summary for Policymakers states that "**climate change will lead to an intensification of the global hydrological cycle and can have major impacts on regional water resources.**" There is also reference to the possibility of changes in the magnitude and timing of runoff and the intensity of floods and droughts. These statements have the attention of the Secretary-General of WMO and the Director of WCRP (World Climate News, January 1997), and GEWEX has the basic elements needed to address this question and to determine to what extent the intensity of the hydrological cycle can be measured, monitored and predicted.

GEWEX is already addressing the predictability of runoff, floods and droughts through the research of the continental-scale experiments in the Mississippi, Amazon, and Mackenzie river basins, and in the Baltic Sea and Asian monsoon regions. The basic data are provided under many GEWEX studies, in particular, the Global Precipitation Climatology Project (GPCP), the GEWEX Water Vapor Project (GVaP), the Global Runoff Data Center (GRDC) and the International Satellite Cloud Climatology Project (ISCCP).

One general indicator of the strength of the hydrological cycle is the mean residence time of water in the atmosphere. The atmosphere recycles its entire water content 33 times per year (total yearly precipitation divided by the total atmospheric precipitable water vapor), giving water vapor a mean global residence time in the atmosphere of about 11 days (*Nature*, 1992, volume 359, page 373). A change in this residence time could indicate an acceleration or deceleration of the hydrological cycle.

A challenge is thus given to GEWEX: (1) Current observational data must be assessed for their ability to determine global precipitation, both liquid and solid, and water vapor with sufficient accuracy for regional and seasonal detection of changes in the rate of recycling of water in the Earth's climate system; and (2) analyses must be conducted to estimate the residence time using historical and current observational data, and these estimates should be compared to modeled values for various climate change scenarios.

GEWEX SCIENTIFIC STEERING GROUP (SSG) MEMBERSHIP

Membership for the GEWEX SSG was approved at the XVIII Meeting of the WCRP Joint Scientific Committee, held in Toronto, Canada, 17-20 March 1997. GEWEX SSG members are:

Moustafa Chahine, Chairman
Yihui Ding*
Dennis Hartmann
Anthony Hollingsworth
Mitchell Moncrieff*
Joel Noilhan*
Erhard Raschke
William Rossow
Igor Shiklomanov
Soroosh Sorooshian*
Ronald Stewart
Thomas Vonder Haar
Brian Wilkinson*
Tetsuzo Yasunari

*New members

Contents

NEW CHAIRMAN FOR INTERNATIONAL SATELLITE LAND-SURFACE CLIMATOLOGY PROJECT (ISLSCP)

Dr. Pavel Kabat

"I consider it a privilege to take the Chairmanship of ISLSCP Science Panel from its former Chairman, my good friend, Piers Sellers, who is currently taking preparation to become a NASA astronaut". (P. Kabat)

Pavel Kabat, Head of the Climate Change Research Programme at The Winand Staring Centre for Integrated Land, Soil and Water Research, is the new ISLSCP Chairman. Dr. Kabat is well-known for his expertise in measurements and modelling of land-surface-atmosphere exchange processes with emphasis on hydrological processes, regionalization and scaling issues.

In addition to Dr. Kabat's scientific accomplishments, he has also contributed to the advancements of the land-surface-atmosphere discipline through his activities on various committees. Dr. Kabat, in his position as Chair of the Scientific Steering Committee of the International Geosphere-Biosphere Program (IGBP), core project of Biosphere Aspects of the Hydrological Cycle (BAHC), has always worked closely with ISLSCP. In Dr. Kabat's words *"ISLSCP/GEWEX and BAHC/IGBP cooperated closely over the last 3 years and this cooperation will continue...."*

ISLSCP INITIATIVE I SUCCESS

Over 3200 CD-ROMs of Global Data Sets for Land-Atmosphere Models distributed and over 50000 ftp files sent. For information visit:
http://daac.gsfc.nasa.gov/

THE GLOBAL SOIL WETNESS PROJECT—INITIAL RESULTS

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Center for Ocean-Land-Atmosphere Studies

As the sophistication and scale of models of the weather, climate, biosphere and terrestrial hydrology have increased, so has the importance of soil wetness. For example, one of the most important roles that the land surface component of a general circulation model (GCM) performs is the partitioning of net incoming radiative energy into sensible and latent heat fluxes. The major factor involved in determining the relative proportions of the two heat fluxes is the availability of water for evaporation and transpiration. This water is generally in the form of moisture in the soil matrix. Globally, soil wetness is second only to sea surface temperature in its importance as a lower boundary forcing for climate. Soil wetness may be the predominant influence on climate over land in much of the tropics, subtropics, and during summer in many areas of the mid-latitudes. Its role in regulating plant physiology and biogeochemistry is well established. As an integral reservoir in the hydrological cycle, moisture in the soil is also crucial to surface and subsurface hydrology. However, soil wetness remains a problematic variable to define and quantify on large scales (Dirmeyer, 1995).

The Global Soil Wetness Project (GSWP) is an ongoing activity of the GEWEX International Satellite Land-Surface Climatology Project (ISLSCP). The GSWP is charged with producing a 2-year global data set of soil moisture, surface and soil temperature, runoff, and surface fluxes by running land surface process models (LSPs) using specified surface forcings and standardized soil and vegetation distributions (namely, the ISLSCP Initiative I data of Sellers et al., 1996). Approximately a dozen modeling groups around the world are taking part. Each group integrates state-of-the-art models over the 1987–1988 period using identical boundary conditions and forcing data to generate global data sets at 1° resolution over ice-free land (see Table 1). An intercomparison center (ICC) has been established at the Center for Climate System Research, University of Tokyo for evaluating and comparing data from the different LSPs. Another group is coordinating studies to validate the global products, either directly (by comparison to field studies or soil moisture measuring networks) or indirectly (applying remote sensing, or using simulated runoff to drive river routing models for comparison to available streamflow data). Further details about the execution of the project are given in IGPO (1995).

Model	Group	Scientist(s)
BASE	Macquarie U.	Pitman
BATS	U. Arizona	Dickinson/Morrill
Bucket	U. Tokyo	Nishimura
	GFDL	Schlosser
Cycle 48	ECMWF	Viterbo
Eta	NCEP	Mitchell/Chen
ISBA	Météo France	Douville
Mosaic	GSFC/Hydrology	Koster
PLACE	GSFC/Mesoscale	Wetzel/Boone
SiB	Japan Met. Agency	Sato et al.
SiB2	Colorado State U.	Zhang
SSiB (GCM version)	GSFC/Climate	Sud/Mocko/Walker
SSiB (offline version)	COLA	Dirmeyer

Table 1: Participating models and groups in GSWP.

GSWP is a pilot study of the feasibility of producing a global data set of soil wetness and surface fluxes. As such, the global data sets produced should not be taken as definitive ground truth, although we believe the final products will be of higher quality than any other similar data sets previously produced. GSWP is planning to make available to the scientific community at large a subset of the data produced by the project, probably on CD-ROM toward the end of 1997.

An example of the high-resolution global data sets being produced by GSWP is shown on the back page. The plot shows 2-year average values of global root-zone soil wetness for March and September from one of the participating LSPs—the simplified Simple Biosphere (SSiB) model of the Center for Ocean-Land-Atmosphere Studies (COLA). The annual cycle of soil moisture is evident in the mid-latitudes and the tropical monsoon regions. The arid regions are also quite pronounced. The fine detail is largely due to variations in soil properties and vegetation in the ISLSCP Initiative I data set, while larger features reflect the patterns of regional climate.

The years 1987 and 1988 are especially significant from a hydroclimatological standpoint because they encompass extremes in the interannual variation of rainfall for many regions of the earth. For example, severe drought occurred over the American Great Plains during the spring and summer of 1988, and that same year saw a temporary interruption of the multi-decadal drought in the Sahel of Africa. In India, 1988 has been heralded as one of the best monsoon years on record, while 1987 was catastrophically dry. Southeast Asia and southern China experienced the reverse of these monsoon anomalies.

The figure on page 1 shows July 1988 minus July 1987 soil wetness in the active upper soil layers from four sources. In the upper left is the difference using SSiB. The lower left panel shows results of Liston et al. (1993), who used a similar procedure to GSWP but at 4x5° resolution and using somewhat different data sets for boundary conditions and meteorological forcing. The upper right panel is from the U.S. National Centers for Environmental Prediction (NCEP) reanalysis (Kalnay et al., 1996). The lower right panel is from the European Centre for Medium-range Weather Forecasts (ECMWF) reanalysis (Gibson et al., 1994). ECMWF reanalysis, GSWP and (Liston et al., 1993) are qualitatively quite similar, with the GSWP product having greater detail.

The simulated soil moisture from the participating LSP groups are being validated using gravimetric soil moisture data from Russia (see Vinnikov et al. in this issue), field campaign measurements from Holland, Niger and Brazil, remote sensing data, and by comparison of routed runoff to streamflow observations (Oki et al., 1996). There is strong indication from the runoff validation effort that the ability of the GSWP models to simulate basin scale runoff is related to the quality of monthly precipitation analysis used. Figure 1 plots errors in model simulated (mean of 9 of the participating LSPs) basin-scale annual-mean runoff as a function of the density of rain gauge observations in each basin. One hundred eight basins are included. The measurements from the rain gauges in each basin went into producing the gridded precipitation forcing data used in GSWP to drive the models. In basins where precipitation observations were scarce, errors in simulated runoff were large, and vice versa. Even though precipitation is one of the more densely measured climate variables over globe, it is apparent that increased observational density could improve verification of the hydrological cycle. The threshold appears to be about 100 gauges per million square kilometers. Currently, the highest gauge densities are found in Europe, eastern China, Japan, and eastern North America.

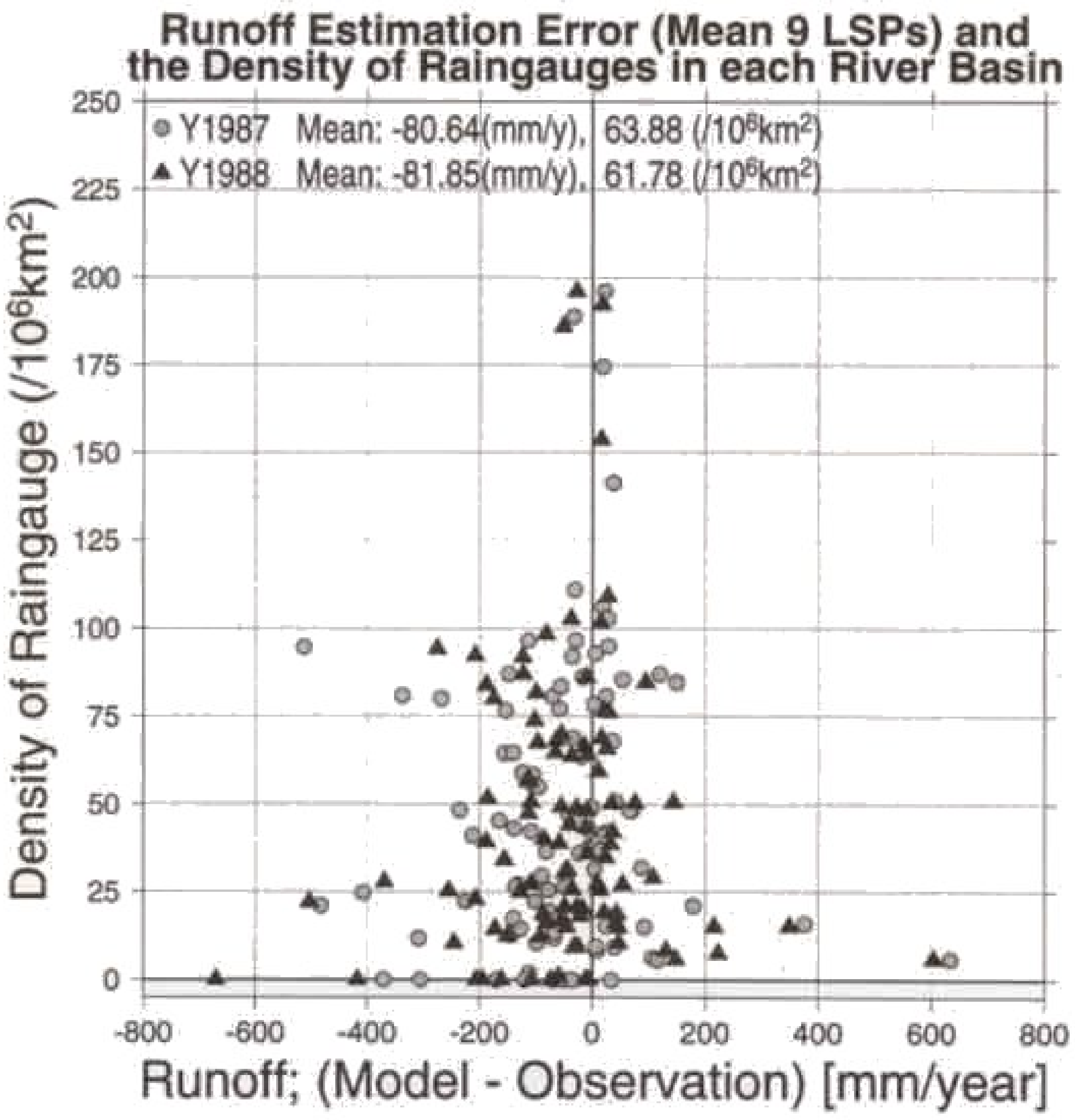

Figure 1: Errors in LSP simulated basin-scale annual-mean runoff as a function of the density of raingauge observations used to produce the gridded precipitation forcing data (courtesy of T. Oki).

A comparison of the models is being conducted by the ICC, where the data are collected for redistribution. In addition to comparison, the ICC performs basic consistency checks of energy and water balances, and points out potential errors to the LSP groups for correction. Results are being posted as they become available at **http://climate3.ccsr.u-tokyo.ac.jp/~nishi/gswp-icc/** on the World Wide Web.

Each LSP group is exploring a specific issue of model sensitivity, either to the prescribed forcings, the soil and vegetation properties, or other model parameterizations. One particular question that will be addressed by several of the groups is: how sensitive are simulated sensible and latent heat fluxes to soil wetness? Phrased another way: given that heat fluxes can be measured to within ±10%, how accurately must soil wetness be simulated to reproduce the heat fluxes within that 10% margin of certainty? The answer will no doubt be a function of location, season, and even model. Nonetheless, this question has not previously been addressed on such a large scale, and the exercise should yield new insights to the problem of land surface modeling.

As a preliminary exercise to show how the GSWP data may be applied, the COLA atmospheric GCM (coupled to SSiB) has been integrated for the summer seasons of 1987 and 1988 for two scenarios: soil wetness initialized from ECMWF operational analyses and allowed to evolve freely in the SSiB model (called "Free-Running"), and soil wetness specified from the soil moisture calculated offline using SSiB as part of the GSWP ("GSWP Specified"). Four-member ensembles were run with slightly different initial conditions from late May. Anomaly correlation coefficients (ACCs) between GCM-simulated and observed June-July-August precipitation were calculated over all non-ice covered land points (Figure 2). Anomaly in this context is defined as 1988 minus 1987 precipitation at each point. Shading indicates the realm where ACC would not be significant at the 95% confidence level. Each possible combination of the four 1988 ensemble members minus four 1987 members was used to produce a "cloud" of 16 points, in order to quantify the uncertainty or spread in the ACC calculations. Each point on the graph has as its X-axis value the ACC using the GSWP specified cases, and on the Y-axis the value for the same pairing (1988 minus 1987) from Free-Running cases. Even though the ACC is statistically significant in all cases with the free-running GCM, the ACC is consistently higher using the GSWP product (i.e., all points lie to the right of the diagonal "X equals

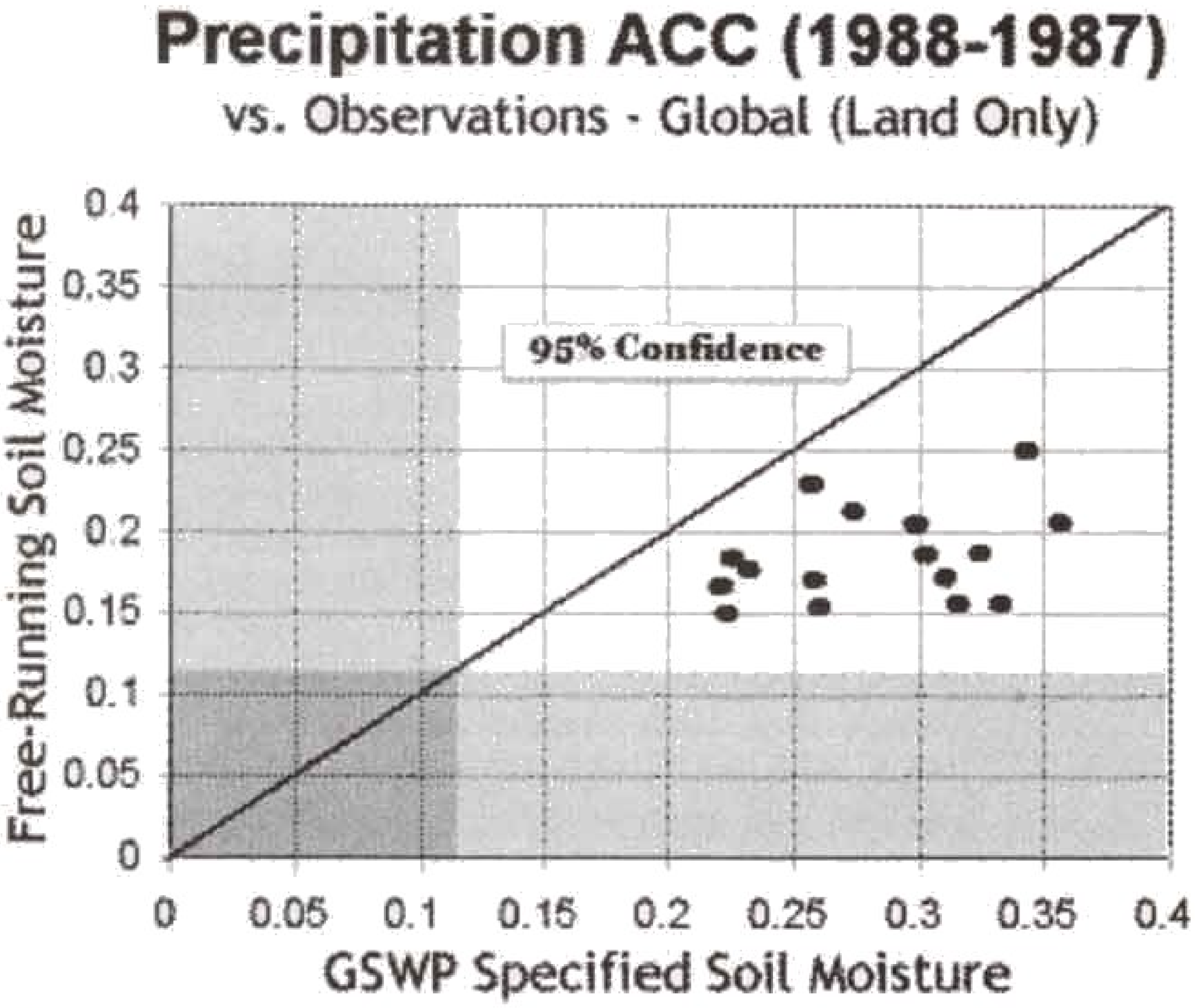

Figure 2: Comparison of anomaly correlation coefficients of precipitation (GCM versus observed) for a free-running GCM and a GCM with specified soil wetness derived from the GSWP product.

Y" line). **This suggests that on a global scale, there is inherent quality in the GSWP soil moisture fields, as they help the GCM produce precipitation patterns which more closely match observed rainfall over land. It also points to the GSWP product's utility as a diagnostic tool for GCMs.**

Although not yet completed, GSWP appears to be a successful pilot study. With the completion of the ISLSCP Initiative II global data set (IGPO, 1996), GSWP will reconvene to produce a global 10-year data set of soil moisture and surface fluxes at Initiative II resolution. Interest within the LSP modeling community has been high, and we expect that many more models will be involved in the next phase of GSWP. In addition to the components of data set production, validation, and intercomparison, the GSWP framework is proving to be a valuable tool for model diagnosis. You may keep up with ongoing progress in the GSWP at **http://grads.iges.org/gswp/**.

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The GEWEX Continental-Scale International Project (GCIP) has a new Web Site location:

http://www.ogp.noaa.gov/gcip

GCIP and other GEWEX projects can be visited from links on the GEWEX Web Site:

http://www.cais.com/gewex/gewex.html

PRECIPITATION ESTIMATION FROM REMOTELY SENSED INFORMATION USING ARTIFICIAL NEURAL NETWORK MODELS (PERSIANN)

(Continued from page 1)

of precipitation from satellite data (Hsu et al., 1997). Details about this procedure and the workings of the PERSIANN system are available at our web site (**http://www.hwr.arizona.edu/persiann/goes.html**) (See back page of this issue.) The primary type and source of data for the PERSIANN system are the infrared brightness temperature images provided by geostationary satellites (e.g., GOES). Among the features and advantages of the PERSIANN system are its abilities to: (1) estimate the nonlinear functional relationship between a set of input variables (consisting of cloud-top temperatures, earth-surface characteristics, etc.) and rainfall rate at the surface at a time-space resolution of 60 minutes and 0.25° latitude/longitude, (2) assimilate spatially and temporally limited ground-based rainfall estimates [rain gauge and radar-based estimates over the land and/or satellite microwave/imager (SSM/I) based estimates over the ocean] to update the ANN model parameters; and (3) process large volumes of satellite data to generate estimates in near real-time. Some preliminary application results are shown in Figures 1a and 2. In Figure 1a, the PERSIANN model precipitation estimates (monthly totals in millimeters at a spatial resolution of 1°x1° lat./long.) are compared with radar-based estimates for January 1996 over the Florida peninsula. The ANN model can be run in both nonadaptive and adaptive modes. The ANN model parameters were first trained in the nonadaptive mode using the data sets for June 1989 assembled for the Japanese Islands as part of the GPCP first Algorithm Intercomparison Project (AIP-1). When transferred to the Florida peninsula, this nonadaptive model resulted in severe underestimation of rainfall, illustrating the fact that a set of parameters obtained from one region may not necessarily be applicable to another region with different seasonal and geoclimatic features. The adaptive mode was then utilized to run the model for the Florida peninsula using only a limited amount of ground-based data for updating the parameters (NEXRAD precipitation estimates available at ten grid locations). The significant improvements obtained by utilization of the adaptive mode are clearly illustrated.

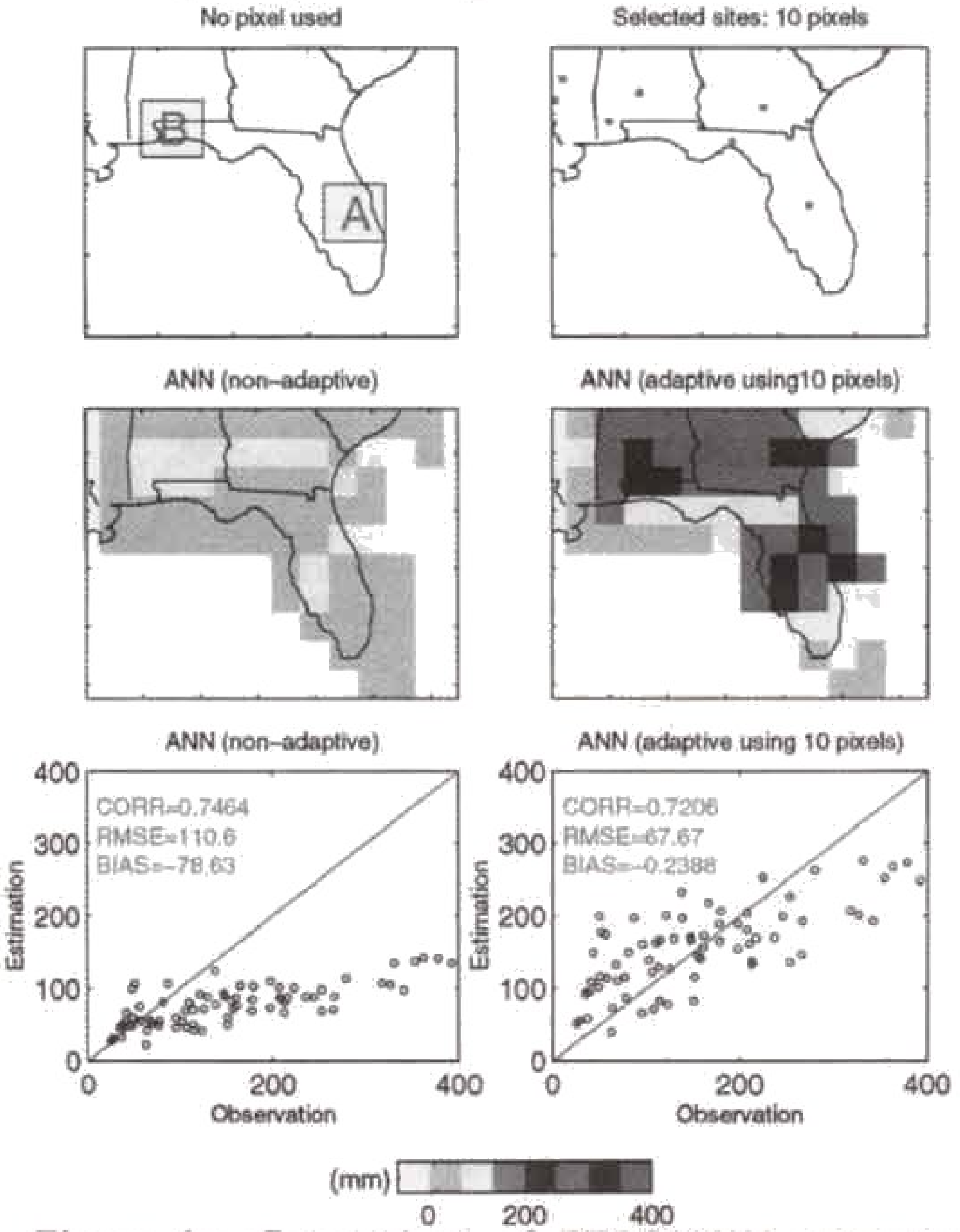

Figure 1a: Comparison of PERSIANN estimates of accumulated precipitation with radar-based estimates (Figure 1b). Improvement is shown when using adaptive estimation mode (right-hand column).

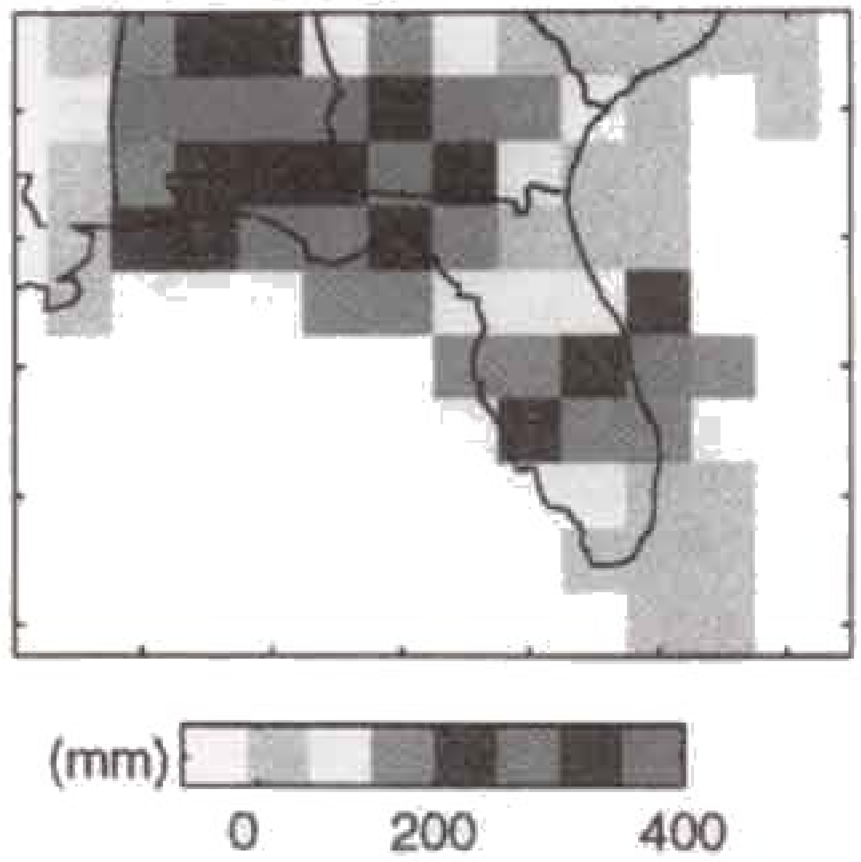

Figure 1b: Radar-based estimates, January 1996, of precipitation for Florida peninsula.

Another important feature being developed in the PERSIANN system is the ability to estimate hourly precipitation in near real-time. Hourly precipitation estimates for two regions over Florida (labeled A and B in Figure 1a) are displayed in Figure 2. The updating feature clearly improves the estimates of hourly precipitation as compared

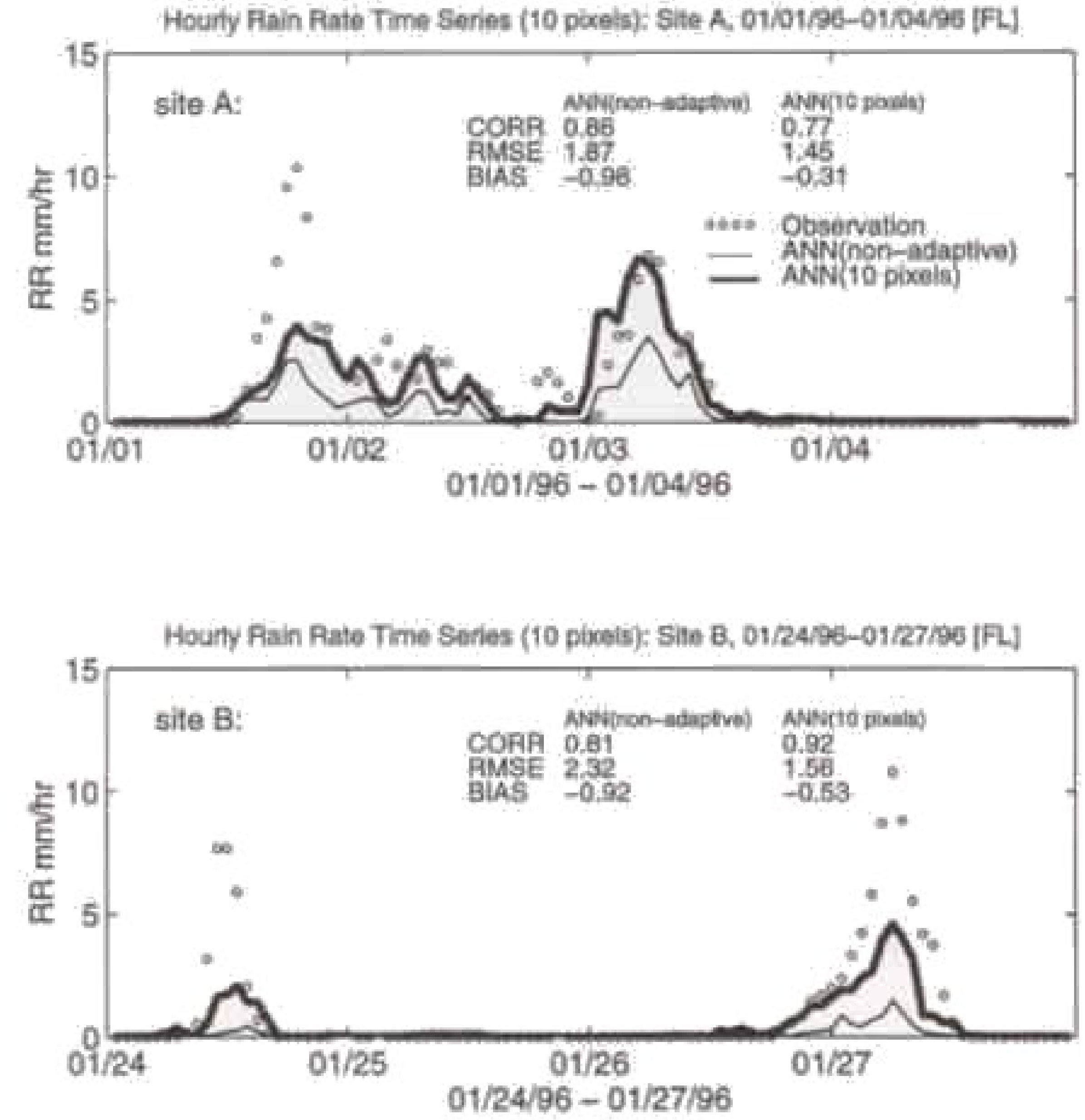

Figure 2: Comparison of adaptive and nonadaptive mode PERSIANN hourly precipitation estimates with WSR-88D (NEXRAD) radar-based estimates. Locations for A and B are shown in Figure 1a.

to the radar observations—for individual storm events. Notice also that the estimation performance improves as additional information for recursive parameter training becomes available.

The PERSIANN system is currently being used to routinely generate hourly satellite-based precipitation estimates at the 0.25°x0.25° grid scale resolution for the Florida peninsula (see web site). Currently, as part of our ongoing project under the Pan American Climate Studies (PACS) program, we have been extending the coverage area to include the Pan American region (see sample result displayed on back page illustration).

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SOIL MOISTURE DATA SETS

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For different scientists, soil moisture is a component of the water budget of the upper soil layer (hydrology), of water resources available for agricultural crops and natural vegetation (agrometeorology), or of meteorological memory (weather and climate predictions). Unfavorable change in the soil moisture regime may be an important problem in the future due to greenhouse global warming. In the United States and Western Europe, there were never any national observing programs of this important earth system element, but we are fortunate that gravimetric observations of soil moisture was started in the 1930s in the Former Soviet Union (FSU) at a few hundred and later at more than 3000 meteorological stations and the data were published in reference books. Multiyear averages for administrative districts and some time series were published by Meshcherskaya et al. (1982), Kelchevskaya (1989), and Zhukov (1986). Kelchevskaya (1983), Vinnikov and Yeserkepova (1991), Robock et al. (1995), Vinnikov et al. (1996) and Yang et al. (1997) have all used these Russian gravimetric soil moisture data for various analyses.

The complex topography of natural landscapes, with spatially variable vegetation and soil types, and gravitational drainage and infiltration of water after heavy rains, are responsible for small-scale spatial (tens of meters) and temporal (up to a few days) variability in the soil moisture field. This component of soil moisture field variability looks like random (white) noise in comparison with the long-term (about 1-4 months) and large-scale (about 400-800 km) signal related to atmospheric forcing (Meshcherskaya et al., 1982; Delworth and Manabe, 1988, 1989; Vinnikov and Yeserkepova, 1991; Vinnikov et al., 1996). One of the traditional empirical methods to eliminate white noise in soil moisture fields consists of spatial averaging of all measurements of stations inside separate administrative districts (Meshcherskaya et al., 1982; Kelchevskaya, 1983; Zhukov, 1986). This approach is used here to examine the large-scale and long-term component in variations of soil moisture of the territory of the FSU.

Six different sets of soil moisture data are currently available to the scientific community and may now be retrieved electronically from the Global Soil Moisture Data Bank at **http://www.meteo2.umd.edu/~alan/soil_moisture/**.

Three of the data sets are available as ASCII text and as GrADS binary data. We also provide FORTRAN programs to read the data and create GrADS files, and GrADS execs to display maps of the data. The GrADS station data function OACRES (Objective Analysis using the CRESsman (1959) scheme) with default parameters was used to interpolate the initial data into a 1°x1° grid. The GrADS exec files display maps of plant-available soil water content in the upper 10, 20, or 50 cm, and upper 100 cm of soil, and also maps of the ratio of water content in the two soil layers. Following are brief descriptions of the six data sets and examples of three of them:

RUSWET–GRASS–130STA. This data set contains soil moisture gravimetric measurements made during 1978-1985 at 130 meteorological stations of the FSU. It contains plant-available soil moisture for the upper 10 cm and 1 m soil layers at flat observational plots with natural grass vegetation. The size of the observational plots is about 0.1 ha. Observations are made with temporal resolution of 10 days during the warm season (3 times per month—on the 8th, 18th and 28th days of each month), and once a month (on the 28th day of the month) during the winter. The time series contain 36 values per year, with a code for missing data if data are absent. The data for 1978-1985 are a small part of the data that are published in annual reference books. More information about 50 of these stations can be found in Vinnikov and Yeserkepova (1991). Robock et al. (1995) used data for six of these stations in their demonstration of soil moisture simulations with two different land surface models forced with atmospheric observations, and the forcing data for these six stations are also available at the same WWW address. Figure 1 below shows an example of the data for the end of May 1985.

RUSWET–AGROCLIM. The data used here are multiyear averages of plant-available water content in the soil layers 0-20 cm, 0-50 cm and 0-100 cm at agricultural fields with winter cereal crops and spring cereal crops (given separately) for 144 administrative districts of the FSU. Winter cereals are the best analog for natural grasslands. Spring cereals are representative of many agricultural regions of the FSU. The number of stations used for spatial averaging for each district varied from about 10 to more than 100. The period of observation is 1946-1980 for the western part of the FSU and 1927-1982 for the eastern part. All the data were retrieved and digitized from two Russian reference books (Zhukov, 1986; Kelchevskaya, 1989). As an example, Figure 2a

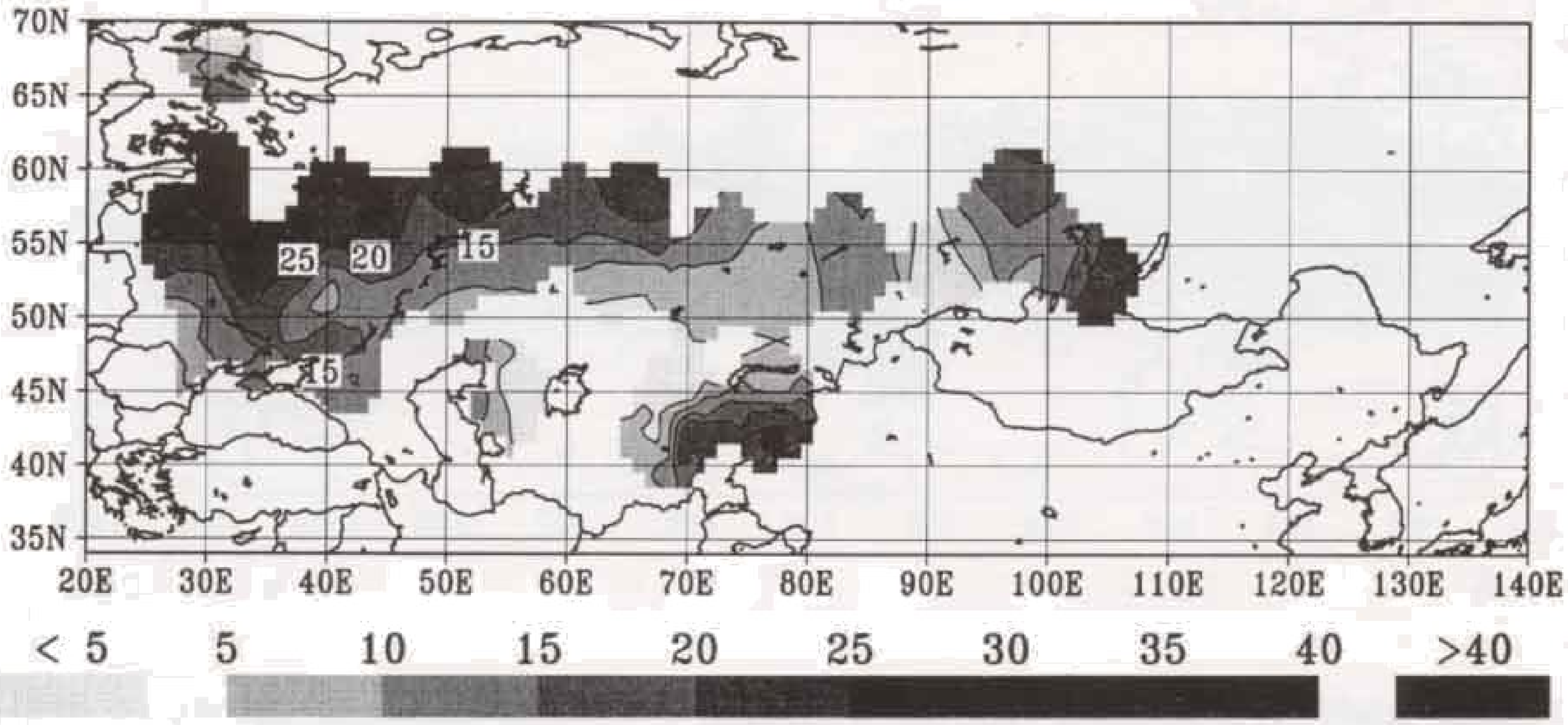

Figure 1: Plant-available soil moisture (cm) for the upper 100 cm soil layer for natural grass, end of May 1985.

displays a climatic map of soil moisture content at agricultural fields with spring cereals for the end of May.

RUSWET–AGRO. This data set is the output of a system for monitoring soil moisture at agricultural fields of the FSU. The data set contains plant-available soil moisture for the upper 20 cm and 1 m soil layers at agricultural fields with winter cereal crops and spring cereal crops (given separately) for 102 administrative districts of the FSU. The measurements of about six stations (on average) were used for each district with equal weights. The spatial domain of the data is the grain belt of the FSU (Russia, Ukraine, Belarus, Moldova, Lithuania, Latvia, Estonia, and Kazakhstan). On average, the area of each district is about 30,000 km^2 (ranging from 10,000 to more than 100,000 km^2). The temporal domain is 1987-1988; the growing period is from April 8 to October 28, for each year, and the temporal resolution is 10 days (3 measurements per month). The data set for 1987-1988 was created for use in the GEWEX/ISLSCP Global Soil Wetness Project for validation of model estimated soil moisture variations. We are now working to make all the data for 1958-1996 available to the scientific community, and they will soon be available at the same WWW site. As an example, Figure 2b displays a map of soil moisture content at agricultural fields with spring cereals for the end of May 1987. There are three other Russian data sets available:

RUSWET–GRASS–50STA. This is the 50-station data set of Russian (FSU) plant-available soil moisture measurements at natural grass fields. The data set consists of measurements of plant-available soil moisture in the top 1 meter of soil

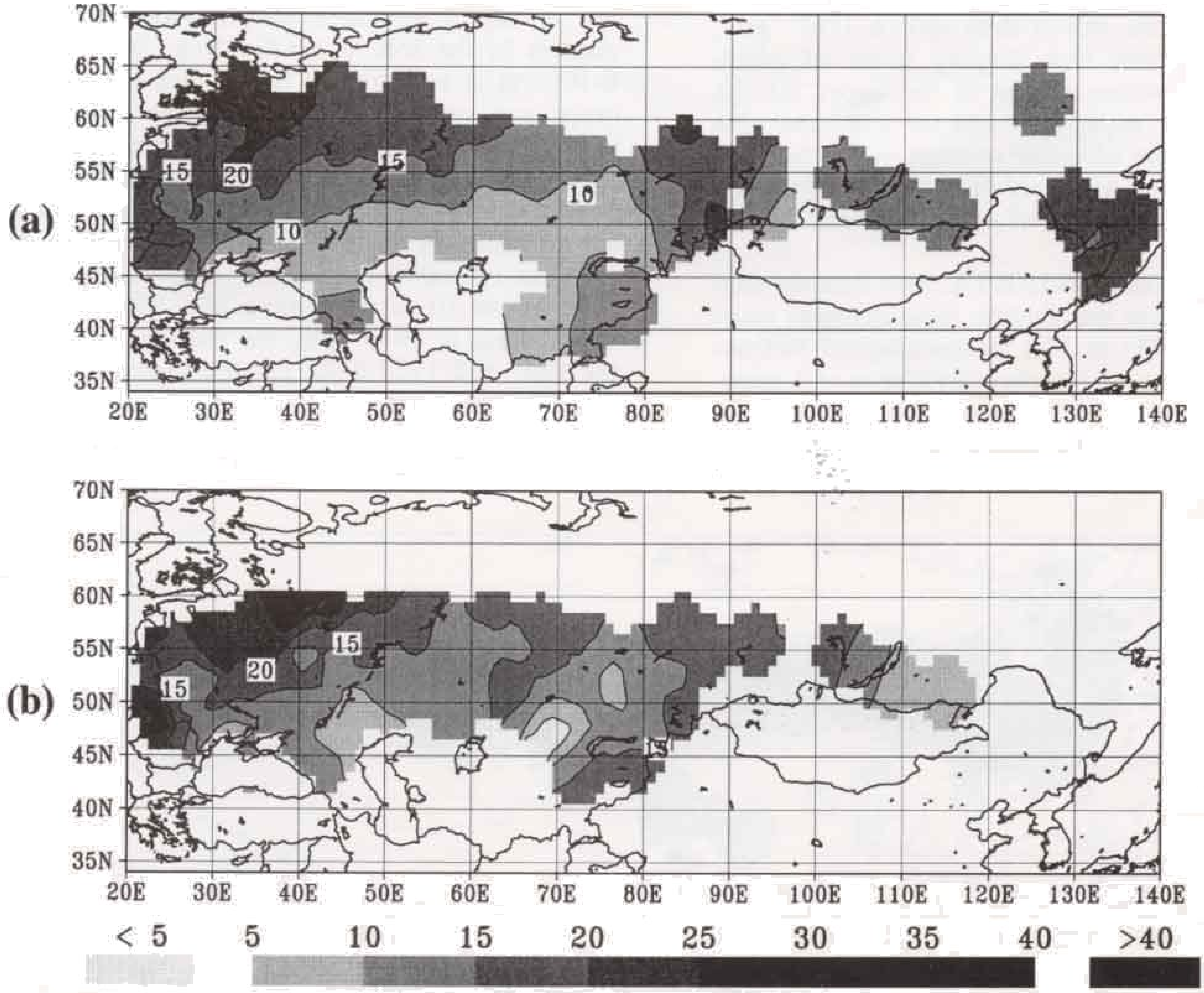

Figure 2: Plant-available soil moisture (cm) for the upper 100 cm soil layer for spring cereals, for (a) end of May, multi-year average and (b) end of May 1987.

at 10-day intervals (on the 8th, 18th, and the end of each month). The measurements were made on a level grass field (natural vegetation) at each station site using a gravimetric technique. Some of these stations are also represented in the RUSWET–GRASS–130STA data set.

RUSWET–GRASS–6STA. Robock et al., 1995 and Yang et al., 1997) used 6 stations from the Vinnikov and Yeserkepova (1991) 50-station archive to demonstrate that land surface models, when forced with actual meteorological and actinometric data, can be evaluated by comparison with actual soil moisture, snow depth, albedo, and net radiation observations. Those soil moisture data are available here. The forcing and other validation data and a subset of depth of frozen soil layers data are also available. These data have been used by a number of land surface groups to exercise their models, and we encourage further use of these data by others.

RUSWET–VALDAI. The Project for Intercomparison of Landsurface Parameterization Schemes (PILPS), (Henderson-Sellers et al., 1993) evaluates soil moisture models in several ways. Data from a grassland catchment at the Valdai Russia research station are being used for the PILPS 2d experiment to test many different land surface models in a climate with seasonal snow cover for an 18-year period. Forcing data for Valdai and a Read Me File are now available. Schlosser et al. (1997) have already conducted this experiment for bucket and SSiB models. When the PILPS 2d runs are complete, we will distribute the validation data as described by Vinnikov et al. (1996).

Currently, we are also preparing new soil moisture data sets for India, China, and Mongolia.

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MEETINGS AND WORKSHOP SUMMARIES

GEWEX SCIENTIFIC STEERING GROUP MEETING
6-10 January 1997

The ninth session of the GEWEX SSG, held in Hamburg, Germany, was a productive meeting including the nomination of new members (see page 2) and the new ISLSCP Chairman, Dr. Pavel Kabat (see page 3).

The GEWEX Hydrometeorology Panel (GHP) reported on the scheduling of the Intensive Operations Periods for the five GEWEX Continental Scale Experiments (CSEs), and the GEWEX Radiation Panel (GRP) reported on plans for the next phase of the GEWEX Global Water Vapor Project (GVaP) and the GEWEX Global Aerosol Climatology Project (GACP) initiation strategy. The GEWEX Modeling and Prediction Panel (GMPP) was organized and given responsibility to advance projects specifically focused on producing improved cloud and land surface parameterizations for use in Atmospheric General Circulation Models. GMPP will also oversee continued progress by the Project for Intercomparison of Land-Surface Parameterization Schemes (PILPS) and GEWEX Cloud System Study (GCSS). The Working Group on Numerical Experimentation (WGNE) will be associated with the activities undertaken by GMPP. With the activation of the GMPP the GEWEX Numerical Experimentation Panel (GNEP) was dissolved.

The SSG reviewed current space agency Earth observing plans and acknowledged the successful launch and operation of the ADEOS-I spacecraft as the first in a new series of Earth Observing System Platforms with significant application to GEWEX. The success of the Second International Scientific Conference on GEWEX held in Washington, D.C., USA, (17-21 June 1996) and plans for a Third International Scientific Conference on GEWEX, to be held in Asia in 1999, were also discussed. The SSG accepted the offer made, on behalf of the Institute for Space Studies of Brazil (INPE), to host the next (tenth session) in Brazil from 2 to 6 February 1998.

AMERICAN METEOROLOGICAL SOCIETY (AMS) MEETING

EMPHASIS ON HYDROLOGY
2-7 February 1997

The dominant themes of the AMS 77th Annual Meeting, held in Long Beach, California, were interdisciplinary science and hydrology. The hydrology emphasis was evident during the entire meeting from the opening business session, where newly elected "Fellows" of the Society were announced (including two scientists, John Schaake and Eric Wood, who have been very active in GEWEX hydrology efforts), to a Soil Moisture Project Workshop held on the last day (see summary on next page).

The AMS Meeting program included eleven technical conferences and symposia, many with a hydrology emphasis. This emphasis was highlighted by the *AMS 13th Conference on Hydrology* with over 200 presentations and posters (some joint with other conferences). Special sessions were held on GCIP and the Global Soil Wetness Project (18 papers reporting on initial results). Another hydrology emphasis was provided by the Robert E. Horton Lecture, delivered by Eugene M. Rasmusson (AMS 1998 President-elect) titled "North American Hydrology: The Evolution of an Interdisciplinary Perspective." This was the opening presentation at the highly successful Special Symposium on *The Land-Atmosphere System: An Interdisciplinary Approach*. Another interdisciplinary lecture at this special symposium was presented by Robert E. Dickinson on atmosphere-land surface interaction. Professor Dickinson was the 1996 recipient of the AMS most prestigious Carl-Gustaf Rossly Research Medal. Dr. Piers Sellers was the 1996 recipient of the AMS Henry G. Houghton award; his citation read "for outstanding achievements in the development and field testing of models describing land biosphere-atmosphere interactions."

In addition to the special interdisciplinary symposium and hydrology conference, there were several other technical AMS conferences and symposia at the AMS Annual Meeting with contributions from the GEWEX community: *Special Symposium on Boundary Layer Turbulence, (Land Surface)* organized by R. Avissar and W. Brutsaert with 24 presentations, *Ninth Conference on Atmospheric Radiation, Eighth Conference on Global Change*

Studies, Seventh Conference on Climate Variations, and Third Conference on Atmospheric Chemistry. GEWEX related topics were presented in essentially all the other conferences and symposia.

At the banquet (over 1500 in attendance). AMS awards were presented by Dr. Paul Try, AMS President and Director, IGPO. Following the awards ceremonies, Dr. Try (right) turned over his duties to the 1997 AMS President, Dr. Ronald McPherson, Director, NCEP. *(AMS Photograph)*

GLOBAL SOIL WETNESS PROJECT (GSWP) WORKSHOP

Paul A. Dirmeyer
Center for Ocean-Land Atmosphere Studies

On 7 February 1997, a GSWP workshop was held in Long Beach, California, with participants from most of the dozen or more modeling groups, as well as members of the intercomparison and validation efforts. The GSWP is producing a global 1° data set of soil wetness and land-surface fluxes for 1987 and 1988. Topics addressed included corrections and schedule for the submission of data produced by these groups to the GSWP intercomparison center (ICC). The ICC was established in Tokyo to evaluate and compare land surface models.

A related topic discussed was GSWP data distribution to the scientific community at large. A list of variables to be included were determined at the workshop. These variables were in categories associated with precipitation, soil moisture, runoff, heat fluxes and surface radiation. Also, issues of data volume and compression were identified. It is likely the data will be released on CD-ROMs to the scientific community as monthly means.

Several publishing efforts were defined: (1) a short article for GEWEX News (see page 3), (2) an in-depth report for the IGPO publication series, and (3) an article suitable for publication in the *Bulletin of American Meteorological Society*. In addition, the working group will investigate having a special issue of a professional journal comprising a series of science articles reporting on results.

WORKSHOP ON SOIL VEGETATION ATMOSPHERE TRANSFER (SVAT) SCHEMES/LAND SURFACE PARAMETERIZATIONS (LSPs)

10–13 February 1997

Han Dolman
DLO Winand Staring Centre

Three decades of research into the exchange of energy, water, carbon dioxide and trace gases between the atmosphere and the land surface has seen tremendous improvement in our understanding of these processes. However, the GEWEX Project Intercomparison of Land-Surface Parameterization Schemes (PILPS) and International Satellite Land-Surface Climatology Project (ISLSCP) have also shown that perhaps one of the greatest uncertainties in climate models is still in just this area. A recent workshop on SVAT/LSP, jointly sponsored by IGBP/Biospheric Aspects of the Hydrological Cycle (BAHC)/Global Change and Terrestrial Ecosystems (GCTE), and GEWEX/ISLSCP/PILPS) at La Jolla, California, aimed at taking stock of recent developments and tried to generate new testable ideas that could decrease the current uncertainties.

Arguably, the two most outstanding areas of focus since the development of linked photosynthesis and evaporation models and the results of the PILPS experiments on soil moisture parameterizations are the "greening" of land surface models by incorporating more realistic plant physiology, and the "wetting" of land surface models by incorporating more realistic wet (liquid) hydrology parameterizations. These topics were discussed in three subgroups; two other subgroups discussed issues of data availability and aerodynamic and radiative issues. The issue of data availability and use for SVAT model development relates both to the increased availability of data from long term eddy correlation measurements through global flux networks as well as increased reliability of algorithms for extraction of land surface parameters from the new generation of Earth Observation Satellites.

Two central problems kept recurring in virtually all of the discussion groups: complexity versus simplicity and the necessity of treating the heterogeneity of the land surface. The development of LSPs has generally been one of increasing complexity. This raises problems in both the use of these models to represent large heterogeneous areas as well as means and data to test and calibrate these models. The subgroup on soil moisture prediction recommended that more systematic study was needed to understand the effects of adding or decreasing complexity of an LSP. Often models are made more complex to simulate new quantities, i.e., carbon fixation by terrestrial vegetation, or to improve the climate of the simulation, or to generate a model quantity that can be tested against observations.

The soil moisture and runoff group came up with a number of hypotheses on how to test the effect of heterogeneity on soil moisture and runoff prediction. The modelling framework, now available through the Global Soil Wetness Project of ISLSCP, could provide an excellent testbed for these hypotheses.

The groups focussing on radiation and aerodynamics recommended that components of the carbon balance should be more accurately measured, so as to provide adequate testing data for the physiology/respiration models. They also recommended the use of sparse canopy models and the inclusion of more naturally occurring heterogeneity in the parameterizations. Remotely sensed data could not only provide global statistics of land surface parameters, but may also function better in a global data assimilation system, which takes into account the slowly varying vegetation characteristics. The ISLSCP Initiative II (10-year data set) will provide ample opportunity for this.

The conclusions and summary of the workshop will be published soon as a report in the *Bulletin of the American Meteorological Society*.

GEWEX ASIAN MONSOON EXPERIMENT (GAME)—INTERNATIONAL SCIENCE PANEL MEETING (ISP)

26–28 March 1997

Tetsuzo Yasunari
University of Tsukuba

This meeting, held in Cheju Island, Korea, was the second session of the GAME-ISP which was established to provide a forum for a broad review of the objectives of GEWEX in the context of the scientific issues associated with the successful accomplishment of the GAME regional experiment. The meeting was held in conjunction with the Third International Study Conference on GEWEX in Asia and GAME, over 100 papers and posters were presented at the Conference.

The ISP session was attended by 35 participants from 10 countries. Topics included scheduling observing periods within GAME and related studies including the Intensive Observing Period (IOP) in 1998 with the South China Sea Experiment (SCSMEX) and the Korean Monsoon Experiment (KORMEX). KORMEX is a planned Korean national program established to better understand the Korean component of the Asian Monsoon. The ISP actions at this meeting included strengthening the link of KORMEX to GAME, clarify planning between SCSMEX and GAME, formulating a request to continue the Tropical Rain Measurement Mission–like rain radar observations and extending them beyond the tropics, and informing WMO on the significant progress of GAME. Another issue discussed was the further development of the GAME Archive and Information Network (GAIN).

At the scientific conference many new results were presented. One of interest to GEWEX and other components of WCRP was the importance of the Siberian and Tibetan Plateau permafrost role in the Asian monsoon, including the soil moisture variability to improve understanding of the energy and water cycle in permafrost regions.

WCRP/GEWEX MEETINGS CALENDAR

For calendar updates consult GEWEX Web Site http://www.cais.com/gewex/gewex.html

20-22 May 1997—IGAC/SPARC/GAW CONFERENCE ON GLOBAL MEASUREMENT SYSTEMS FOR ATMOSPHERIC COMPOSITION, Toronto, Ontario, Canada. For information contact IGAC-GOMAC, Dept. of Physics, Univ. of Toronto, 60 St. George Street, Toronto, Ontario M5S 1A7, Canada; Tel: 416-978-4723; Fax: 416-978-8905; E-mail: gomac@atmosp.physics.utoronto.ca.

19-22 May 1997—GPCP WORKING GROUP ON DATA MANAGEMENT, Frascati, Italy.

2-6 June 1997—THE 31ST ANNUAL CONGRESS OF THE CANADIAN METEOROLOGICAL AND OCEANOGRAPHIC SOCIETY, Saskatoon, Saskatchewan, Canada; Theme: "Energy and Water Cycles", with special sessions on GEWEX and BOREAS. For information contact: Geoff Strong, Atmospheric Environment Service, 11 Innovation Blvd., Saskatoon, Saskatchewan, S7N 3H5, Canada; Tel: 306/975-5809; Fax: 306/975-6516; E-mail: geoff.strong@ec.gc.ca. Congress home page at: http://essask65. innovplace.saskatoon.sk.ca/pages/cmos97/congrs97.html.

18-20 June 1997—GVaP WORKING GROUP ON SCIENCE AND DATA, Silver Spring, Maryland.

25-27 June 1997—PROJECT FOR INTERCOMPARISON OF LAND-SURFACE PARAMETERIZATION SCHEMES (PILPS) WORKSHOP. For information contact Dr. Bertrand Timbal, BMRC, GPO Box 1289K, Melbourne, VIC 3001, Australia; Tel: (61)-3-9669-4412; Fax: (61)-3-9669-4660; E-mail: bxt@bom.gov.au.

1-9 July 1997—EARTH-OCEAN-ATMOSPHERE FORCES FOR CHANGE, Melbourne, Australia. For details contact IAMAS/IAPSO Secretariat, Convention Network, 224 Rouse Street, Port Melbourne, Victoria 3207, Australia; Tel: +61-3-9646-4122; Fax: +61-3-9646-7737; E-mail: mscarlett@peg.apc.org.

10-11 July 1997—ISLSCP SCIENCE PANEL MEETING, Silver Spring, Maryland.

22-25 July 1997—GEWEX RADIATION PANEL MEETING, Honolulu, Hawaii.

24-25 July 1997—GCSS WORKING GROUP I - BOUNDARY LAYER CLOUDS WORKSHOP, Seattle, Washington. For further information contact Prof. Chris Bretherton, University of Washington, Tel: 206-685-7414; Fax: 206-685-9302; E-mail: breth@math.washington.edu.

26-29 August 1997—WMO/ICSU/IOC CONFERENCE ON THE WORLD CLIMATE RESEARCH PROGRAMME, Geneva, Switzerland.

8-12 September 1997—THIRD GEWEX HYDROMETEOROLOGY PANEL MEETING, Sapporo, Japan, for further information contact Tetsuzo Yasunari, Univ. of Tsukuba, Tsukuba, Ibaraki, Japan; Tel: 81-298-53-4399; Fax: 81-298-51-9764; E-mail: yasunari@atm.gev.tsukuba.ac.jp.

26-29 October 1997—SYMPOSIUM ON CLIMATE VARIABILITY, CLIMATE CHANGE AND WATER RESOURCE MANAGEMENT, Colorado Springs, Colorado, USA. For more information, consult Web Site: http//civil.colorado.edu/climate or GCIP Office, 1100 Wayne Avenue, Suite 1210, Silver Spring, Maryland, 20910, USA.

27-31 October 1997—WCRP FIRST INTERNATIONAL CONFERENCE ON REANALYSES, Washington, D.C. For information contact: International GEWEX Project Office, 1100 Wayne Avenue, Suite 1210; Silver Spring, Maryland, 20910, USA; Tel: (301) 427-2089 ext. 33; Fax: (301) 427-2222; E-mail: gewex@cais.com. For the Conference Web Site and links to reanalysis projects web sites: http://www.cais.com/gewex/gewex.html.

3-6 November 1997—POLAR PROCESSES AND GLOBAL CLIMATE, Orcas Island, Washington, USA (about 120km Northwest of Seattle). For further information contact ACSYS International Project Office, P.O. Box 5072 Majorstua, 0301 Oslo, Norway. Tel: 47-22-95-96-05; Fax: 47-22-95-96-01, or ACSYS web site: http://www.npolar.no and the ACSYS office E-mail is: acsys@polar.no.

3-7 November 1997—13TH SESSION OF WGNE, NOAA Science Center (World Weather Building), National Centers for Environmental Prediction, Camp Springs, Maryland, USA.

1-5 December 1997—GCSS SCIENCE PANEL MEETING, Boulder, Colorado, USA.

10-16 January 1998—AMERICAN METEOROLOGICAL SOCIETY ANNUAL MEETING, Phoenix, Arizona.

2-6 February 1998—GEWEX SCIENTIFIC STEERING GROUP, Brazil.

24-29 May 1998—OCEAN CIRCULATION AND CLIMATE THE 1988 WOCE CONFERENCE, Halifax, Nova Scotia, Canada. For conference information contact Andrea Frische, WOCE International Project Office, Southampton Oceanography Centre, Empress Dock, Southampton, SO14 3ZH, UK, Tel: 44 1703 596789; Fax: 44 1703 596204; E-mail: woceipo@soc.soton.ac.uk; or Conference Web Site: http://www.soc.soton.ac.uk/OTHERS/woceipo/wconf.

17-21 August 1998—INTERNATIONAL CONFERENCE ON SATELLITES, OCEANOGRAPHY AND SOCIETY, Lisbon, Portugal. For information contact D. Halpern, Jet Propulsion Laboratory, MS 300-323, California Institute of Technology, Pasadena, CA 91109-8099; Fax: 818/393-6720; E-mail: halpern@pacific.jpl.nasa.gov.

GEWEX REPORTS AND DOCUMENTS

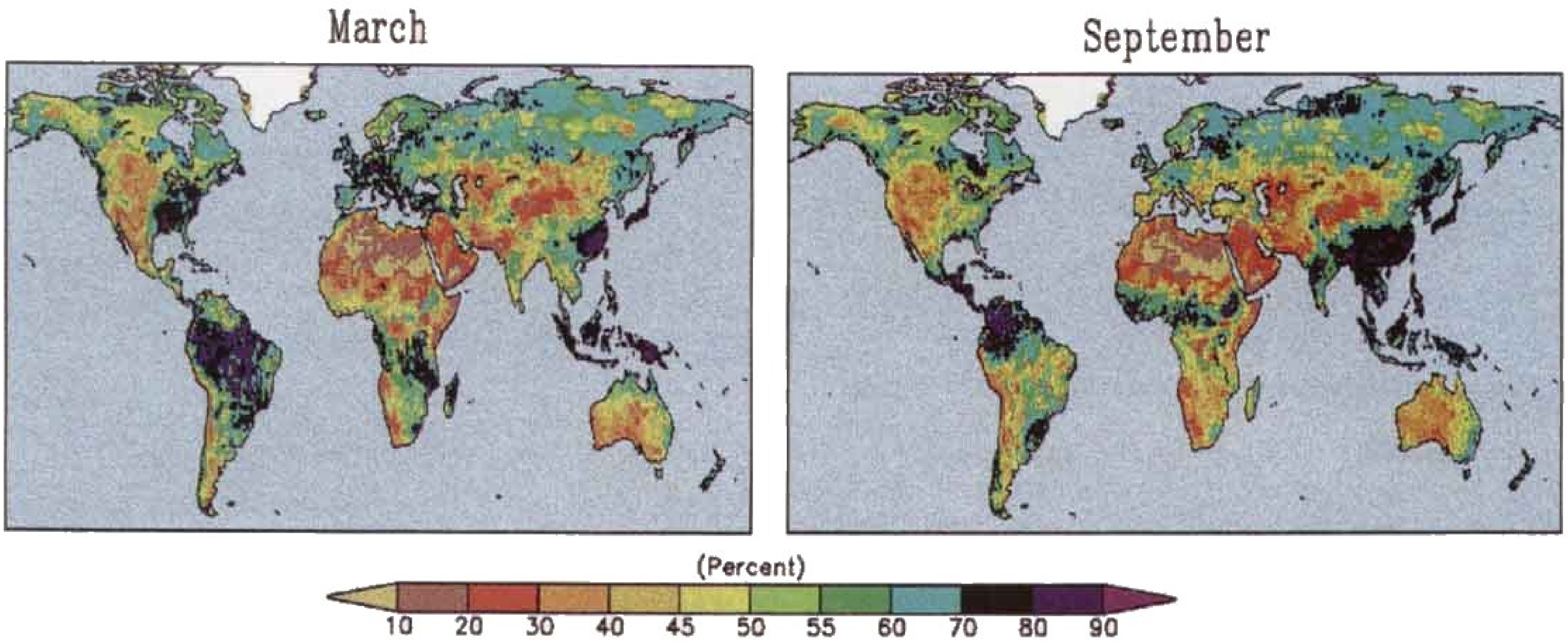
(Available from IGPO)

For complete listing of GEWEX reports and documents consult the GEWEX Web Site:

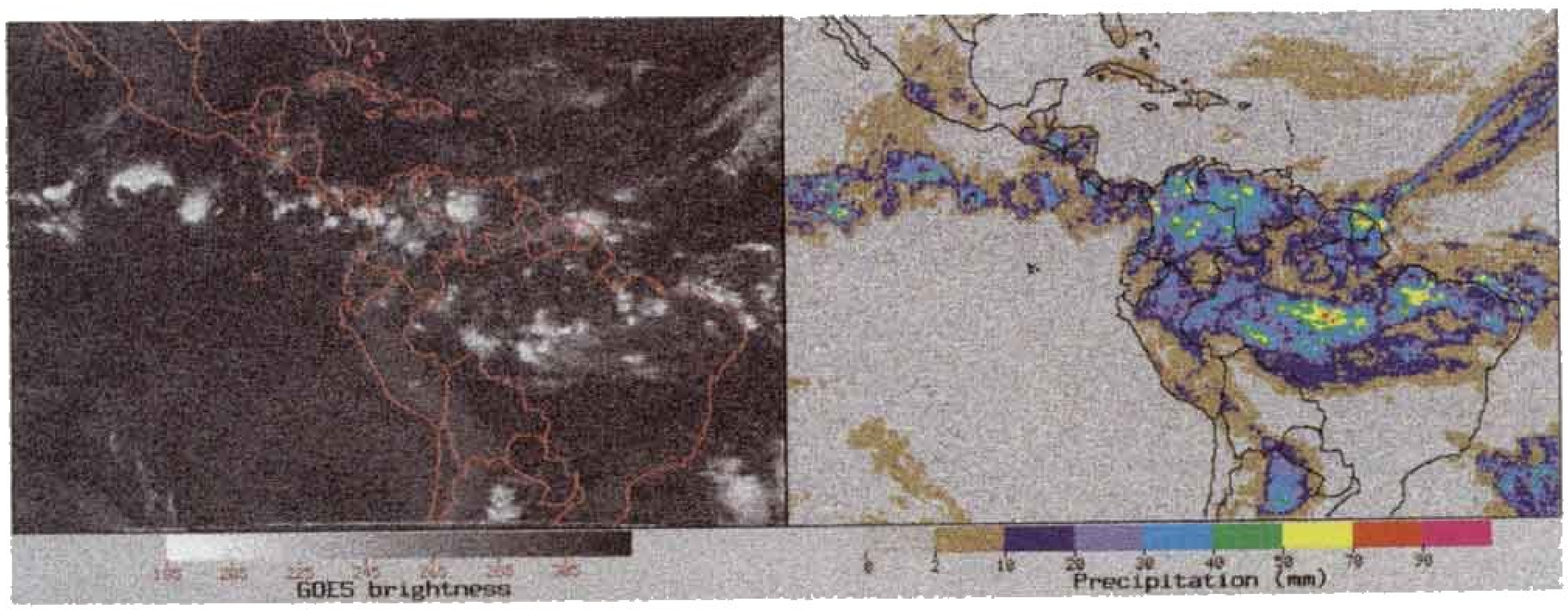
http://www.cais.com/gewex/gewex.html

WATER VAPOR CD-ROM

The February 1997 issue of GEWEX News incorrectly stated that a CD-ROM was currently available. Because the planned full data set is not yet complete, the CD-ROM will not be available until later. However, the data can be obtained (on-line/tape) from NASA at: NASA/Langley Research Center, Mail Stop 157B, Hampton, Virginia 23668, USA, Tel: (757) 864-8656, Fax: (757) 864-8807, E-mail: userserv@eosdis.larc.nasa.gov, Web Site: **http://eosdis.larc.nasa.gov.**



Root zone soil wetness from the COLA/SSiB LSP. *See GSWP article on page 3 for explanation.*



University of Arizona, Department of Hydrology and Water Resources, Web Site for PERSIANN system for estimating precipitation for satellite-based data. Shown here are daily estimates for Pan American region on May 3, 1996. *See article on page 1.*

GEWEX NEWS

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