

World Climate Research Programme—WCRP



Location in central Canada of the Boreal Ecosystem-Atmosphere Study (BOREAS). BOREAS is an element of the GEWEX International Satellite Land Surface Climatology Project (ISLSCP) (see page 6).

### THE RELATIVE CONTRIBUTIONS OF LAND AND OCEAN PROCESSES TO PRECIPITATION VARIABILITY: SUMMARY OF A GCM STUDY

Randal D. Koster and Max J. Suarez  
NASA/Goddard Space Flight Center

In an atmospheric general circulation model (GCM), temporal variability in the surface boundary conditions can be disabled at will. We take advantage of this temporal variability in a series of integrations designed to examine how land processes (as represented by interactive land hydrology) and ocean processes (as represented by time-varying sea surface temperatures, or SSTs) contribute to precipitation variability. The integrations employ Aries, a GCM developed at the NASA/Goddard Space Flight Center, coupled to a sophisticated land-surface model that includes explicit vegetation control over the surface energy balance (Koster and Suarez, 1992).

(Continued on page 3)

### WHAT'S NEW IN GEWEX

- GEWEX Establishes Outreach Focus Program
- GCIP Conducts Integrated Systems Test
- BOREAS/ISLSCP Yields Initial Results
- PILPS Update
- New GCIP CD-ROM Available
- GAME and GCIP Highlighted at Hong Kong Meeting
- GCSS Boundary Layer Workshop Held
- Soil Moisture Changes Measured from Space

#### In This Issue

Contributions to Land and Ocean Precipitation	1
Commentary—GEWEX Outreach	2
GIDS-1 CD-ROM	4
GCIP Integrated Systems Test	4
GCIP Data Available	5
Boreal Forest and Climate Change	6
Soil Moisture Studies	8
PILPS Current Experiments	9
Meeting Summaries	10
Meeting Announcements	11
GEWEX Meetings Calendar	14
GEWEX Reports and Documents	15

## COMMENTARY

### GEWEX OUTREACH

**Moustafa T. Chahine, Chairman  
GEWEX Science Steering Group**

I would like to outline a new focus for the GEWEX program, which I term: "GEWEX Outreach." The purpose of GEWEX Outreach is to provide better integration across scientific disciplines and to better develop the pathways to collaboration and cooperation with efforts outside the GEWEX programmatic umbrella. GEWEX Outreach has three principal thrusts: (1) integration of data streams and optimal use of the data sets produced by the diverse spaceborne instruments of the space agencies; (2) improved connections to other scientific programs; and (3) increased support of climate impact assessment studies.

**Thrust #1:** All GEWEX component project programs must contribute to improved integration of available global data streams, fully exploiting the capabilities of the current suite of operational and research satellites and must prepare to utilize the enhanced capabilities of planned future systems.

As an example, the International Satellite Cloud Climatology Project (ISCCP) has produced valuable research quality global data sets of cloud radiative properties combining the sensor output from European, Japanese and U.S. satellites. Recently, ISCCP proposed an extended program, integrating added sensor data from current satellites to provide improved information on optically thin high clouds, cloud particle size, snow/ice discrimination, and cloud liquid water content. As new systems are deployed, ISCCP will utilize the improved spectral and temporal coverage they provide. In addition, the Global Precipitation Climatology Project (GPCP) and the GEWEX Water Vapor Project (GVaP), now integrating infrared, microwave, and surface-based sensors into global data sets, are also providing the foundation for integrating the full scope of the Earth Observing System (EOS), and Japanese and European space sensors and are providing key contributions to Mission to Planet Earth activities.

**Thrust #2:** All GEWEX component projects must increase their dialogue with other programs, both within and outside of the WCRP, to determine what products (data, models) can be exchanged and what efforts (process studies, regional experiments) can benefit from combined planning and implementation.

For several years, this type of dialogue has been conducted between the GEWEX International Satellite Land Surface Climatology Project (ISLSCP) and the International Geosphere-Biosphere Program on Biospheric Aspects of the Hydrologic Cycle (BAHC). One result has been the close coordination of efforts in the planning for a hydrological and biogeochemical experiment in the Amazon Basin. A similar dialogue is underway with the Climate Variability and Predictability (CLIVAR)/Global Ocean and Land Surface (GOALS) program. Three areas have been identified where collaboration between GEWEX and CLIVAR/GOALS is expected to be fruitful. First, the GOALS program depends upon GEWEX to develop improved land-surface/atmosphere models. In turn, GEWEX will benefit from improved knowledge of the variability and predictability of the global and regional hydrological cycle over ocean and from the improved models of air-sea flux exchanges. Second, in order to validate climate model predictions, GOALS requires global climatologies of important surface and atmospheric parameters under development by GEWEX. These include atmospheric water vapor (within GVaP) and a surface wetness index (within ISLSCP). Third, certain regional hydrological experiments and process studies can provide observations of importance to both programs and will be planned and executed jointly. These efforts include the GEWEX Asian Monsoon Experiment (GAME) and may include some future activities within the GEWEX Cloud System Study (GCSS).

**Thrust #3:** All GEWEX component projects must develop an approach to contribute to climate impact assessment studies.

A first, new step in this direction will be the formulation of a scientific plan, within GEWEX, to address the impact of aerosols on climate, with special emphasis on anthropogenic aerosols. Other GEWEX component projects are actively developing the tools needed for accurate implementation of assessment studies [e.g., impacts on water resources (GCIP), results from landcover and albedo changes (ISLSCP), aerosol influences on the surface radiation budget (SRB)] and will need to expand these efforts.

I have proposed these new thrusts because I believe that GEWEX Outreach will magnify the scientific results of individual scientific projects. I encourage the international scientific community to communicate with the International GEWEX Project Office and with the GEWEX scientific projects to explore additional means of cooperation.

## LAND AND OCEAN CONTRIBUTIONS TO PRECIPITATION

(Continued from page 1)

Four decadal simulations at a  $4^\circ \times 5^\circ$  resolution were performed. In these simulations, land and ocean influences were artificially turned on or off as follows:

- a. *Simulation with Land and Ocean Enabled (ALO)*

A 10-yr simulation with the coupled atmosphere and land models forced with interannually varying SSTs—the same SST anomalies used in the Atmospheric Model Intercomparison Project.

- b. *Simulation with Land Enabled, Ocean "Fixed" (AL)*

A 20-yr simulation with the coupled atmosphere and land models forced by climatological SSTs.

- c. *Simulation with Ocean Enabled, Land "Fixed" (AO)*

A 10-yr simulation of the atmospheric GCM alone, forced with the interannually varying SSTs and by the climatological mean behavior of the land surface.

- d. *Simulation with Ocean and Land "Fixed" (A)*

A 20-yr simulation of the atmospheric GCM alone, forced with climatological SSTs and by the climatological mean behavior of the land surface.

In simulations A and AO, the land surface model is fully decoupled from the GCM and replaced by a prescription of climatological " $\beta$ s", i.e., climatological values of the ratio between evaporation and potential evaporation, as determined from a multiyear subset of simulation AL. The climatological  $\beta$ s and SSTs vary seasonally, but contain no diurnal, synoptic-scale, or interannual variations.

In Figs. 1 and 2, the precipitation variability is characterized by the standard deviation of annual precipitation. The histograms show the grid square standard deviations averaged over the land within northern midlatitudes ( $30^\circ\text{N}$ – $50^\circ\text{N}$ ) and the tropics ( $10^\circ\text{S}$ – $10^\circ\text{N}$ ). The figures show that when only

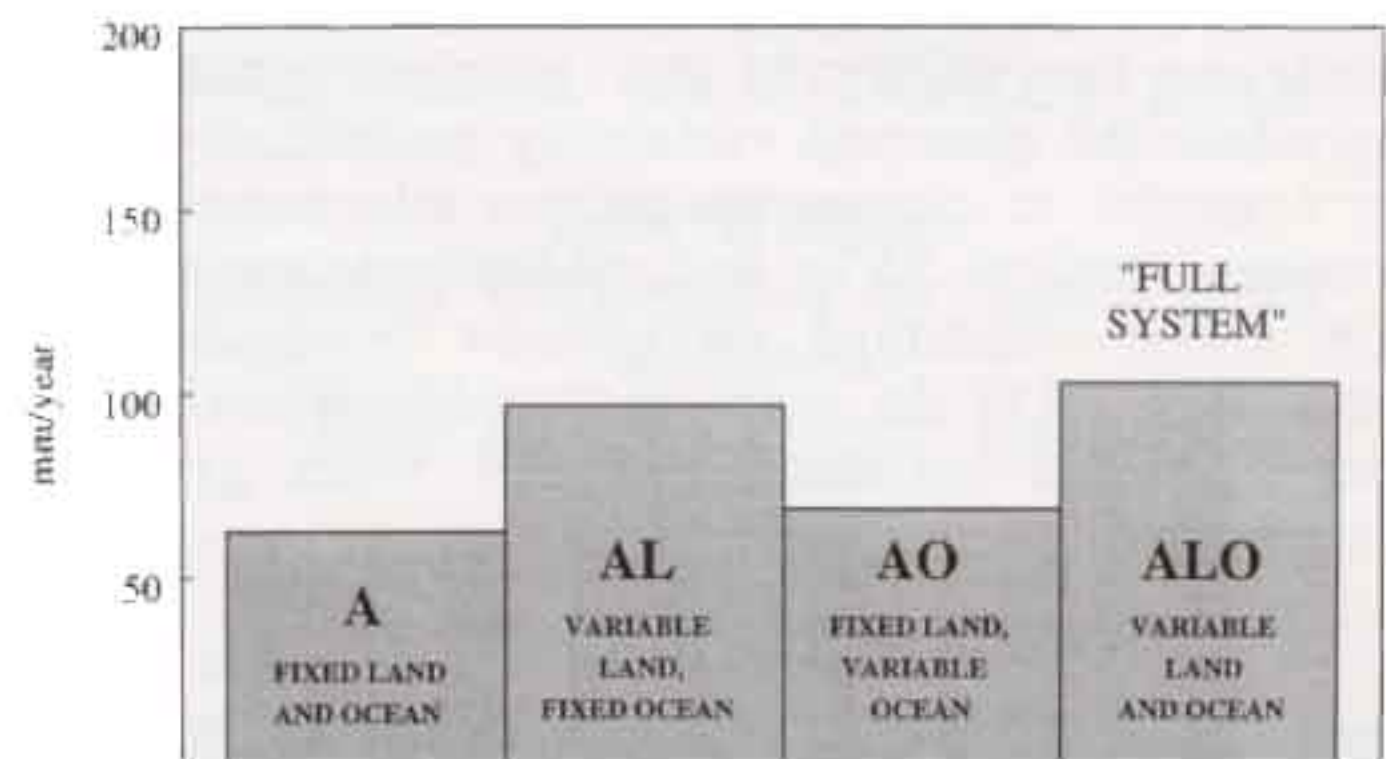


Figure 1. Standard deviations of annual precipitation: Midlatitude land.

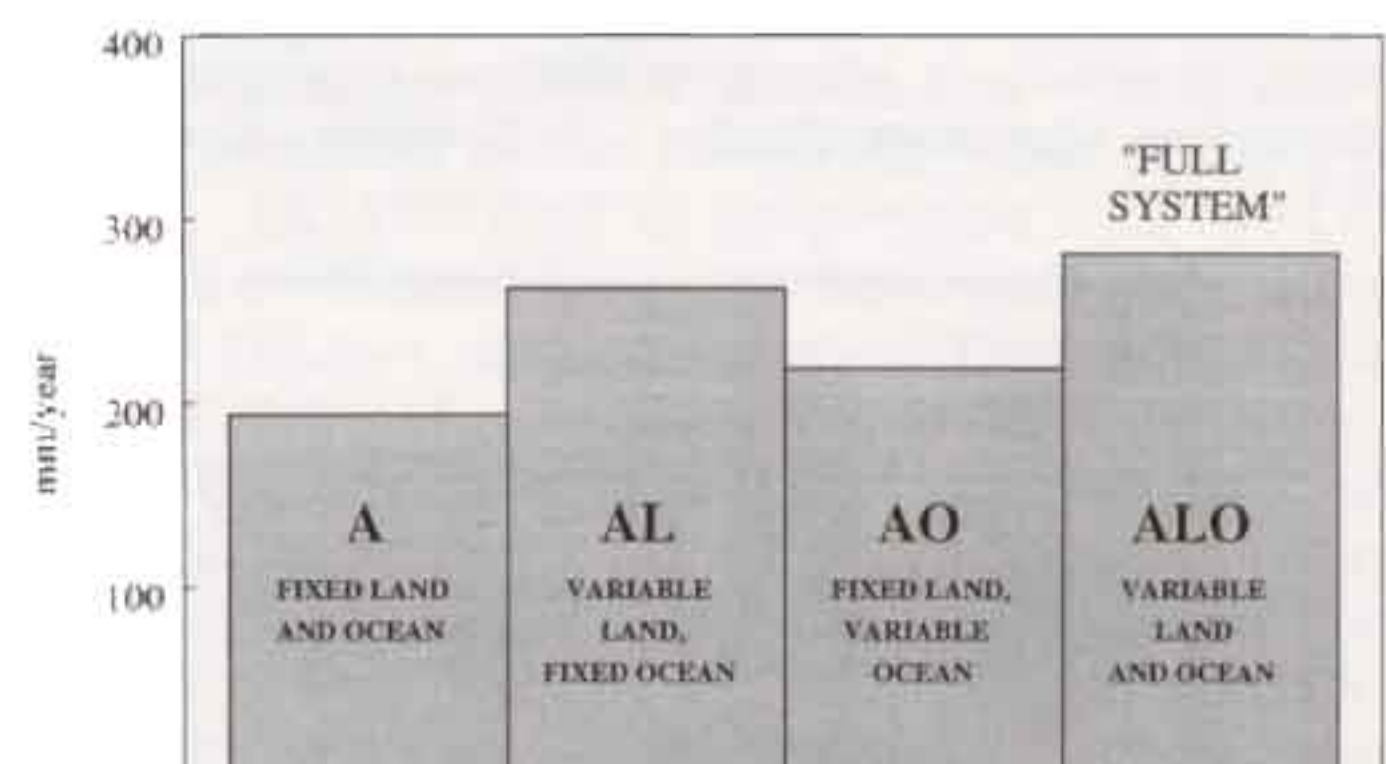


Figure 2. Standard deviation of annual precipitation: Tropical land.

SSTs are variable, precipitation variability over continents is limited. Precipitation variability approaches that of the full system, as represented by simulation ALO, only when the land surface hydrology is interactive.

According to this study, land processes dominate over ocean processes in defining precipitation variability over land. Sea surface temperature variations may indeed promote precipitation anomalies, but the interactive nature of the land surface—particularly the retention of soil moisture following precipitation events—is apparently necessary to amplify them. This finding is supported by the significant lagged correlation between precipitation and the following month's evaporation in simulations AL and ALO (not shown), correlations that are, of course, absent in simulations A and AO. Further analysis of the data shows that the contribution from interactive land hydrology is strongest during summer, when evaporation anomalies are largest and when moist convection provides most of a region's precipitation.

The accuracy of these results, of course, depends on the ability of the coupled models to reproduce the observed variability realistically and, for example, to capture the proper teleconnections between tropical SSTs and midlatitude precipitation. The standard deviations produced by simulation ALO do seem reasonable when compared against estimates derived from gridded observational precipitation data.

A complete description of these results has been submitted for publication in the *Journal of Geophysical Research*.

**Reference**

Koster, R., and M. Suarez, 1992: Modeling the land surface boundary in climate models as a composite of independent vegetation stands. *J. Geophys. Res.*, **97**, 2697-2715.

**FIRST OF THE GCIP INITIAL DATA SETS (GIDS-1) NOW AVAILABLE ON CD-ROM**



This CD-ROM is available from the IGPO (see p. 15 for address). In addition, copies of the CD-ROM and "browse" software package are available from UCAR/OFPS upon request. Direct OFPS requests by telephone 303-497-8987, electronic mail (Internet: [sfw@ncar.ucar.edu](mailto:sfw@ncar.ucar.edu)), or conventional mail (UCAR/Office of Field Project Support, P.O. Box 3000, Boulder, CO 80307). See page 5.

**GCIP INTEGRATED SYSTEMS TEST**

**John A. Leese**  
**GCIP Office**

The data acquisition portion of the GEWEX Continental-Scale International Project (GCIP) Integrated Systems Test (GIST), essentially a GCIP pilot study prior to the start of the 5-yr Enhanced Observing Period in 1995, was conducted during the period 1 April - 31 August 1994. The primary purpose of GIST is the execution of a logistical test of data-stream integrity, archival procedures, and distribution to an international community. The test emphasizes the assessment of the data acquired from the new systems being implemented by the United States to modernize the National Weather Services, including the Doppler Radar (WSR-88D) and the new generation of geostationary satellites (GOES I series). The new regional mesoscale atmospheric models being implemented by the Canadian and U.S. meteorological centers are also an area of emphasis for GIST. It was recognized during the implementation planning for GCIP that the combination of such new systems together with a number of collaborative groups such as the Atmospheric Radiation Measurement (ARM) Program and the International Satellite Land Surface Climatology Project (ISLSCP), and a distributed archival strategy, will collectively require some period of adjustment prior to the implementation of the Enhanced Observing Period (EOP).

The geographical area for GIST is shown in Fig. 1. The area encompassed by the large irregular shaped polygon defines the area of the Arkansas-Red River basin. This area encompasses the southwestern Great Plains site for the Cloud and Radiation Testbed facility labeled as the CART/ARM site in the figure. A GCIP/ARM intensive upper air observing period was conducted at this site during a 6-week period in July and August.

The large east-west gradients of climate variables, especially precipitation, coupled with the unusually diverse mix of atmospheric and surface hydrological data were the principal reasons for selecting the area shown in Fig. 1 for GIST and the first 2 years of the EOP. This area of the Mississippi River basin is data rich since most of the new systems being implemented as part of the upgrade of the U.S. observing network are already operating in the GIST region. In addition to the

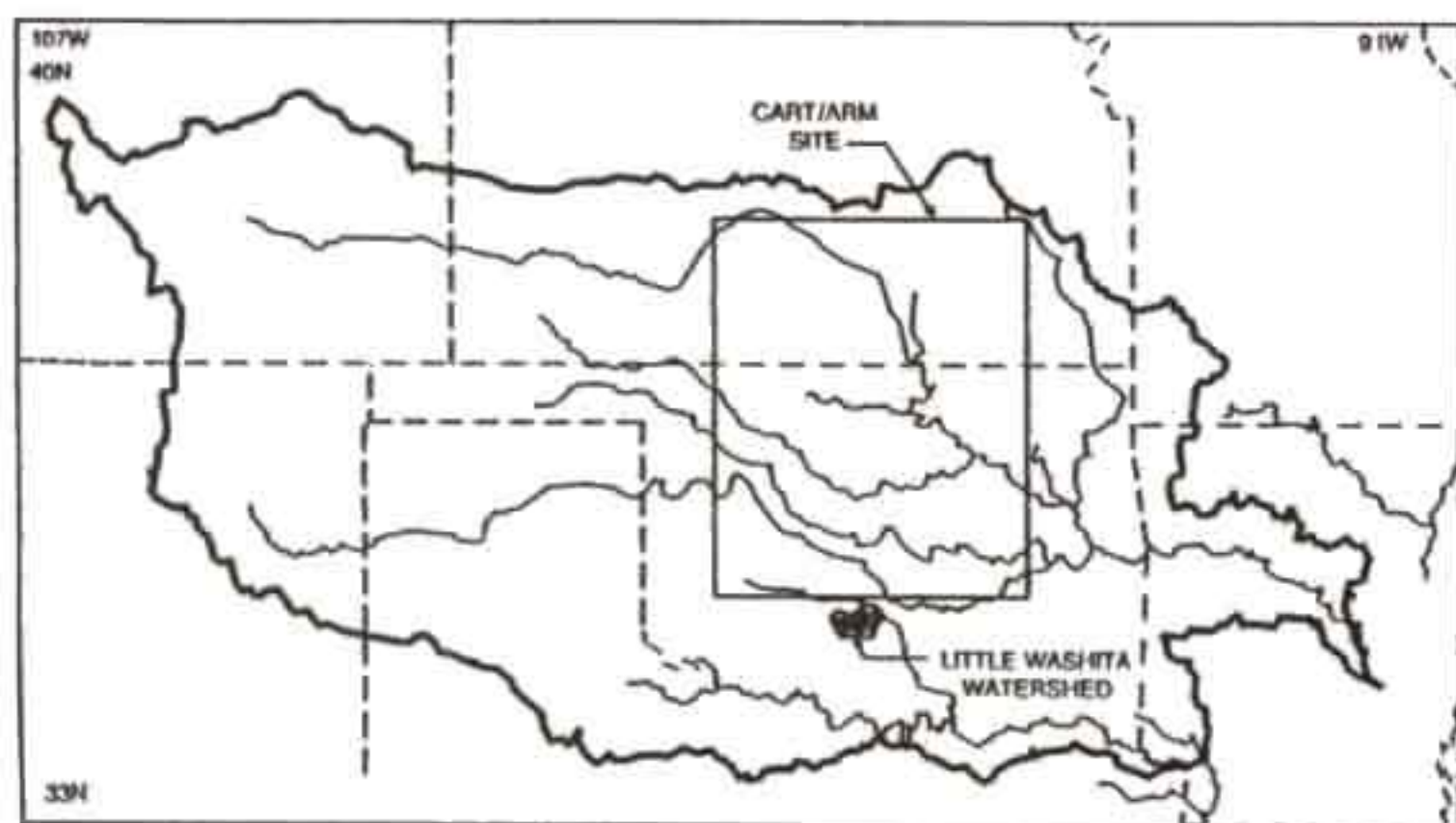


Figure 1. Geographical area for GIST.

large east-west variation in climate, four other environmental features are significant:

- Large water vapor transfer by a low-level jet across the southern boundary
- Significant warm season convective contributions to precipitation
- Large diurnal variability in summer for hydrological components such as water vapor transport and convective regimes
- Significant seasonal storage of soil and vegetative moisture.

The observations and model output data collected during GIST are being used to build the third of the GCIP initial data sets. This data set is expected to be completed by the end of June 1995. Portions of the GIST data set will be made available earlier through the UCAR/CODIAC system, and these will be announced as they become available.

#### EDITOR'S NOTE

Deadline for contributions to the February 1995 issue of *GEWEX News* is 20 December 1994.

## A GCIP DATA SET AVAILABLE ON COMPACT DISK

Steve Williams  
University Corporation for Atmospheric  
Research  
Office of Field Project Support

John Leese  
GCIP Office

The first of the GCIP Initial Data Sets (GIDS-1) is currently available through on-line access using the UCAR/Office of Field Project Support (OFPS) CODIAC (COoperative Distributed Interactive Atmospheric Catalog) system. Further information regarding GIDS-1 and access via CODIAC were provided in the June 1994 issue of *GEWEX News*. UCAR/OFPS in cooperation with NOAA's Office of Global Programs have published a subset of GIDS-1 data on Compact Disk (CD-ROM). The CD-ROM (available from the International GEWEX Project Office) contains atmospheric and hydrologic data for the Central Mississippi River basin for the period 1 February through 30 April 1992. The CD-ROM includes imagery (GOES-7 satellite infrared, radar composites, surface/upper air maps, and vegetation index), surface meteorological composites, rawinsonde and profiler data, hydrologic data (streamflow, discharge), soil moisture data, observing station lists, and complete file documentation. The CD-ROM has been mastered in ISO9660, allowing for easy use on a variety of systems (i.e., DOS-based personal computers, UNIX, and Macintosh).

The data on the CD-ROM are provided in a format compatible with a variety of commercially available software packages (i.e., GIF image viewers and most spreadsheets). Also, a preliminary "browse" software tool set compatible for use with the CD-ROM has been compiled and is available through UCAR/OFPS. This version 1.0 software package (distributed separately) contains: (1) software to uncompress the profiler data; (2) a GIF viewer to display the image files; (3) a thermodynamic diagram (SkewT/LogP) plotter to display the rawinsonde data; (4) a plotter to display vertical time series plots of profiler winds; and (5) a time series plotter to display surface observation data. Various versions of this software package compatible with DOS-based personal computers, UNIX, or Macintosh are included.

## BOREAL FOREST AND CLIMATE CHANGE

Piers Sellers  
and  
Forrest Hall  
on behalf of the  
BOREAS Team

NASA/Goddard Space Flight Center

The Boreal Ecosystem-Atmosphere Study (BOREAS) is an activity sponsored by the GEWEX International Satellite Land Surface Climatology Project (ISLSCP), as well as other international organizations. The scientific goal of BOREAS is to gain an understanding of how predominantly coniferous forests impact global climate change. To improve understanding of boreal forest processes on climate change, scientists are examining the exchange of heat, energy, water and key gases such as carbon dioxide between boreal forests and the atmosphere.

Planning for the implementation of BOREAS began in 1990. The area selected covers over a million square kilometers of the Canadian Provinces of Saskatchewan and Manitoba. Within this large forested region, two study areas, each about 50 by 100 km, were identified (see figure on page 1). The first site is close to the southern edge of the boreal forest and the other relatively close to the northern edge. Several field campaigns occurring in 1993 and 1994 included ground measurements, eleven instrumented aircraft, and the acquisition of satellite data. Data from these diverse sources will be compiled for use by the international science community. ISLSCP has produced similar data sets in the past, e.g., from the FIFE experiment (available on CD-ROM), and BOREAS will continue that tradition.

A focused winter campaign (FFC-W) carried out during the winter period of 2-18 February 1994 was successful in spite of brutal weather conditions (-45°C). The field teams still managed to sample snow transects arranged under remote sensing aircraft flight lines. The aircraft involved were: the Canadian National Research Council Twin Otter carrying NASA/Goddard Space Flight Center microwave radiometers; the National Oceanic and Atmospheric Administration (NOAA) Aerocommander, equipped with a gamma-ray sensing package; the Canadian Chieftain, equipped with an imaging spectrometer, CASI; and the NASA ER-2, equipped with the MODIS Airborne Simulator (MAS). FFC-W was followed by another focused

field campaign (FFC-T) targeted at studying the forest during the thaw. FFC-T ran for 3 weeks in April.

The first full-up Intensive Field Campaign (IFC-1) of BOREAS took place from 24 May through 16 June 1994. At the outset of IFC-1, approximately 150 scientists were at work on the ground, taking a wide range of meteorological, ecological, hydrological and remote sensing measurements. These scientists were mainly divided between the two mesoscale study areas. The Northern Study Area (NSA) is located near Thompson, Manitoba and is the focus for investigation of temperature-limited processes, while the Southern Study Area (SSA) near Prince Albert, Saskatchewan (some 400 miles and a time zone away from the NSA) is the center for studies of those processes that determine the Southern boundary of the boreal forest.



*University of Wyoming Kingair (Flux Aircraft) deployed in BOREAS.*

A small air force of research aircraft was committed to the SSA for the first half (24 May through 6 June) of IFC-1. Four flux measurement aircraft (U. Wyoming Kingair, NCAR Electra, Canadian NRC Twin Otter, NOAA Long EZ) and three remote sensing aircraft (NASA C-130, NASA Helicopter, Canada's Chieftain) were based at Prince Albert airport or nearby Saskatoon (NCAR Electra). The NASA ER-2 and DC-8 also flew missions over the study areas from Spokane, Washington and NASA/Ames Research Center, respectively. The locally based aircraft completed their assigned missions by 6 June 1994, after which five of them—the C-130, helicopter, Chieftain, Kingair and Twin Otter—moved the 400 miles up to the NSA to complete a large number of missions there in two days of glorious weather on 6-8 June 1994. A huge forest fire just north of the NSA trailed a smoke plume over the study area for a few days near the end of IFC-1, which closed down remote sensing work but, fortunately, it was extinguished before roasting any investigators or equipment. In all, nearly 100 airborne missions were flown during IFC-1.

**Preliminary results from IFC-1 were surprising because they showed that the boreal forest was releasing very little water vapor to the atmosphere (Bowen ratios of 2 to 5 were**

commonplace) with the result that the atmospheric boundary layer, pumped by large amounts of surface sensible heat flux, often reached 3000 m in depth. The period of the IFC-1 also bracketed the leaf-out of deciduous species with associated dramatic changes in CO<sub>2</sub> and water vapor flux. The wetland areas showed surprisingly low rates of water and CO<sub>2</sub> exchange, partly because of frozen soil/water layers of 30–100 cm in depth. The picture that emerges is of a system that is “wet” hydrologically, i.e., the soils and fens are often saturated, but a relatively small fraction escapes by evapotranspiration, at least during this early part of the growing season.



*Double-scaffold flux measurement tower at the Old Black Spruce site in the BOREAS Southern Study Area.*

The second intensive field campaign of BOREAS (IFC-2) ran from 19 July 1994 through 10 August 1994. Once again, the initial focus was in the Southern Study Area (SSA) near Prince Albert, Saskatchewan. Most of the research aircraft were based at the airport and many of the teams working on remote sensing science had set up sites within the nearby forest in the SSA. On 21 July 1994, 2 days after the start of IFC-2, a high pressure ridge moved over the SSA and sat there for about 12 hours giving beautiful clear sky conditions over the entire 140 × 60 km area. All 11 aircraft that were committed to the experiment flew that day for a record total of 16 research missions. The resulting data set is truly impressive. In addition to the continuous surface measurements made by the 25 science teams on the surface, the aircraft collected a wide range of coordinated optical (ER-2, C-130, Chieftain, NASA Helicopter) and microwave (DC-8, CV-580) remote sensing data, and a comprehensive set of low-level surface flux measurements (NCAR Electra, U. Wyoming Kingair, Canadian NRC Twin Otter, NOAA LongEz). In addition, a NOAA aircraft acquired gamma-ray (soil moisture) data. This day’s work will stand out as a definitive *Golden Day* for BOREAS.

After a few more days of activity near Prince Albert, the BOREAS air force moved up to Thompson, Manitoba, some 400 miles away, to work at the Northern Study Area (NSA) on 26 July 1994. At this point, the incredible streak of good luck that BOREAS had enjoyed from the beginning showed signs of flagging. A number of huge forest fires were raging across Northern Canada from Manitoba all the way to British Columbia. The nearest fire to

the NSA was located in the bush some 30 miles north (and directly upwind) of the area; this fire alone was burning on a 20-mile front. Visibility at Thompson Airport dropped steadily for several days to the point where all air traffic was subject to instrument flight rules (less than 3/4 miles forward visibility) and even the heavy smokers on the project cried “enough!” Collecting good data under these conditions was difficult for many parts of the project and obviously impossible for most of the aircraft equipped with optical remote sensing equipment.

On the last morning of IFC-2, the skies cleared for just over 2 hours, long enough for the NASA aircraft to acquire a minimum data set. Among other things, the NASA C-130 acquired MAS data over both the SSA and NSA during this campaign.

BOREAS IFC-3 began on 30 August 1994 with a completion date of 19 September 1994. Late in the IFC, on 16 September, the skies cleared over the SSA for a perfect day of missions by all seven research aircraft present. The clear sky conditions moved over the NSA on 17 September 1994 with the remote sensing aircraft in pursuit. Most of the remote sensing missions of IFC-3 were thus accomplished in the last two days.

Scientists from Canada, the United States, France, the United Kingdom, Scandinavian countries, and Russia are participating in BOREAS. The project is primarily sponsored by the United States and Canadian government agencies. The lead agencies in the United States are the National Aeronautics and Space Administration (NASA) and National Oceanic and Atmospheric Administration (NOAA) and collaborating agencies including the National Science Foundation (NSF) and Environmental Protection Agency (EPA). In Canada, the lead organization is the Canadian Centre for Remote Sensing of Natural Resources Canada. Collaborating agencies include Agriculture and Agri-Food Canada, Atmospheric Environment Service of Environment Canada, Canadian Forest Service of Natural Resources, National Research Council of Canada, Natural Sciences and Engineering Research Council, Canadian Global Change Program of The Royal Society of Canada, and Parks Canada Heritage.

## SOIL MOISTURE STUDIES IN THE LITTLE WASHITA WATERSHED

Edwin Engman  
NASA/Goddard Space Flight Center

The Little Washita Watershed near Chickasha, Oklahoma is one of the hydrology supersites for NASA Space Shuttle Endeavour's Shuttle Imaging Radar (SIR) mission. The Little Washita has been the focus of hydrological research by the U.S. Department of Agriculture, Agricultural Research Service, since 1961 and is one of the best and most comprehensively instrumented research basins in the world. The objective of the Shuttle's mission in Oklahoma is to evaluate the capability of the imaging radar to measure soil moisture.

The Shuttle Imaging Radar-C and X-Band Synthetic Aperture Radar (SIR-C/X-SAR) is a cooperative space shuttle experiment between the National Aeronautics and Space Administration (NASA), the German Space Agency (DARA), and the Italian Space Agency (ASI). The experiment is the next evolutionary step in NASA's spaceborne imaging radar program that began with the Seasat Synthetic Aperture Radar (SAR) in 1978, and continued with SIR-A in 1981 and SIR-B in 1984. The SIR-C/X-SAR mission benefits from synergism with the Magellan mission to Venus, other international spaceborne radar programs, and prototype aircraft sensors such as the JPL Airborne SAR (AIRSAR) and the German Aerospace Establishment (DLR) E-SAR.

SIR-C provides increased capability over Seasat, SIR-A, and SIR-B by acquiring digital images simultaneously at two microwave wavelengths ( $\lambda$ ): L-band ( $\lambda \cong 24$  cm) and C-band ( $\lambda \cong 6$  cm). These vertically and horizontally polarized transmitted waves will be received on two separate channels so that SIR-C will provide images of the magnitude of radar backscatter for every polarization configuration. The radar polarimetric data will yield more detailed information about the surface geometric structure, vegetation cover, and subsurface discontinuities than image brightness alone. X-SAR will also operate at X-band ( $\lambda \cong 3$  cm) with VV polarization,

resulting in a three-frequency capability for the total SIR-C/X-SAR system. Because radar backscatter is most strongly influenced by objects comparable in size to the radar wavelength, this multifrequency capability will provide information about the Earth's surface over a wide range of scales not discernible with previous single-frequency experiments.

The SIR-C/X-SAR mission extends the capability of an aircraft campaign by providing regional-scale data on a rapid temporal scale. By having multiple flights, insights on seasonal variations for the key science issues will also be provided. Such validation and algorithm development studies are critical for developing future mission concepts. The Little Washita is the site of extensive surface measurements that provide critical ground truth data used in the development of algorithms needed to produce quantitative estimates of soil moisture for the radar measurements. The Little Washita research facility gives us the opportunity to collect soil moisture data during the shuttle overpass to validate the instrument and, perhaps more importantly, allows us to interpret these measurements within a hydrological framework. The hydrological context allows us to study the utility of soil moisture measurements and how they control or affect hydrologic processes such as infiltration,

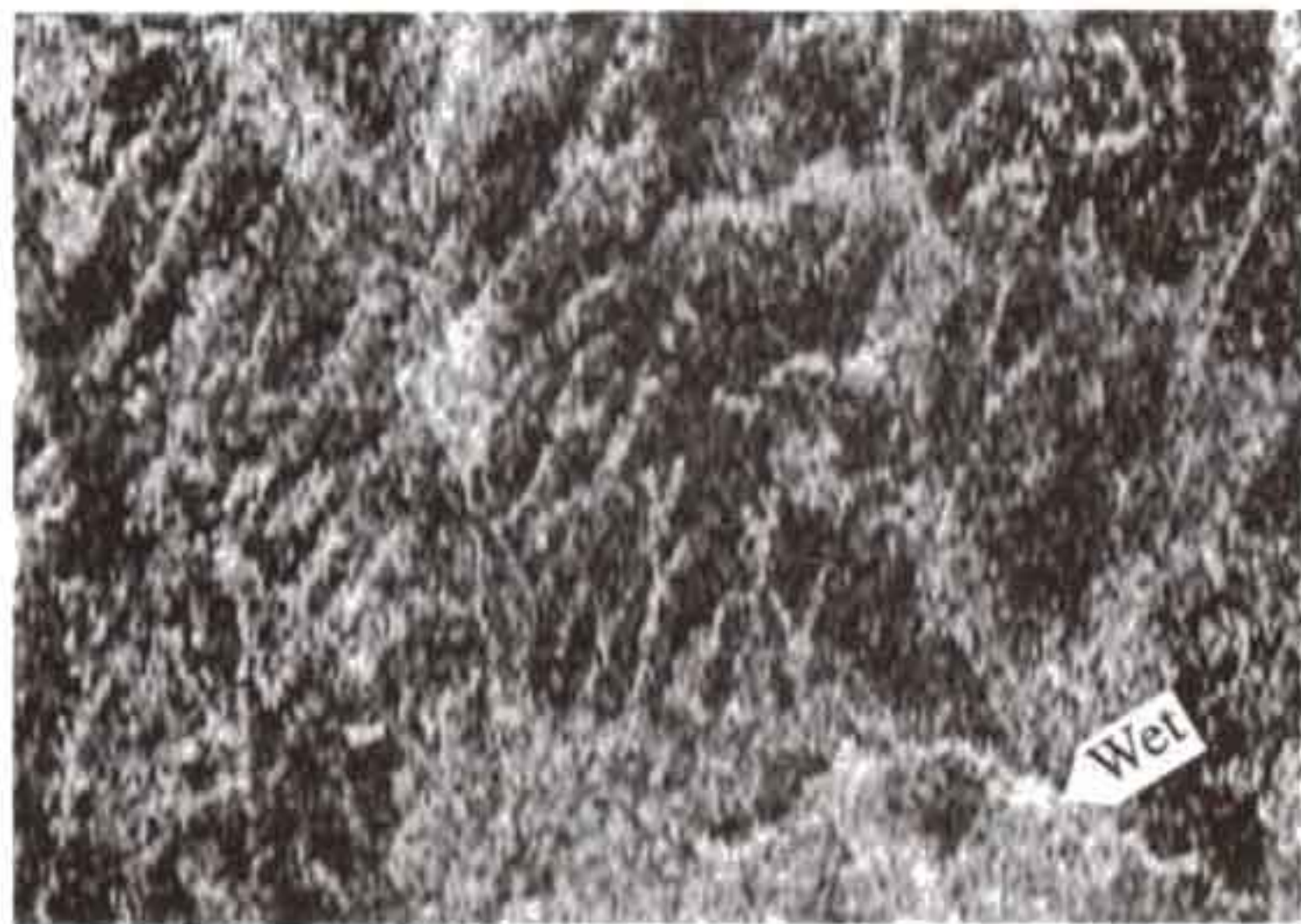


Figure 1. Preliminary Shuttle Imaging Radar image of the Little Washita Watershed near Chickasha, Oklahoma for a relatively wet day of 12 April 1994.



runoff, evaporation and the partitioning of latent and sensible heat.

The first SIR-C/X-SAR mission was flown during the period of 9–18 April, and during that time the shuttle imaged the Little Washita Watershed eleven times. Fortunately during that period, rain did occur just after launch so that we could observe changes in soil moisture. Figures 1 and 2 show some preliminary data of a part of the Little Washita Watershed for two dates, 12 April (a relatively wet day) and the 15th (after considerable drying has occurred). These C-band polarization images illustrate the contrast resulting from changes in soil moisture: the Fig. 1 (wetter) image appears slightly brighter than the image in Fig. 2. The average volumetric soil moisture change during this period was from about 20% to 10–12%. Additional data have been collected from a second mission on Space Shuttle Endeavour that was flown from 30 September – 11 October 1994. As in the April 1994 mission, extensive ground data collection activities were carried out in the Little Washita Watershed to validate the soil moisture algorithms. This second mission provides data with different soil moisture conditions and different land cover patterns.

## THE PROJECT FOR INTERCOMPARISON OF LAND-SURFACE PARAMETERIZATION SCHEMES (PILPS): CURRENT EXPERIMENTS

**T. H. Chen and A. Henderson-Sellers**  
Climatic Impacts Centre  
Macquarie University  
Sydney, Australia

Since the PILPS meeting in London (part of the GEWEX European Conference), 21 July 1994, it has become clear that some of the scatter we observed in the past PILPS experiments results was due to inconsistencies. At the meeting, a set of criteria was presented against which to check the submitted outputs of the PILPS Phase 1*b* experiment—synthetic forcing from a GCM—for various types of internal consistency.

To indicate the problem, Table 1 lists the checks of annual water balance and energy balance that have been applied on the recently submitted output files of the PILPS Phase 2*a* experiment (comparison with observational data from Cabauw, The Netherlands). We should point out that the figures in the table should not be linked to any notion of “quality” of individual schemes because many factors may affect performance in these tests. Twelve of the 23 schemes shown in the table exhibit problems with model internal consistencies. Following this finding, it was agreed to re-run some of the previous PILPS experiments.

Currently, PILPS participants have been requested to run a “Fangio-type” experiment. It includes a standard simulation, which is the re-run of Phase 2*a* experiment, and along with two sensitivity tests, in which the air temperature in the forcing is artificially raised by 2°C and reduced by 2°C throughout the simulation period (one year). At the same time, the PILPS Phase 1*c* experiments, a redesigned set of Phase 1*b*, are also progressing. In both Phase 2*a* and 1*c* experiments, a major issue is that results must satisfy pre-defined basic consistency checks, such as water and energy balances, before they can be included for PILPS intercomparison. In addition, modelers are now required to use the PILPS experiment redesigned output procedure for the purpose of standardizing and providing assistance in the



Figure 2. Same region as Figure 1 for a dry day 15 April 1994.

**Table 1. Annual Water and Energy Residuals of PILPS Experiment Outputs from Phase 2a. The + indicates that the scheme exceeded at least one of the cutoff values of 3 mm/yr for Water Residual (WR) and 3 Wm<sup>-2</sup> for Energy Residual (ER).**

Scheme	WR mm/yr	ER Wm <sup>-2</sup>
BATS	-0.00	-2.56
BEST	-0.02	-0.32
BUCK	-0.50	0.55
+CLASS	-0.03	3.57
+CSIRO9	-3.63	-2.50
GISS	0.02	-0.35
ISBA	-0.21	0.12
+LEAF	-301.64	16.86
MOSAIC	0.01	0.01
+NMC_CAPS1	-4.08	-3.34
+NMC_CAPS2	29.94	-4.74
+CAPS	-8.11	-23.93
PLACE	-1.45	0.40
+SPONSOR	-1164.30	8.25
SSIB	-0.02	0.11
UKMO	0.04	0.05
+VIC	-35.16	1.39
+UGAMP_OLD	-20.92	0.34
+UGAMP_NEW	-20.02	0.29
SECHIBA2	1.30	0.08
+ECHAM	-0.02	3.05
SWAP	0.11	1.17
+SLPPS	-2524.73	41.35

consistency check. A full description of the PILPS experiment output procedure is available at [mqmet.cic.mq.edu.au](http://mqmet.cic.mq.edu.au) (IP:137.111.91.14) through anonymous ftp site [pilps/PROG](ftp://pilps/PROG).

Finally, as noted at the PILPS meeting in London, the next task for PILPS is Phase 2b which should use real observations from a site in the GCIP area (the Mississippi River basin, U.S.A.) or one that contains some of the additional problems that we shall encounter in GCIP such as snow and frozen soil water, e.g., the Russian data of Robock et al. (1994). We are working on obtaining such a data set now and we plan to commence Phase 2b in early 1995.

#### Reference

Robock, A., K.Ya. Vinnikov, C.A. Schlosser, N.A. Speranskaya, and Y. Xue, 1994: Use of Russian soil moisture and meteorological observations to validate soil moisture simulations with biosphere and bucket models. *J. Clim.*, submitted.

## MEETING AND WORKSHOP SUMMARIES

**Western Pacific Geophysics Meeting  
Hong Kong  
25-29 July 1994**

**X. Gao  
University of Arizona**

The Western Pacific Geophysics Meeting (Hong Kong, 25-29 July 1994) had a special session for GEWEX/GCIP and GEWEX Asian Monsoon Experiment (GAME). Scientists from four countries presented 13 papers in this 1-day session. E. Rasmusson and A. Hall from the United States and T. Yasunari from Japan addressed the priority scientific goals of GCIP and GAME and the modeling and observing projects in the Mississippi River basin and four selected GAME intensive study areas. Five papers related to preliminary study results of GCIP and GAME areas were given. They included the satellite remote sensing and ground-based monitoring of the surface conditions over the Tibetan Plateau (GAME); modeling activities in the Arkansas-Red River basin (GCIP); and model and field-based study in the Chao Phraya River basin (GAME). Papers with special topics on climate study were presented and discussed. K. Takeuchi and E. Koizumi from Japan reported their studies on rainfall estimation from satellite imagery. X. Gao and S. Sorooshian from the United States proposed a stochastic precipitation disaggregation scheme to deal with precipitation heterogeneity at GCM subgrid scales. T. Oki, Japan, used the analysis of atmosphere water balance to estimate global soil moisture deficit. Q. Duan and J. Schaake provided a simple conceptual water balance model to couple with the mesoscale Eta model of the U.S. National Weather Service.

**GCIP Science Management Meeting  
Silver Spring, Maryland, U.S.A.  
16 August 1994**

**Alan Hall, Office of Hydrology  
NOAA National Weather Service**

A meeting of the GCIP Science Panel Chairman, the four Sub-panel Chairmen (Atmosphere, Hydrology, Water Resources and Data), the conveners and/or representatives of the ten principal research areas, GCIP Office staff and representatives of NASA and UCAR was held on 16 August at the GCIP Office, NOAA Office of Global

Programs, Silver Spring, Maryland. The principal research areas were established at the last Science Panel meeting in October 1993. These are Diagnostic Studies, Coupled Modeling, Data Assimilation, Project for Intercomparison of Land Surface Parameterization Schemes (PILPS), Water Resources Research, Precipitation, Streamflow/Runoff, Soil Moisture, Land Surface Characteristics, and Clouds and Radiation. The participants reviewed the progress of GCIP since the last meeting of the Science Panel. They welcomed the launching of the first CD-ROM of the GCIP Initial Data Sets, GIDS-1. GIDS-1 contains atmospheric and hydrological data for the Central Mississippi River basin, 1 February–30 April 1992, prepared by the UCAR Office of Field Project Support and was described in the June 1994 issue of *GEWEX News*. The current activities in collecting data from the GCIP Integrated Systems Test (GIST), June–August 1994, over the Arkansas-Red River basin, were presented. It was noted that most of the desired data and data products will be made available by the participating agencies. GIST is already providing valuable insights to the problems and effort that will be required for the 5-yr Enhanced Observing Period planned to commence in October 1995.

The main purpose of the meeting was to discuss the GCIP Major Activities Plan for 1995 and 1996 and Outlook for 1997. This document provides extensive details of the near-term research and associated activities projected over the next 2–3 yr. The description of planned activities is based on what should be done in an orderly progression toward the end objectives of GCIP, with a realistic assumption about the resources that will be available to do it. Draft proposals from the principal research area conveners, coordinated by GCIP Office staff, were reviewed, and missing material was identified and allocated to authors for the completion of the draft Activities Plan. This draft was forwarded to the Science Panel members in early September for review at the GCIP Science Panel Meeting in Boulder, 1–4 November 1994.

---

**Boundary Layer Clouds Workshop  
16–18 August 1994  
Boulder, Colorado, U.S.A.**

**William R. Cotton  
Colorado State University**

A workshop on Boundary Layer Clouds, jointly sponsored by the National Center for Atmospheric Research (NCAR) and the GEWEX Cloud Systems

Study (GCSS), brought together general circulation modelers, cloud modelers, and large eddy simulation modelers, as well as cloud observers. Over 40 scientists participated in describing their recent research results. The major focus of the workshop was to intercompare simulated results for an “idealization” of the 7 July 1987 FIRE I stratus experiment. The models ranged from full three-dimensional large eddy simulation (LES) models, to two-dimensional cloud-resolving models, to one-dimensional single-column models.

While there was some variability of results among LES models, it appeared that a major source of those differences was due to the details of the cloud radiation scheme implemented in the models. The two-dimensional models yielded consistently higher turbulent kinetic energy (TKE) profiles than the LES models, but the mean first moment profiles were similar. The one-dimensional models generally yielded similar results to the LES models for cloud top height, TKE, and liquid water contents; but cloud coverage, liquid water path, and total water fluxes differed greatly.

It was decided to perform an even more idealized intercomparison study of a smoke-topped atmospheric boundary layer in order to isolate differences in top entrainment rates among the models. This study will be done by electronic mail. The next major intercomparison study will be based on the Atlantic Stratocumulus Transition Experiment (ASTEX) Lagrangian experiments. The next workshop will be held in about a year, with Aad Van Ulden acting as host in The Netherlands.

---

**MEETING ANNOUNCEMENTS AND  
CALL FOR PAPERS**

**The 75th Annual Meeting of the American Meteorological Society (AMS), 15–20 January 1995, Dallas, Texas, U.S.A.**

As part of the 75th AMS Annual Meeting, there will be several symposia on climate topics. For further information on the Sixth Symposium on Global Change Studies contact Eric J. Barron, Earth System Science Center, 248 Deike Bldg., Pennsylvania State University, University Park, PA 16802. Tel: 814-865-1619; Fax: 814-865-3191; Omnet: E.Barron; Internet: eric@essc.psu.edu.

For the Conference on Hydrology, contact Dara Entekhabi, Dept. Civil and Environmental Engineering, Building 48-331, Massachusetts Institute of

Technology, Cambridge, Massachusetts, Tel: 617-253-9698; Fax: 617-258-8850; E-Mail: [dara@alborz.mit.edu](mailto:dara@alborz.mit.edu).

Additional information on other symposia and registration can be found in recent issues of the Bulletin of the American Meteorological Society.

---

### **The Second International Study Conference on GEWEX in Asia and GAME, 6-10 March 1995, Pattaya, Thailand**

The purpose of this conference is to review the scientific issues related to the water and energy cycles in monsoon Asia and its relation to the global climate system. Another important objective is to discuss and coordinate the international cooperation related to the GEWEX Asian Monsoon Experiment (GAME), which is one of the major subprograms of the Global Energy and Water Cycle Experiment (GEWEX). The utilization of the data from future earth observational satellites, such as the Advanced Earth Observing Satellite (ADEOS) and the Tropical Rainfall Measuring Mission (TRMM), will also be a focus. Prof. T. Yasunari, University of Tsukuba, Japan is the Conference Chairman.

Preliminary conference topics include:

- Spatial and temporal variability of energy and water cycles in Monsoon Asia.
- Observational studies about regional water balance in Asia.
- Utilization of satellite remote sensing technique for atmospheric, hydrologic and oceanographic processes in GEWEX/GAME.
- Physical processes related to interannual variability of Asian monsoon: ocean, snow, ice, permafrost and soil moisture.
- Land-atmospheric interaction and the role of vegetation in hydrologic processes.
- Macroscale hydrological modeling, meso-scale atmospheric modeling and their coupling.
- GCM studies and diagnostic studies of monsoon.
- Seasonal prediction of rainfall and water resources in Monsoon Asia.
- GEWEX strategy in Asia and international corporations related to GEWEX/GAME.

To obtain additional information and registration form, contact: Prof. K. Musiake, Secretariat of the Second International Study Conference on GEWEX in Asia and GAME, c/o Institute of Industrial Science, University of Tokyo, 7-22-1 Roppongi, Minato-ku, Tokyo 106, Japan, Tel: +81 3 3402 6231 ext. 2525; Fax: +81 3 3402 2597; E-Mail: [prof@hydro.iis.u-tokyo.ac.jp](mailto:prof@hydro.iis.u-tokyo.ac.jp).

---

### **NATO Advanced Study Institute on Remote Sensing of Processes Governing Energy and Water Cycles in the Climate System, 1-12 May 1995, Plön, Germany**

The NATO Advanced Study Institute series of lectures will cover all aspects related to atmospheric and ground property measurements and how they are used in energy and water cycle climate studies. Three of the lectures will review state-of-the-art climatology and modeling. All lectures are of basic interest for many climate research issues, in particular for the projects within GEWEX. One day will be spent at a "Remote Sensing Park" where there will be various active and passive sounding systems.

For additional information contact: Prof. E. Raschke, GKSS Research Center, D-21502 Geesthacht, Germany, Tel: +49 4152 871833, Fax: +49 4152 872020, E-mail: [raschke@dvmc10.gkss.de](mailto:raschke@dvmc10.gkss.de).

---

### **International GEWEX Workshop on Cold-Season/Region Hydrometeorology, 22-26 May 1995, Banff, Alberta, Canada**

An international GEWEX Workshop focusing on cold-season/regional hydrometeorological scientific issues will be held in Banff, Alberta, Canada during the period 22-26 May 1995. The workshop is being held in conjunction with the Annual General Meeting of the Canadian Geophysical Union. The workshop sponsors include the International and Canadian GEWEX project offices, the United States National Oceanic and Atmospheric Administration (NOAA), and the Canadian Atmospheric Environment Service. The objectives of the workshop are to review the current state of knowledge of cold-season hydrology and land-atmosphere interactions, and to identify and address the most crucial problems facing the modeling community. Workshop themes will include all aspects of snow and ice hydrology, surface-atmosphere and surface-subsurface interactions and modeling, as well as hydrologic, GCM, and land surface process parameterizations, scaling and modeling. Call-for-papers pamphlets and announcements will be distributed in October with a deadline for receipt of abstracts of 1 December 1994. More information concerning this workshop can be obtained by contacting the workshop organizing committee chairman:

Dr. Tom Carroll, Tel: 612-725-3039; Fax: 612-725-3338; Internet: tcarroll@snow.nohrsc.nws.gov or Dr. Terry Krauss, Tel: 306-975-4215; Fax: 306-975-5143; Internet: krausst@nhri.v.nhrc.sk.doe.ca.

---

### **XVIII Pacific Science Congress, 5-12 June 1995, Beijing, China**

The 18th Quadrennial Congress held by the Pacific Science Association will include 6 symposia and about 20 scientific sessions, including the following topics:

- Global Climate and Environment Change
- Asia-Pacific Monsoon Meteorology

For abstract and registration forms, contact the XVIII Pacific Science Congress Secretariat, Laboratory of Climate Research Institute of Atmospheric Physics, Chinese Academy of Sciences, P.O. Box 2718, Beijing, 100080, China, Tel: (+86-1)2575034; Fax: (+86-1)2562458; E-Mail: fucb%bepc2@scs.slac.stanford.edu.

---

### **IUGG XXI General Assembly Joint IAHS-IAMAS Symposium, 3-7 July 1995, Boulder, Colorado, U.S.A.**

At the International Union of Geodesy and Geophysics (IUGG) XXI General Assembly there will be a Joint International Association of Hydrological Sciences (IAHS) and International Association of Meteorology and Atmospheric Sciences (IAMAS) Symposium, titled Clouds Convection and Land-Surface Processes.

This Symposium will address a number of related and multidisciplinary topics important to the improvement of the parameterization of sub-grid atmospheric and land-surface processes in atmospheric models. Results being produced by international projects will be presented. The Symposium will have the following themes:

1. Status of land-surface process models convened by Ann Henderson-Sellers
2. Land-surface process model development, convened by Alan Hall
3. Biospheric and hydrological aspects of land-surface experiments, convened by Alfred Becker
4. Clouds, convection and large-scale flow, convened by Dennis Hartmann
5. Satellite cloud climatology and related regional experiments, convened by Erhardt Raschke.

The Project for Intercomparison of Land-Surface Parameterization Schemes (PILPS) Phases 1 and 2 will be discussed, together with analysis and interpretation of model intercomparisons, and results from Atmospheric Model Intercomparison Project (AMIP)/PILPS experiments. The Regional Interactions of Climate and Ecosystems (RICE) will focus on regional climate, vegetation and soil interaction experiments. The development of interactive vegetation schemes for GCMs, data sets for evaluating land surface processes and soil moisture, atmospheric boundary layer and convective cloud coupling in short-term weather forecasting and long-term climate variability will be covered.

Land-surface process modeling will examine what is being done to improve parameterizations of the land surface in hydrological, atmospheric and coupled hydrological/atmospheric models. This includes development and testing of parameterizations using observed forcing and response data, as well as model sensitivity studies in stand-alone mode and coupled models. Model parameter estimation issues from basin to continental scales will be discussed. Special attention will be given to activities related to the GEWEX Continental-Scale International Project (GCIP) which is focusing on the Mississippi River basin during the Enhanced Observing Period 1995-2000. Preliminary results from the GCIP Integrated Systems Test conducted during June-August 1994 will be presented.

The results of past biospheric and hydrological land-surface experiments will be presented, along with the early results of ongoing experiments. New requirements for future experiments will be addressed. These will include ecological phenomena and processes and the need for coupling intensive short-term measurement campaigns (meteorological, hydrological and ecological) with long-term observations and measurements of hydrological and ecological characteristics, such as discharges, waterborne transport, biomass and biochemical fluxes. These requirements will define criteria for the planning, design, and implementation of future experiments with special attention to integration (upscaling) techniques, efficient algorithms to derive land surface characteristics from remote sensing data and the effects of topography and land-surface heterogeneities on land-surface processes.

The relationships among the cloud fields, convective circulations and large-scale thermodynamic and dynamic conditions will be described in mesoscale and global modeling. Particular attention will be directed to those relationships with relevance to interannual variability and climate change.

Satellite cloud climatology and related regional experiments will be considered using the past 10 years of research within ISCCP. Clouds are dominating modulators of radiative energy transfer within the climate and their various relevant properties must be

modeled and measured accurately. The analysis of a time series of satellite data, its impact on cloud modeling and the recent GCSS project will be reported. The status of ISCCP and its regional experiments and other analyses of satellite data and its use in global and regional-scale modeling will be presented. Future opportunities for regional and global experiments and modeling within GEWEX will be discussed.

Contributions (oral and poster presentations) are invited on any of the above topics. The author(s) should indicate the theme (1-5) under which the paper should be presented by including in the submittal information item 5(a) the theme number after HJ1, e.g., HJ1 (2).

Abstracts of selected papers will be prepublished by the AGU. Deadline for abstracts is 1 February 1995. (Details, EOS (AGU) 5 April 1994). Instructions for the submittal of AGU abstracts by E-Mail will be contained in the IUGG XXI Third Circular. Mail original and two copies with payment to: IUGG XXI General Assembly, c/o American Geophysical Union, 2000 Florida Ave., NW, Washington, DC 20009, U.S.A. For more information contact: J. Schaake, National Weather Service, Office of Hydrology (W/OHx2), 1325 East-West Highway, Silver Spring, MD 20910, USA.; Tel: 301-713-1660; Fax: 301-713-1051.

---

### **FIRST STUDY CONFERENCE ON BALTEX, 28 August-1 September 1995, Visby, Sweden**

The First Study Conference on the Baltic Sea Experiment (BALTEX) is being organized by the BALTEX Science Steering Group (BSSG), the Swedish National Committee for the International Geosphere-Biosphere Program (IGBP) and WCRP of the Royal Swedish Academy of Sciences, and the Swedish Meteorological and Hydrological Institute (SMHI). The conference is designed to offer first opportunities to review the present state of the art in modeling and measuring energy and water cycles in the Baltic Sea drainage basin. It will cover recent research in hydrology, meteorology and physical oceanography. The conference is scheduled to take place in Visby on the island of Gotland. The provisional program comprises invited lectures on research related to BALTEX, reports from the BSSG and BALTEX Working Groups on the progress of BALTEX, and presentation of scientific papers on results and ideas relevant for BALTEX.

The first circular for this conference has been delivered by the local organizing committee. A second circular will follow at the end of this year. Extended abstracts, one page long, should be submitted not later than 28 February 1995. After the conference, manuscripts will be submitted to TELLUS and peer reviewed for a special issue. For further information and submittance of registration, please contact Professor

Anders Omstedt, SMHI, S-60176 Norrköping, Sweden, Tel: +46 11 15 80 00; Telex: 64400 smhis; Fax: +46 11 17 02 07; E-mail: aomstedt@smhi.se.

---

## **WCRP/GEWEX MEETINGS CALENDAR**

**1-4 November 1994**—MEETING OF BALTEX IMPLEMENTATION PLAN DRAFTING GROUP, Island of Bornholm, Denmark.

**2-4 November 1994**—FIFTH GCIP SCIENCE PANEL MEETING, Boulder, CO (by invitation only).

**5-6 November 1994**—GEWEX NUMERICAL EXPERIMENTATION PANEL MEETING, Boulder, Colorado (by invitation only).

**7-10 November 1994**—DYNAMICS OF THE ARCTIC SYSTEMS, Göteborg, Sweden. See page 16, August issue.

**13-16 December 1994**—GCSS SCIENCE PANEL MEETING, Victoria, BC, Canada.

**15-20 January 1995**—AMERICAN METEOROLOGICAL SOCIETY ANNUAL MEETING, Dallas, Texas. See announcement page 11.

**25-27 January 1995**—SECOND BALTEX SCIENCE STEERING GROUP MEETING, Helsinki, Finland.

**30 January-3 February 1995**—GEWEX SSG, Melbourne, Australia (by invitation only).

**6-10 March 1995**—SECOND INTERNATIONAL STUDY CONFERENCE ON GEWEX IN ASIA AND GAME, Pattaya, Thailand. See announcement page 12.

**28-31 March 1995**—GPCP THIRD ALGORITHM INTER-COMPARISON PROGRAMME (AIP-3) WORKSHOP. Melbourne, Australia. For additional information contact: Dr. E. E. Ebert, Bureau of Meteorology, GPO Box 1289K, Melbourne, Victoria, Australia, Tel: 61 3 669 4688; Fax: 61 3 669 4660; E-mail: eee@bom.goes.au or Dr. A. Gruber, National Weather Service, Washington, DC, U.S.A., Tel: 301-763-8127; Fax: 301-763-8108; E-mail: a.gruber@OMNET.com.

**1-12 May 1995**—NATO ADVANCED STUDY INSTITUTE on Remote Sensing of Processes Governing Energy and Water Cycles in the Climate System, Plön, Germany. Applicants should contact Professor Erhardt Raschke, ASI-Director, GKSS Research Center, Max Planck Str., D-21502 Geesthacht, Germany, Tel: +49 4152 871833; Fax: +49 4152 872020; E-mail: raschke@devmc10.gkss.de. See announcement page 12.

**15-19 May 1995**—ATMOSPHERE MODEL INTERCOMPARISON PROJECT (AMIP) CONFERENCE, Monterey, California.

**22-26 May 1995**—INTERNATIONAL GEWEX WORKSHOP ON COLD-SEASON/REGION HYDROMETEOROLOGY, Banff, Alberta, Canada. See announcement page 12.

**5-12 June 1995**—XVIII PACIFIC SCIENCE CONGRESS, Beijing, China. For information contact Congress Secretariat, Laboratory of Climate Research, Institute of Atmospheric Physics, Chinese Academy of Sciences, P.O. Box 2718, Beijing 100080, China, Tel: (+86-1) 2575034; Fax: (+86-1)2562458. See Announcement page 13.

**3-7 July 1995**—AT INTERNATIONAL UNION OF GEODESY AND GEOPHYSICS XXI GENERAL ASSEMBLY JOINT IAHS/

IAMAS SYMPOSIUM ON CLOUDS CONVECTION AND LAND SURFACE PROCESSES. For more information contact: Dr. John Schaake, National Weather Service (W/OHx2), 1325 East-West Highway, Silver Spring, MD, 20910, U.S.A., Fax: (301) 713-1051. Abstracts: Deadline 1 February 1995. Details: EOS (AGU) 5 April 1994. AGU abstract template available via anonymous FTP from: earth.agu.org (192.102.233.21) in meetings/abstracts/readme.doc. See announcement page 13.

**28 August - 1 September 1995**—FIRST STUDY CONFERENCE ON BALTEX. For further information, contact Professor Anders Omstedt, SMHI, S-60176 Norrköping, Sweden. Tel: +46 11 15 80 00; Telex: 64400 smhis; Fax: +46 11 17 02 07; E-mail: aomstedt@smhi.se.

---

## GEWEX REPORTS AND DOCUMENTS

(Available from IGPO)

FIRST GCIP INITIAL DATA SET (GIDS-1) on CD-ROM.

GEWEX CLOUD SYSTEM STUDY (GCSS) SCIENCE PLAN. May 1994. IGPO Publication Series No. 11.

GEWEX PAMPHLET (fivefold glossy)

UTILITY AND FEASIBILITY OF A CLOUD PROFILING RADAR, Report of the GEWEX Topical Workshop, 29 June-1 July 1993, Pasadena, California. April 1994, IGPO Publication Series No. 10.

IMPLEMENTATION PLAN FOR GEWEX CONTINENTAL-SCALE PROJECT (GCIP), VOLUME III: Strategic Plan for Data Management. March 1994, IGPO Publication Series No. 9.

IMPLEMENTATION PLAN FOR GEWEX CONTINENTAL-SCALE PROJECT (GCIP), VOLUME II: Research. June 1994, IGPO Publication Series No. 8.

PROJECT FOR INTERCOMPARISON OF LAND-SURFACE PARAMETERIZATION SCHEMES (PILPS): Results from Off-line Control Simulations (Phase 1A). December 1993, IGPO Publication Series No. 7.

GCIP PAMPHLET (trifold glossy)

IMPLEMENTATION PLAN FOR THE GEWEX CONTINENTAL-SCALE INTERNATIONAL PROJECT (GCIP), VOLUME I: Data Collection and Operational Model Upgrade. May 1993, IGPO Publication Series No. 6.

A PRELIMINARY SCIENCE PLAN FOR A LARGE-SCALE BIOSPHERE-ATMOSPHERE FIELD EXPERIMENT IN AMAZON BASIN, Report on Workshop convened 18-20 June 1992 at NASA Goddard Space Flight Center, Greenbelt, Maryland, U.S.A.

INTERNATIONAL SATELLITE LAND SURFACE CLIMATOLOGY (ISLSCP) WORKSHOP REPORT, 23-26 June 1992, Columbia, Maryland, U.S.A.

PROJECT FOR INTERCOMPARISON OF LAND-SURFACE PARAMETERIZATION SCHEMES (PILPS): Report on PILPS Workshop, 24-26 June 1992, Columbia, Maryland and First Science Plan. September 1992, IGPO Publication Series No. 5.

GEWEX CONTINENTAL-SCALE INTERNATIONAL PROJECT (GCIP) DATA WORKSHOP: Summary report on 5-8 May 1992 Workshop. June 1992, IGPO Publication Series No. 4.

GEWEX CONTINENTAL-SCALE INTERNATIONAL PROJECT (GCIP) ATMOSPHERIC SCIENCE COMPONENT: Report on Atmospheric Subpanel Workshop 18-19 March 1992. May 1992, IGPO Publication Series No. 3.

IMPLEMENTATION PLAN FOR THE PILOT PHASE OF THE GEWEX WATER VAPOR PROJECT (GVaP): March 1992. March 1992, IGPO Publication Series No. 2.

SCIENTIFIC PLAN FOR THE GEWEX CONTINENTAL-SCALE INTERNATIONAL PROJECT (GCIP)-WCRP-67, February 1992 (WMO/TD/No. 461). (Second Printing now available)

THE ROLE OF WATER VAPOR IN CLIMATE, A STRATEGIC RESEARCH PLAN FOR THE PROPOSED GEWEX WATER VAPOR PROJECT (GVaP), Report of Workshop, Easton, MD, U.S.A., 30 October - 1 November 1991. NASA Conf. Pub. 3210.

GLOBAL ENERGY AND WATER CYCLE EXPERIMENT (GEWEX)—REPORT OF THE FIRST GEWEX TEMPERATURE/HUMIDITY RETRIEVAL WORKSHOP, WCRP-XX, Greenbelt, MD, U.S.A., 23-26 October 1990.

GEWEX CONTINENTAL-SCALE INTERNATIONAL PROJECT (GCIP). REPORT OF THE FIRST GCIP PLANNING WORKSHOP, RESTON, VIRGINIA, U.S.A., 8-10 October 1990. April 1991, IGPO Publication Series No. 1.

SCIENTIFIC PLAN FOR THE GLOBAL ENERGY AND WATER CYCLE EXPERIMENT—WCRP-40, AUGUST 1990. (WMO/TD-No. 376).

GLOBAL CLIMATE CHANGE—A SCIENTIFIC REVIEW PRESENTED BY THE WORLD CLIMATE RESEARCH PROGRAMME (WCRP), January 1990. The WCRP is the international scientific program chartered jointly by the International Council of Scientific Unions and the World Meteorological Organization to provide a quantitative understanding of climate and predictions of global and regional climate changes on all time scales. This document is a review of global climate change as of 1990.

---

### GEWEX NEWS

Published by the International GEWEX Project Office (IGPO), Dr. Paul D. Try, Director  
Editor: Dr. Paul F. Twitchell

Requests for documents or contributions to GEWEX News can be made to the IGPO via

MAIL: International GEWEX Project Office  
(IGPO), Suite 203, 409 Third Street SW,  
Washington, DC 20024, U.S.A.  
TEL: 202-863-1435/0012  
FAX: 202-488-5364  
OMNET: INTL.GEWEX  
INTERNET: gewex@cais.com