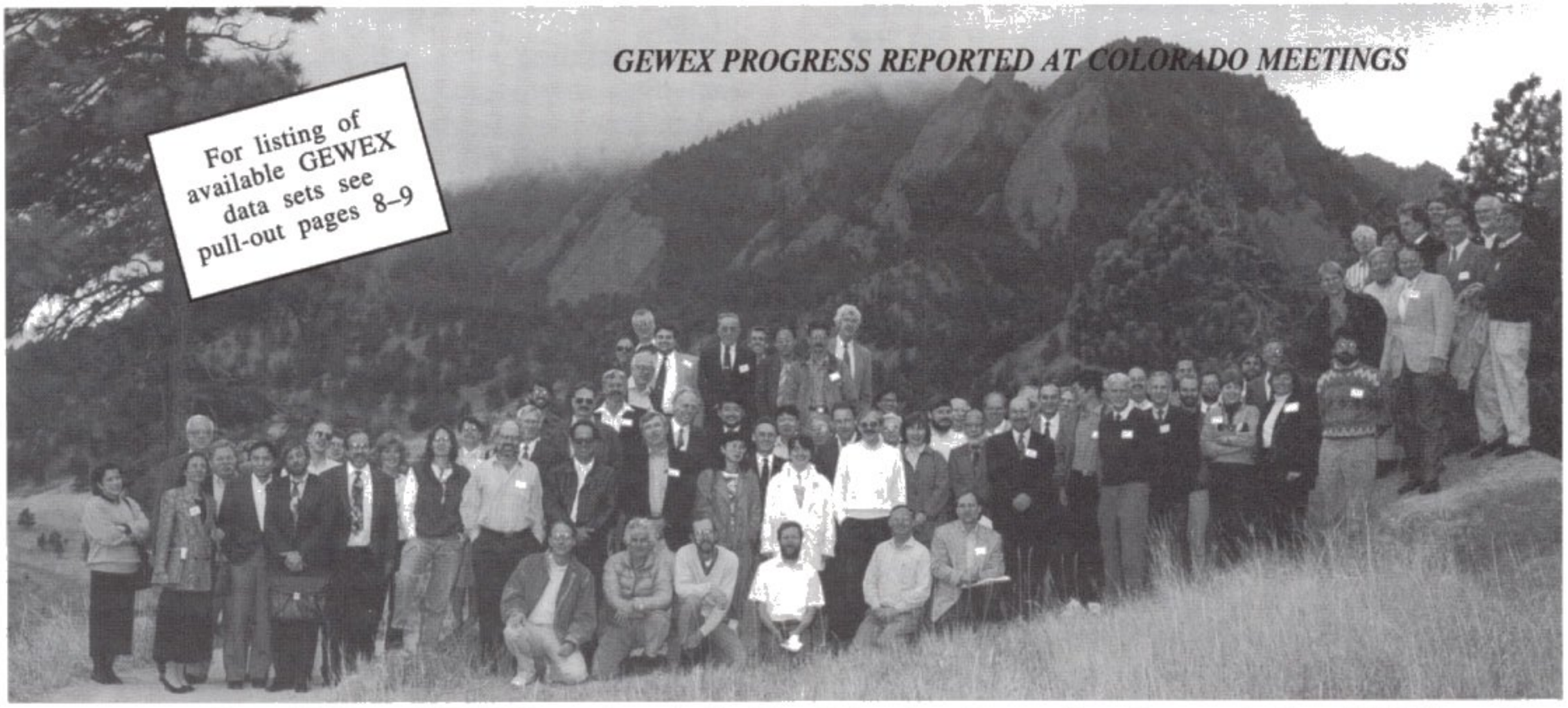
GEWEX WCRP

Global Energy and Water Cycle Experiment

NEWS

Vol. 5, No. 1 February 1995

World Climate Research Programme–WCRP



Participants at GCIP, G-NEP and ISLSCP meetings in Boulder, Colorado. Reports from these and other GEWEX meetings are on pages 11–14. (Photograph by Bob Bumpas, courtesy National Center for Atmospheric Research Photographics.)

ISCCP BEGINS SECOND DECADE PRODUCING CLOUD CLIMATOLOGY DATA SETS

Robert A. Schiffer, NASA Headquarters

Clouds have first-order effects on radiation and water exchanges in the atmosphere and these energy exchanges control a crucial set of feedbacks on climate change. In order to support the developing climate change research activities, the International Satellite Cloud Climatology Project (ISCCP) was established and began processing visible and infrared images from polar and geostationary satellites in 1983 to produce monthly 2.5-degree data sets of global cloud cover and radiative properties. The ISCCP was established as the first World Climate Research Programme (WCRP) project and became an important part of a WCRP research strategy that included the Surface Radiation Budget (SRB) project, and the Global Precipitation Climatology Project (GPCP). The ISCCP and other WCRP activities were brought together in the 1988–92 time frame as components of the Global Energy and Water Cycle Experiment (GEWEX).

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WHAT'S NEW IN GEWEX

- ISCCP Reanalyzing 8-Year Data Set
- GEWEX Home Page Now on Internet
- Surface Radiation Network Adds 2 Sites
- New ISLSCP CD-ROM Available
- Soil Wetness Index Project Initiated
- G-NEP Develops Initial Plan
- GCIP Data Now Available on World Wide Web

In This Issue

COMMENTARY

THE INTERACTION OF GEWEX WITH OTHER PROJECTS OF THE WORLD CLIMATE RESEARCH PROGRAMME

Hartmut Grassl, Director, WCRP

This brief overview presents my view, from the standpoint of newly appointed director of WCRP, of the interaction of GEWEX with World Climate Research Programme (WCRP) projects and related international science programmes. The scope of WCRP is reflected by the names of its projects, which include the recently established Arctic Climate System Study (ACSYS) and Stratospheric Processes and their Role in Climate (SPARC); the recently completed Tropical Ocean Global Atmosphere (TOGA) project and the World Ocean Circulation Experiment (WOCE) scheduled to end its field phase in 1997; the continuing activities of the Working Group on Numerical Experimentation (WGNE) to improve and coordinate numerical modeling efforts; the developing Climate Variability and Predictability (CLIVAR) project; and the ongoing GEWEX. How each GEWEX component specifically interfaces with the other WCRP projects will be topics for future contributions to GEWEX News.

No single WCRP project exists without connections to all the other ones. Scientific progress is accelerated if real interaction between different projects takes place. Since GEWEX results are needed by other WCRP projects, the overall WCRP success depends heavily on the outcome of GEWEX. The strongest impact GEWEX will have is via quality-controlled global climate data sets derived from satellite data merged with high quality *in situ* data. Examples include: cloud amount, optical depths and interannual variability (ISCCP); surface radiation budget and surface heat flux (SRB); precipitation (GPCP); water vapour (GVaP); runoff (GRDC); and sea-surface temperature.

GEWEX is fundamental for climate impact studies and could become the strongest partner for the United Nations Environment Programme's World Climate Impact and Response Strategies Programme (WCIRP). The products from the GEWEX Global Precipitation Climatology Centre (GPCC) and the envisaged global soil moisture data set are examples of needed input for WCIRP. Also, results of regional experiments are urgently needed for regionalization of climate change, calculated with global coupled models and nested mesoscale models.

GEWEX encompasses the global water cycle and thus includes the influence of vegetation as far as physical climate parameters are affected. The International Geosphere-Biosphere Programme (IGBP) core project on the Biospheric Aspects of the Hydrological Cycle (BAHC) focuses on the vegetation portion of the water cycle with respect to biological aspects. Thus, GEWEX also needs to cooperate with BAHC-IGBP projects, which determine facets of the water cycle. All would profit from common experimentation sites and an exchange of results, including improvements of parameterizations used in atmospheric circulation models.

In addition, a special relationship between GEWEX and CLIVAR should be mentioned, namely the seasonal and interannual climate prediction, an initial thrust of CLIVAR, which will not only profit from the observations of the ocean but also from hydrological parameters on land delivered by GEWEX. Without a successful GEWEX we will not get a successful CLIVAR, because the climate models for interannual and, hopefully, multiyear predictions must get improved parameterizations for cloud and land surface processes derived from the elements of GEWEX, including ISCCP, ISLSCP, SRB, GVaP, GCSS, and GPCP, as well as all the GEWEX regional experiments (GCIP, MAGS, BALTEX, GAME, LAMBADA).

American Meteorological Society (AMS) Announces Election Results

The American Meteorological Society has announced the election results for President. The new President-elect is Dr. Paul D. Try, Director of the International GEWEX Project Office. Dr. Try will serve as President in 1996 and be a participant in the AMS Executive Council during 1995.

Dr. Eugenia Kalnay, Chairperson of the GEWEX Numerical Experimentation Panel is the 1995 recipient of the prestigious AMS "Jule G. Charney Award." Elected "Fellows" of the AMS in 1995 include Dr. Moustafa T. Chahine, Chairman GEWEX Steering Group, Prof. Soroosh Sorooshian, Chairman of the United States National Academy of Science GEWEX Panel, and Dr. Paul F. Twitchell, IGPO.

ADD THE GEWEX HOME PAGE TO YOUR HOTLIST

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

The International GEWEX Project Office (IGPO) has created a GEWEX Home Page for viewing via the World Wide Web (WWW). The GEWEX Home Page includes general information about GEWEX and its projects, as well as hyperlinks to other relevant home pages. Just click onto the highlighted text and you are instantly connected to a related information resource. The GEWEX Home Page currently has links to NOAA's GEWEX Continental-Scale International Project (GCIP) Home Page and NASA home pages related to the International Satellite Cloud Climatology Project (ISCCP) and Surface Radiation Budget (SRB) project. Organizations such as WMO, WCRP, NASA, and NOAA can also be accessed. For recent program developments, be sure to check out "What's New in GEWEX."

The GEWEX Home Page can be viewed by WWW browsers, such as Mosaic, MacWeb, SlipKnot, and Netscape. Netscape has faster performance characteristics than Mosaic, and is available for multiple platforms. A copy of Netscape can be downloaded at the following address: ftp.mcom.com.

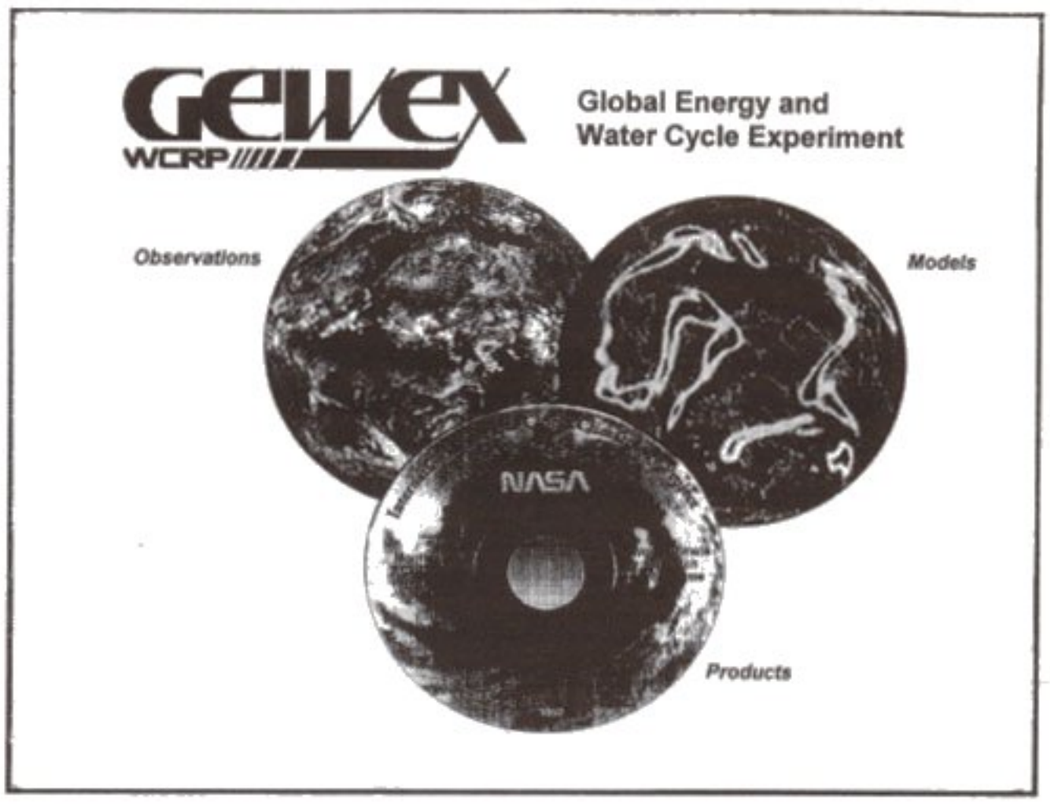
If you have a home page you would like to see linked to the GEWEX Home Page or would like further information, contact Dawn Erlich at IGPO (E-mail: gewex@cais.com).

GEWEX DATA SETS

The components of GEWEX have and are continuing to produce data sets for the international scientific community. The GEWEX data sets are available to all investigators and may be obtained from many sources including World Data Centers and organizations such as those noted in the pull-out table located in the center of this issue, pages 8–9, which can be removed for posting. The intent of the table is to guide a potential GEWEX data set user to data sources. GEWEX News will publish a notice whenever a new data set becomes available. For Internet users, notices of new data sets will first appear on the GEWEX Home Page. Also, see related article announcing the GCIP Home Page on the next page.

Many of the GEWEX data sets can be obtained through NASA's EOSDIS Information Management System (IMS). EOSDIS VO IMS is a prototype system that allows users to search for and order Earth science data from several data centers in a single session. The EOSDIS VO IMS Home Page (WWW URL: http://harp.gsfc.nasa.gov:1729/eosdis_documents/eosdis_home.html) provides links to other home pages that describe EOSDIS Distributed Active Archive Centers (DAACs) and Affiliated Data Centers (ADCs). These home pages provide access to information that describes data holdings, platforms, sensors, data sets, and the data centers in EOSDIS.

Global Energy and Water Cycle Experiment (GEWEX) Home Page



Welcome to the GEWEX Home Page

The Global Energy and Water Cycle Experiment (GEWEX) was initiated in 1988 by the World Climate Research Center (WCRP) to observe and model the hydrologic cycle and energy fluxes in the atmosphere, at the land surface, and in the upper oceans. GEWEX is an integrated program of research, observations, and science activities ultimately leading to the prediction of global and regional climate change. The International GEWEX Project Office (IGPO) is the focal point for the planning and implementation of all GEWEX Projects and activities.

- GEWEX Overview
- International GEWEX Project Office
- What's New in Gewex
- GEWEX Projects
- GEWEX Data Sets
- GEWEX Newsletter
- GEWEX Reports and Documents
- GEWEX Meetings Calendar

GEWEX Projects

- Overview

Hydrometeorology and Land-Surface Projects

- GEWEX Continental-Scale International Project (GCIP)
- Global Runoff Data Centre (GRDC)
- International Satellite Land-Surface Climatology Project (ISLSCP)
- Project for Intercomparison of Land-Surface Parameterization Schemes (PILPS)

Regional Continental-Scale Projects

- Europe - Baltic Sea Experiment (BALTEX)
- Asia - GEWEX Asian Monsoon Experiment (GAME)
- Brazil- Large-Scale Atmospheric Moisture Balance of Amazonia Using Data Assimilation (LAMBADA)
- Canada - Mackenzie River GEWEX Study (MAGS)

Radiative Flux Projects

- Baseline Surface Radiation Network (BSRN)
- GEWEX Water Vapor Project (GVaP)
- International Satellite Cloud Climatology Project (ISCCP)
- Surface Radiation Budget Project (SRB)

Cloud System and Precipitation Projects

- GEWEX Cloud System Study (GCSS)
- Global Precipitation Climatology Project (GPCP)
- Cloud Profiling Radar Project

GEWEX Numerical Experimentation Panel (G-NEP)

Please send comments to Dawn Erlich (gewex@cais.com)

GCIP DATA AVAILABLE THROUGH WORLD WIDE WEB

Steven F. Williams
University Corporation of Atmospheric Research (UCAR)

Wayne Faas
National Oceanic and Atmospheric Administration (NOAA)

The GEWEX Continental-Scale International Project (GCIP) Data Management Service System (DMSS) can now be accessed using the World Wide Web (WWW) using various WWW browsers (i.e. Mosaic, Lynx, Netscape, etc.). The DMSS is a distributed data management system consisting of *in situ*, model, satellite and remote sensing, and special data modules. The In-situ Module provides on-line data to GCIP researchers using the UCAR Office of Field Project Support (OFPS) Cooperative Distributed Interactive Atmospheric Catalog (CODIAC) and NOAA National Climate Data Center (NCDC) On-line Access and Service Information System (OASIS). Currently, data from the first of the GCIP Initial Data Sets (GIDS-1) and the GCIP Integrated Systems Test (GIST) are available on-line and are now linked to the WWW. WWW links to the other DMSS Modules are expected in 1995.

The WWW "Home Page" for GCIP and the DMSS is located at NOAA/NCDC (address: http://www.ncdc.noaa.gov/gcip/gcip_home.html). It contains overview information and scientific objectives on GCIP and the DMSS, references and published papers, access to selected on-line GCIP publications, information on "What's New in GCIP", and an electronic link to the In-situ Module. Check "What's New in GCIP" for GCIP announcements and upgrades to the DMSS!

The In-situ Module "Home Page" resides at UCAR/OFPS (address: http://www.ofps.ucar.edu/gcip/gcip_in_situ.html). It provides information on availability of various GCIP data sets, on-line documentation, and an interactive electronic link to the CODIAC system. This link includes the ability to display specific data set information (metadata), a graphical display browse of user selected data, and WWW "forms" for the user to order data. Users that do not have forms-capable browsers may continue to use the CODIAC system. Forms-based access to the OASIS system will be supplemented in 1995. All WWW displayed information is interactively extracted from the CODIAC database to ensure the information is up to date.

Further information on GCIP on-line documentation can be obtained from Wayne Faas (E-mail: wfaas@ncdc.noaa.gov) or Steve Williams (sfw@ncar.ucar.edu). For more information about WWW, contact the National Center for Supercomputing Applications (NCSA) at (217) 244-0072 or see the WWW Frequently Asked Questions list (WWW FAQ). It is regularly posted to several USENET newsgroups including "news.answers" and "comp.infosystems.www.users". It is available for anonymous FTP from "rtfm.mit.edu" in the directory "/pub/usenet/news.answers/www/faq". It is available on WWW via the WWW address: http://sunsite.unc.edu/boutell/faq/www_faq.html. You may retrieve it by e-mail by sending mail to mailserver@rtfm.mit.edu with no subject line and the body of the message as: send usenet/news.answers/www/faq/*. The WWW FAQ will be sent to you by return e-mail, usually within a day.

SURFACE RADIATION NETWORK EXPANDS IN GCIP AREA

The SURFace RADiation (SURFRAD) monitoring network has added two more sites within the GEWEX Continental-Scale International Project (GCIP) Mississippi River basin region. They are at Fort Peck Indian Reservation in northeastern Montana (48.48°N, 105.20°W) and at Goodwin Creek Experimental Basin located in northwest Mississippi (34.25°N, 89.97°W). Another site has been operating since April 1994 at Bondville, Illinois (40.06°N, 88.37°W). The scientific criteria for each site required it be 75-100 km from a WSR-88 Doppler radar installation for radar-derived precipitation estimates and for verification of satellite-derived surface radiation budget information. The uniform surface area surrounding a site should be approximately the size of a geostationary satellite sounding pixel or about 10 km (E-W) and 40 km (N-S).

The SURFRAD monitoring network is intended to provide high quality, long-term solar and infrared surface radiation measurements for a variety of research needs such as to validate satellite-derived surface insolation, to provide a long-term climatology of surface radiation measurements (at least 25 years), to detect trends in surface radiation, and to verify radiative transfer models. The *basic instrumentation set* includes radiometers for upwelling and downwelling solar and infrared radiation, a sun-tracking pyrheliometer for measuring direct solar irradiance, and a meteorological tower. In the future, other specialized radiometers and lidars are options to be added to selected, or possibly all, sites. In addition to the science requirements there are such practical considerations as availability of telephone lines, electrical power, and long-term commitment for operating the site.

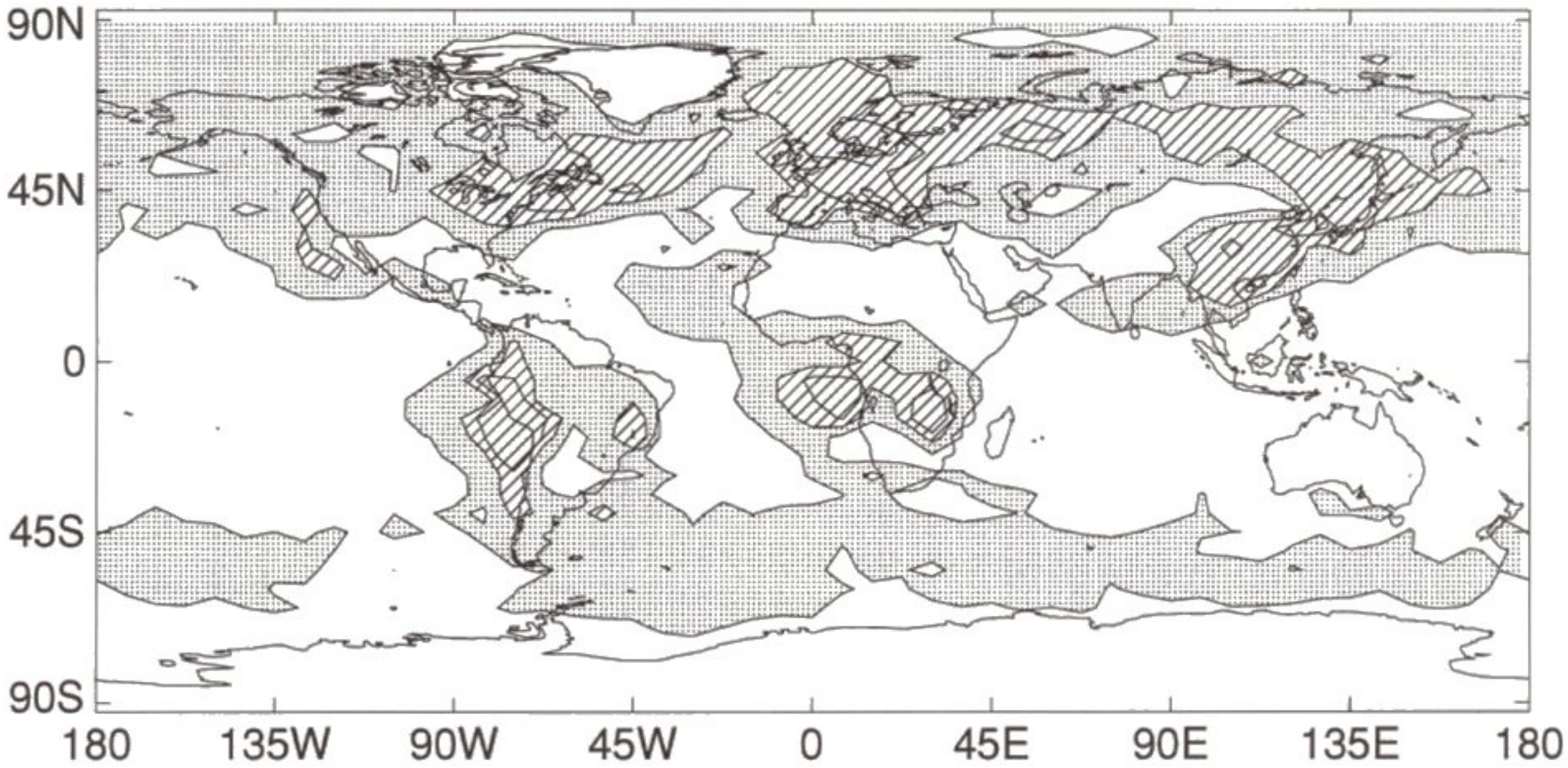


Figure 1. Distribution of indirect radiative forcing due to anthropogenic sulphate aerosols. Contours are at –1, –3, and –5 Wm^{-2}. Regions between –1 and –3 Wm^{-2} are stippled; regions with larger forcing are hatched.

ESTIMATING INDIRECT AEROSOL FORCING

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There has been much speculation over the past few years as to the effects of anthropogenic sulphate aerosols on the climate. These aerosols are believed to affect the radiative balance of the Earth, and two mechanisms that produce this effect have been proposed—direct and indirect. The *direct* radiative effect of aerosols is to enhance the scattering of solar radiation back to space from regions of otherwise clear air. The magnitude of this cooling effect has been estimated to lie in the range –0.3 to –0.9 Wm^{-2} in the global annual mean (Charlson et al., 1991; Kiehl and Briegleb, 1993; Taylor and Penner, 1994). This is not inconsiderable when compared with the estimates of radiative forcing due to increases in greenhouse gases to date, approximately +2.5 Wm^{-2} (IPCC, 1994).

The other mechanism is the so-called *indirect* effect, originally identified by the work of Twomey (1974), which involves the modification of the radiative properties of clouds by the aerosol. Increases in aerosol lead to increases in the numbers of cloud condensation nuclei (CCN), and assuming the amount of water in clouds is unchanged, this causes a reduction in the average size of cloud droplets, making the clouds reflect more sunlight. This indirect effect is much more difficult to estimate, as it involves complex and poorly understood interactions between aerosols, CCN, and cloud properties.

Recently, however, parameterizations of the 'effective radius' of water cloud droplets have become available for use in general circulation models (GCMs; Bower and Choularton, 1992; Martin et al., 1994), and so a quantitative estimate of this indirect forcing was performed (Jones et al., 1994). The 'effective radius' of the cloud droplets is the relevant measure of cloud droplet size for radiative purposes. The parameterization links this radius to the cloud liquid water content and to the distribution of sulphate aerosols. The GCM used in this study was the Hadley Centre model, a version of the U.K. Meteorological Office model (Cullen, 1993), and the prognostic cloud scheme in this model (Smith, 1990) could provide the necessary cloud water content. To be able to estimate the indirect effect, it was necessary to have distributions of sulphate from both natural and man-made sources, and these were derived from a 3-dimensional chemical transport model (Langner and Rodhe, 1991).

Using these inputs, a year-long control integration was performed using total (natural plus anthropogenic) sulphate sources, to represent 'present day' conditions. At various points in this integration

This year GEWEX components are beginning to take a special look at the influence of anthropogenic aerosols on their respective activities.

single-timestep runs using *only* the natural sulphate sources were performed in parallel to the control. The difference between the annual-mean reflected solar radiation with and without the anthropogenic sulphate gives an estimate of the indirect radiative forcing due to anthropogenic sulphate aerosols, and is shown in Figure 1. The global annual mean of -1.3 Wm^{-2} is of similar magnitude to some of the higher estimates of the direct effect, but it is distributed in a much more complex fashion. The forcing is greatest over regions where high anthropogenic aerosol loading exists *and* where the low cloud affected by this aerosol is visible from space and not overlain by ice cloud. Strong local maxima exist over major Northern Hemisphere industrial centres, but there are also large regions in the Southern Hemisphere where the forcing is significant. This is because the relatively cleaner clouds in these regions are the most susceptible to modest changes in CCN concentrations, whereas in more polluted areas the effect saturates, and the same modest CCN changes do not produce a similar change in microphysical (and hence radiative) properties (Taylor and McHaffie, 1994; Platnick and Twomey, 1994).

It is admitted that this estimate of the indirect radiative forcing is highly uncertain, but even if the true value of the indirect effect is considerably less than that predicted, if taken together with the direct effect, it still forms a large negative forcing compared with the positive (warming) forcing due to increases in greenhouse gases to date. It would be a challenge to GEWEX to provide data on the various interrelated fields of cloud cover and distribution, droplet effective radii, CCN, and aerosol concentrations, which would help in validating this type of work.

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ISCCP Begins Second Decade

(Continued from page 1)

In 1994, ISCCP scientists embarked on the production of improved data sets as part of the continuing effort to serve the international scientific community. A new improved reanalyzed global 8-year (1983–1991) data set will be available by mid-1996. This new effort follows the tradition by which ISCCP was established by following the objectives to:

- Produce a research quality improved infrared- and visible-radiance data set, along with basic information on the radiative properties in the atmosphere, from which cloud parameters can be derived; and

- Improve understanding of the Earth's radiation budget (top-of-the-atmosphere and surface) and hydrologic cycle.

Broad use of the current ISCCP data set is indicative of the accepted quality of the ISCCP products of the past decade. Producing consistent data sets necessary for climate studies is a difficult task because of the varied satellite instruments from which the cloud information is derived. Calibration of the imaging radiometers in the visible and infrared

spectral bands (Schiffer and Rossow, 1985) and validation of cloud detection methods (Rossow and Garder, 1993) have provided new knowledge for improved cloud climatology data set production. Recently, ISCCP completed major diagnostic studies on (1) radiance calibration, (2) cloud detection and cloud amounts, particularly at high latitudes, (3) the cloud particle size assumption for liquid water clouds, and (4) the treatment of ice clouds, especially optically thin clouds. Results from these studies provided the basis for the reanalysis project to produce the updated ISCCP datasets.

The reprocessed global cloud climatology will update the ISCCP climatology now available and improve the support to the planned new activities of the surface radiation science community. Similarly, the presently available global short wave surface radiation data sets based on the current ISCCP data and produced under the Surface Radiation Budget (SRB) project will be improved and extended to include a long wave surface radiation data set. These new ISCCP data sets will provide a reliable measure of diurnal, seasonal, and regional interannual changes. For example, new ISCCP winter data sets for high latitude regions developed with a new multichannel cloud detection algorithm will provide an improved cloud and surface climatology. Also, the improved treatment of thin clouds using new ice crystal shape and size distributions will be useful in assessing the influence of tropospheric and stratospheric clouds on land surface processes. In addition, water path cloud parameters that include average properties of 15 cloud types for each grid cell for the entire globe every 3 hours will be provided. These and other ISCCP data sets will be available for analysis and for use by investigators studying the cloud climate relationships. A further extension in developing data sets from 1995 to 2000 is being planned as an ISCCP-2 Project.

Presently, a 1983–1990 data set is available on CD-ROM and all ISCCP data are available on 9-track tapes. Information on how to obtain ISCCP data is found in the table on page 9. The GEWEX Home Page will announce new ISCCP products as they become available. (See article on page 3.)

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HOW APPROPRIATE IS MIE THEORY FOR PREDICTING THE RADIATIVE PROPERTIES OF ATMOSPHERIC PARTICLES?

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This may initially sound like an academic or philosophical question. But when one considers that our predictions regarding the Earth's radiation budget are deeply rooted in Mie theory, the answer to this question may have real consequences to our understanding of radiation transfer and climate.

In this article, a new treatment of cirrus cloud radiative properties has been developed, based on anomalous defraction theory (ADT), which does not parameterize size distributions in terms of an effective radius (Mitchell et al., 1994). Rather, it uses the size distribution parameters directly, and explicitly considers the ice particle shapes. There are three fundamental features that characterize this treatment: (1) the ice path radiation experiences as it travels through an ice crystal is parameterized, (2) only the physical cross-section or projected area of the particle determines the amount of radiation scattered and absorbed, and (3) as in other treatments, the projected area of the size distribution is conserved. The first two features are unique to this treatment, since it does not convert the ice particles into equivalent volume or area spheres in order to apply Mie theory.

It may not be obvious that the second feature differs from Mie theory. However, Mie theory predicts that the absorption and extinction cross-section of a sphere can be (and often is) substantially greater than would be predicted from its physical cross-section. This appears to involve the capture of photons that have approximately tangential trajectories to the sphere. Once captured, they can propagate as a "surface wave" around the sphere. The fate of the surface wave involves either absorption into the sphere, or "spraying" (i.e., scattering) the wave away from the sphere. By capturing photons that do not actually collide with the sphere, the absorption cross-section for a sphere may be greater than the sphere's physical cross-section. Now, the question is, does this same physics also apply to ice?

Measurements of extinction efficiency (Q_{ext}) were made in a laboratory ice cloud over wavelengths

(Continued on page 10)

GEWEX DATA SETS

NAME	DATA SETS	SOURCES
GEWEX CONTINENTAL-SCALE INTERNATIONAL PROJECT (GCIP)	GCIP Initial Data Set (GIDS-1) CD-ROM contains atmospheric, hydrologic, satellite and radar composites and surface data for the Central Mississippi River basin for the period 1 February through 30 April 1992. GCIP Reference Data Set (GREDS) contains topography, land use and other types of data which are expected to change little, if any, during the next several years. GIDS-2 will consist of two abnormal climate events, i.e. the 1988 drought and 1993 floods in the Mississippi River basin. GIDS-3 is in preparation and will contain data from GCIP Integrated System Test (GIST) conducted in 1994.	The GIDS-1 CD-ROM is available from IGPO. Inquiries on GCIP data sets to Univ. Corp. for Atmos. Research/Office of Field Projects Support, P.O. Box 3000, Boulder, CO, 80307; Tel: 303–497–8987; Fax: 303–497–8158; E-mail: sfw@ncar. ucar.edu WWW URL: http://www.ofps.ucar.edu/gcip/gcip_in_situ. html or to GCIP Office, 1100 Wayne Avenue, Room 1225, Silver Spring, MD 20910, Tel: 301–427–2089 ext. 511; Fax: 301–427–2222. E-mail: gcip@ogp.noaa.gov
GLOBAL RUNOFF DATA CENTRE (GRDC)	The GRDC data set contains daily and monthly discharge data for approximately 3,300 stations in 2,900 river basins (including sub-basins) from 140 countries. Six reports have been published. The GRDC disseminates data and additional data products on request. A catalog is produced with updated information and a standard set of tables, statistics and graphic displays can be provided to data users for selected stations.	Global Runoff Data Centre, Federal Institute of Hydrology, Bundesanstalt für Gewasserkunde, Kaiserin-Augusta-Anlagen 15-17, 56068 Koblenz, Federal Republic of Germany; Tel.: +49 261 1306–224; Fax: +49 261 1306–280.
INTERNATIONAL SATELLITE LAND SURFACE CLIMATOLOGY PROJECT (ISLSCP)	Available are First ISLSCP Field Experiment Data CD-ROMs; Vol. 1, Surface Observations and Non-image Data Sets; Vol. 2, Satellite Imagery; Vol. 3, Thematic Mapper Simulator (aircraft) Imagery; Vol. 4, Spectroradiometer and Microwave Radiometer (aircraft) Imagery; Vol. 5, Includes Vegetation Index, Soil Moisture, Terrain Reference, Surface Temperature, Digitized Site Photographs. The ISLSCP Initiative I CD-ROM contains vegetation, hydrometeorology, soils, snow and ice, meteorology and radiation parameters and variables required for initialization, forcing and validation of global biosphere-atmosphere models. Data sets are for the 24-month period, 1987 and 1988, and all except the river basin runoff data and the NOAA/NESDIS snow cover data provide Northern Hemisphere coverage on a common 1° by 1° grid.	The ISLSCP CD-ROMs are available from the EOSDIS Distributed Active Archive Center, P.O. Box 2008, Mail Stop 6407, Oak Ridge National Laboratory, Oak Ridge, TN 378331–6407; Tel: 615–241–3952; Fax: 615–574–4665; E-mail: ornldaac@onrl.gov WWW URL: http://www.eosdis.ornl.gov Initiative I data are available on CD-ROMs from the Goddard EOSDIS Distributed Active Archive Center, Code 902.2, NASA Goddard Space Flight Center, Greenbelt, MD 20771, U.S.A.; Tel: 301–286–3209; Fax: 301–286– 1775; E-mail: gsfc@eos. nasa.gov WWW URL: http://daac.gsfc.nasa.gov
GEWEX WATER VAPOR PROJECT (GVaP)	Raman Lidar water vapor profiles from Coffeyville, Kansas Experiment, November–December 1991, are available on tape.	NASA Langley Research Center, EOSDIS Mail Stop 157B, Hampton, VA 23681–0001, U.S.A.; Tel: 804–864–8656; Fax: 804–865–8807; E-mail: userserv@ eosdis.larc.nasa.gov WWW URL: http://eosdis.larc.nasa.gov

NAME	DATA SETS	SOURCES
GEWEX WATER VAPOR PROJECT (GVaP) (continued)	Blended global water vapor data set using radiosonde, microwave, and infrared satellite data with 1° x 1° resolution for the period 1988–1992 includes total precipitable water and a three layer distribution. Data sets in preparation include: Raman Lidar water vapor profiles, Lamont, Oklahoma, April 1994.	The 5-year data set will be available in summer 1995. For information contact D. Randel, CIRES, Colorado State University, Fort Collins, CO, USA; Tel: 303–491–8219; Fax: 303–491–8441; E-mail: randel@terra. cira.colostate.edu Will be available from NASA Marshall Space Flight Center, EOSDIS, 977 Explorer Boulevard, Huntsville, AL 35806, USA; Tel: 205–922–5932; Fax: 205–922–5859; E-mail: msfc@eos.nasa.gov WWW URL: http://wwwdaac.msfc.nasa.gov
INTERNATIONAL SATELLITE CLOUD CLIMATOLOGY PROJECT (ISCCP)	On CD-ROM (ISCCP C2) are global monthly cloud products at 280-km resolution, 72 variables, 3-hour intervals for July 1983–December 1990 (data sets with improved resolutions are in preparation). Data now available through June 1991 (ISCCP C1 & C2); through June 1992 (B3). These products are derived from an array of polar orbiting and geostationary meteorological satellites. ISCCP products are also available on 9-track/6250 bpi tape.	The ISCCP CD-ROMs are available from: NASA Earth Observing System Distributed Active Archive Center, Mail Stop 157B, Langley Research Center, Hampton, VA 23681–0001; Tel.: 804–864–8656; Fax: 804–864–8807; E-mail: userserv@eosdis. larc.nasa.gov The tapes are available from NOAA, National Environmental Satellite Data and Information Service, Satellite Data Service Division, Princeton Executive Square, Room 100, 5627 Allentown Road, Camp Springs, MD 20746; Tel: 301–763–8400; Fax: 301–763–8443; E-mail: sdsdreq@pres. sdsd.mcdc.noaa.gov WWW URL: http://ns.noaa.gov/saa/ home page.html
SURFACE RADIATION BUDGET (SRB)	Shortwave radiation parameters March 1985–December 1988 are available on CD-ROM and floppy disks.	NASA Earth Observing System Distributed Active Archive Center, Mail Stop 157B, Langley Research Center, Hampton, VA 23681–0001, USA; Tel: 804–864–8656; Fax: 804–864–8807; E-mail: larc@eos. nasa.gov
GLOBAL PRECIPITATION CLIMATOLOGY PROJECT (GPCP)	Available now are formatted 2.5° products including the display software GPCCSHOW and two programs to convert binary data data to ASCII and vice versa. The data in ASCII format will need 24MB free space on a hard disk for the two years, January 1987–December 1988. Also available are 24 terrestrial gridded precipitation data sets (January 1987–December 1988) on a 1° grid published on the Initiative I – ISLSCP CD-ROM. There are two files for each month: The area-mean precipitation and the number of stations per grid. The data sets are preliminary versions V001. The raingauge density will be improved (now 6,700 stations, reanalysis with 30,000 stations) is planned. The method of merging satellite and raingauge products will be optimized.	Global Precipitation Climatology Centre, c/o Deutscher Wetterdienst, Postfach 10 04 65, D-63004 Offenbach am Main, Germany; Tel: +49 69 80 62 29 81; Fax: +49 69 80 62 29 93 or 2880; E-mail: rudolf@k7-wzn.za-offenbach. dwd.d400.de The data are distributed by the World Data Centre for Meteorology A, NCDC, Asheville, NC, Tel: 704–271–4800; Fax: 704–271–4876; E-mail: orders@ncdc.noaa. gov
GEWEX CLOUD SYSTEM STUDY (GCSS)	Case study data sets are in development for cloud resolving model evaluation.	

Mie Theory for Predicting Radiative Properties

(Continued from page 7)

in the thermal infrared. Details can be found in Arnott et al. (1995). Q_{ext} is a measure of how efficient a particle is at removing radiation from the original beam. Figure 1 gives the results of this study for an ice cloud of hexagonal columns. The sizes and concentrations of the ice crystals were measured, and the estimated mean crystal size was 7 μm. The short-dashed curves depict the laboratory measurements. The solid curve was generated by the new ADT treatment, assuming a mean size for hexagonal columns of 7 μm. The minima shown are extremely sensitive to ice crystal size, and only occur when sizes are relatively small and the real index of refraction, n_r, approaches 1. The agreement of the measurements with the ADT curve indicates the ice crystal path of the radiation was well represented (feature 1 above). A method was developed to make ADT "act" like Mie theory, where the contribution of grazing photons to the extinction and absorption cross-section was parameterized. This parameterization generally matched the Mie theory result to within 10 percent for ice spheres and wavelengths in the solar and thermal IR. The new ADT treatment, after being modified in this way, was also compared to the measured Q_{ext} as shown by the long-dashed curve. It is seen that when the effect of grazing photon capture is included, agreement between theory and observations becomes poorer away from the minima where $n_r > 1$. This indicates that for irregular ice particles, grazing photons might not be captured as surface waves, and that only the physical cross-section of the particle need be considered for predicting scattering and absorption of radiation. More laboratory measurements and analytical work are needed to test this hypothesis.

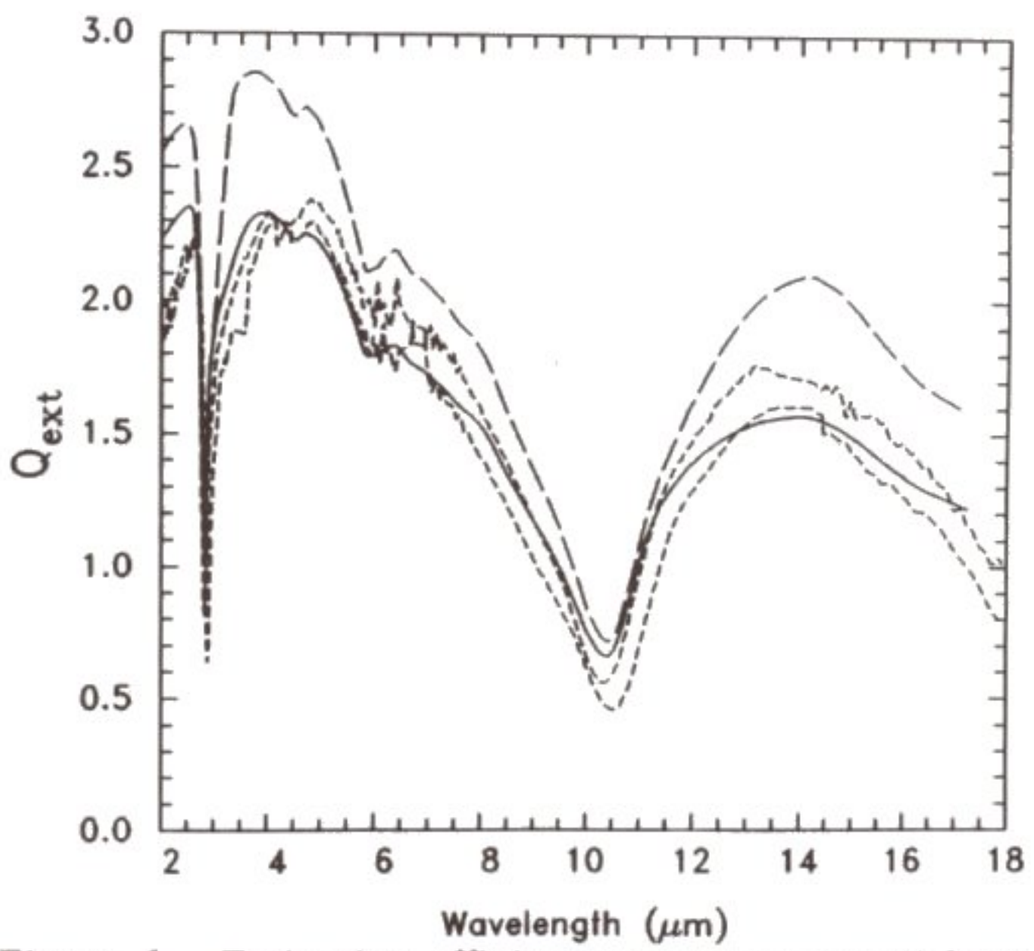

Figure 1. Extinction efficiency measurements (short-dashed curves) for an ice cloud of hexagonal columns. The solid curve was predicted from the observed crystal sizes by the new cirrus radiation treatment. The same is true of the long-dashed curve, except that it was based on Mie theory.

Other evidence to this effect was obtained from a cirrus cloud field study (Paltridge and Platt, 1981), where broad-band albedos and emittances from a cirrus deck were measured from an aircraft (albedo and emittance indicate how efficiently a cloud, in this case, reflect solar radiation or emit terrestrial radiation). These measurements are shown in Figure 2 by the "+" signs. The mean ice crystal size, based on the measured size distributions, was estimated as d = 10 μm. Theoretical curves are shown for d = 10 μm, for various ice crystal shapes. These were predicted from the new ADT treatment. This is the first time these observations have been explained theoretically from the observed microphysics. Also shown is the curve predicted for columns by the Mie modified ADT treatment, which is like the ADT treatment except that the effect of grazing photon capture has been parameterized. This process causes the absorption cross-section of an ice crystal to be larger than would be predicted from the physical cross-section. This results in greater emittances than evidently occur, causing the Mie curve to lie below the observations.

To summarize, it appears that not all of the physics that Mie theory embraces is applicable to nonspherical particles in the atmosphere. The inclusion of this "extra physics" in treating the radiative properties of ice crystals may indeed be a primary reason why radiation transfer models have not been able to reproduce the observed radiative properties of cirrus clouds from the observed cloud microphysics. Moreover, anomalous diffraction theory, which is simple and allows cloud radiative properties to be formulated analytically, appears appropriate for treating the radiative properties of irregular particles.

References

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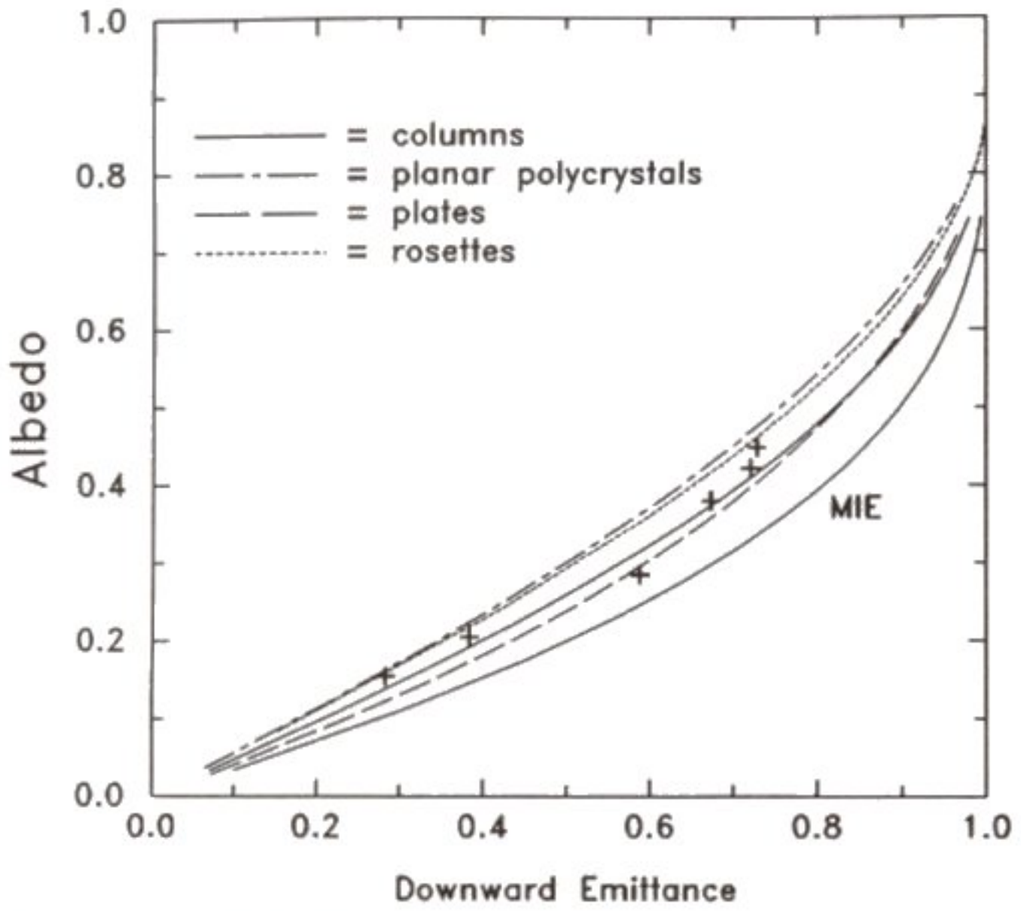

Figure 2. Albedo-emittance data from cirrus cloud field study indicated by +. Theoretical curves based on new radiation treatment and observed mean ice crystal size are shown for various ice crystal types. The two solid curves are for hexagonal columns, with lower curve based on Mie theory.

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Mitchell, D.L., A. Macke, S.K. Chai, Y. Liu, Y. Dong, and A. Heymsfield, 1994: A model predicting the evolution of bimodal size spectra and the radiative properties of cirrus clouds, with quantification of ice crystal shape and aggregation effects. *J. Atmos. Sci.*, **51**, 817–832.

Paltridge, G.W., and C.M.R. Platt, 1981: Aircraft measurements of solar and infrared radiation and the microphysics of cirrus cloud. *Quart. J. Roy. Met. Soc.*, **107**, 367-380.

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GEWEX NUMERICAL EXPERIMENTATION PANEL

Eugenia Kalnay
National Meteorological Center
Washington, DC

The newly formed GEWEX Numerical Experimentation Panel (G-NEP) met in Boulder, Colorado on 2–3 November 1994. The G-NEP has three primary responsibilities:

(1) Promote the development of interactive regional mesoscale and global-scale model formulations of the land-surface, hydrological, and atmospheric processes that regulate the global hydrologic cycle, river flow, and large-scale water storage and evaporation.

(2) Organize numerical experimentation/model intercomparison projects in order to refine such model formulations and develop predictions of these environmental properties.

(3) Promote the exploitation of field observations for validation of interactive atmospheric-hydrological models and the assimilation of such data in predictive regional and global models.

At the November 1994 G-NEP meeting, a proposal was developed to meet these objectives. The goal of this proposal is to intercompare the products of global data assimilation, free running GCMs and nested regional models with each other and available data sets: point comparisons where suitable time-series exist, as well as averages over selected basins up to the continental scale.

The focus will be on comparing the energy and water budgets, such as surface and top-of-the-atmosphere (TOA) radiation fields, surface fluxes of energy, water and momentum, vertical profiles and integrals of model advective terms and parameterized physical processes, subsurface thermal and water budgets, surface hydrology, snow, etc. In addition, we will focus on the comparison of the mean diurnal cycle of the boundary layer (BL) or 2-m temperature and humidity on a seasonal basis, together with BL depth and the BL cloud field.

The two periods of 1988 and 1983 were chosen for coordinated experiments because the Northern Hemisphere summers of 1988 and 1993 were characterized by extreme situations of drought and flooding, respectively over North America. In addition, these two summers were characterized by major anomalies in other areas, such as a wet monsoon in India in 1988, and 1993 by a wet anomaly in Europe and southern South America.

The experiments proposed by G-NEP were centered on the use of atmospheric and hydrological models. The goal is to increase our understanding of the importance of, and interplay between, various processes in the atmospheric and land surface hydrologic cycles, particularly under verifiable extreme conditions. The intercomparison of model results in this context should yield valuable insights into the validity of the different formulations used.

Four types of coordinated atmospheric modeling experiments were identified.

(1) Land Surface Data Assimilation System (LDAS). This will be similar to some of the Project for Intercomparison of Land-Surface Parameterization Schemes (PILPS) experiments, in the sense that the land surface model is driven by observed atmospheric data, but will be performed on a continental scale.

(2) Global Data Assimilation System (GDAS) Approach (Reanalysis): Several state-of-the-art reanalyses will be performed for the northern hemisphere spring and summers of 1988 and 1993. These will then be made available to the community for intercomparisons.

(3) Free Running GCMs Approach: Initial conditions from the spring of 1988 and 1993, as well as boundary conditions (sea-surface temperature and soil moisture) from the reanalyses will be used to run ensembles of 1- to 3-month integrations. The questions to be explored are whether the drought and flood conditions can be reproduced; and what is the impact of the initial soil moisture, the Bowen ratio, and the fraction MC/P.

(4) Regional Models with Reanalysis Boundary Conditions: Will address the question of whether regional models driven by global reanalyses can provide high resolution regional estimates of the regional circulation, which is of great interest to the climate and the GEWEX Continental-Scale International Project (GCIP) communities.

Three types of experiments were proposed for land-surface hydrological comparisons.

(1) Regional calibration of Land Surface Process (LSP) Models: For selected basins using at least 10 and up to 40 years of "observed" precipitation (i.e., monthly averages with 6-hour reanalysis rescaling), potential evaporation from the reanalysis, and observed river flow. The results of these tunings can be compared with the standard parameters of the LSP models and their implied basin capacity.

(2) Sensitivity of GCMs to the LSP models: Use "extreme" sets of parameters from the regional calibration of land surface process models within a GCM and explore the sensitivity of the results.

(3) River Routing Models: Use global and regional river routing models to estimate the implied river flow for precipitation from the reanalyses, and from GCMs or regional atmospheric model runs.

MEETING AND WORKSHOP SUMMARIES

ISLSCP/G-NEP Global Soil Wetness Workshop Longmont, Colorado 4–6 October 1994

Dawn Erlich, IGPO

Soil moisture has been recognized as one of the key factors in climate prediction due to its influence on continental evapotranspiration and precipitation rates. Soil moisture is, therefore, an important quantity for GCM initialization.

The Global Soil Wetness Workshop was organized by the GEWEX International Satellite Land-Surface Climatology Project (ISLSCP) and the GEWEX Numerical Experimentation Panel (G-NEP). The goal of the workshop was to develop methods for producing a global soil wetness index (SWI) for use in GCMs and climate models. The first part of the workshop reviewed current progress in the following three areas: (1) existing models with emphasis on their treatment and sensitivity to soil wetness, as well as current initialization techniques, (2) retrievals and soil moisture product generation techniques, and (3) product validation and experiments.

In the second part of the workshop, two working groups were formed. Working Group I, Product Generation, was tasked with the generation of global 1° x 1° soil wetness fields using 2-D land surface presentations driven by observed precipitation. Working Group II, Product Validation, will develop a strategy for validating the global 1° x 1° SWI product using a range of coordinated techniques, which include *in situ* observations, field experiment results, retrievals from meteorological analyses, and satellite data.

At the workshop, parameters were chosen as desirable for a global and regional time series of soil moistures. They include (1) spatial resolution of 1° x 1°, (2) temporal resolution of 10–15 days, and (3) vertical resolution of at least three layers [surface (5 cm), root zone and hydrologically active layer].

The period of 1987–1988 was chosen for a pilot study, which allows the initial analyses to be based on atmospheric forcings and surface boundary conditions

taken from the ISLSCP CD-ROM scheduled for release in early 1995. A number of organizations represented at the workshop, such as ECMWF, JMA, NOAA, NASA, Arizona State University and Colorado State University will participate in the pilot study and others will be invited to join.

ISLSCP Science Panel Meeting
Boulder, Colorado
31 October – 1 November 1994

Dawn Erlich, IGPO

The first meeting of the reorganized International Satellite Land-Surface Climatology Project (ISLSCP) Science Panel was held at the National Center for Atmospheric Research (NCAR) to review the progress of current programs and data set initiatives.

Program Status

ISLSCP scientists are assisting with the planning for the GEWEX Continental-Scale International Project (GCIP) surface flux validation measurements. The draft GCIP major activities plan for 1995-97 is under review (see GCIP Meeting Summary).

The most recent field campaign for the Boreal Ecosystem-Atmosphere Study (BOREAS) ran from 30 August to 19 September 1994. Over 85 science teams are involved in BOREAS, which covers an area over a million square kilometers in northern Canada. Recent findings from BOREAS showed that the boreal forest releases very little water vapor, and that plant roots remain frozen to 50 cm until July, although canopy-top temperatures reach 39°C in June.

The Large-Scale Atmospheric Moisture Balance of Amazonia Using Data Assimilation (LAMBADA) Project, Biosphere-Atmosphere Transfers and Ecological Research In situ Studies (BATERISTA), and Amazon Biogeochemistry and Atmospheric Chemistry Experiment (AMBIACE) (LBA) Science Steering Committee is being formed. A planning meeting is tentatively scheduled for April 1995 in Miami, Florida.

The chairs for the GEWEX Global Soil Wetness Workshop working groups for product generation and product validation presented status reports. For more information see the Global Soil Wetness Workshop summary in this issue.

Data Set Initiatives

A summary of the characteristics and parameters of Initiative I (1° x 1° land-surface-atmosphere data sets) was presented. Sea-surface temperature fields, sea-ice fields, Zobler texture maps for soil wetness, flow rates and partitioning of observed monthly precipitation into hourly values using NMC forecast data are late additions to the CD-ROM. An independent review of the data was held at Goddard Space Flight Center on 26–28 October 1994; release of the CD-ROM is scheduled for February 1995.

ISLSCP Workshop participants at National Center for Atmospheric Research, Boulder, Colorado.

Initiative I covers the period 1987 to 1988. At the meeting, the ISLSCP Science Panel agreed that Initiative II will include data sets for the period 1987 to 1994, with a CD-ROM release date of 1997. For Initiative II, the Science Panel is examining the feasibility of providing 3- and 6-hourly data sets at 0.5° x 0.5° spatial resolution.

The ISLSCP Activity Plan was reviewed at the meeting. The final plan will be ready for printing in early 1995. The next ISLSCP Science Panel Meeting will be held on 18–19 April 1995 in Washington, DC.

GCIP
Boulder, Colorado, U.S.A.
1–4 November 1994

John Leese, GCIP Office

The GEWEX Continental-Scale International Project (GCIP) held several scientific sessions in conjunction with the fifth session of the GCIP Science Panel held at the National Center for Atmospheric Research (NCAR) in Boulder, Colorado, U.S.A. The meetings were hosted by the UCAR Office of Field Project Support (OFPS).

A GCIP Science Review was held on Tuesday, 1 November 1994 to evaluate the early results and progress from a number of research projects related to GCIP that have been underway for the past 2 to 3 years. The 17 scientific presentations by investigators from academic and government research institutions were well received by the 120 persons in attendance. There was general agreement that the GCIP-sponsored research program had made a healthy start, and that already there was a firm base on which to build. Of particular note and importance to GCIP is the rapid progress being made in the evaluation and upgrade of the operational, Eta mesoscale model at the U.S. National Meteorological Center. The Eta Model will serve as a principal source of 4-dimensionally assimilated and analyzed data for the GCIP region.

GCIP and ISLSCP held a joint modeling workshop on Wednesday, 2 November 1994. The purpose of the workshop was to address issues related to the scaling of processes associated with land-surface atmosphere coupling in models whose domains range from the patch scale (single column), through the continental scale to the global scale. This workshop was well attended (see photo on page 1) with numerous, enthusiastic discussions on the key scientific issues put forth by the different speakers. This workshop will make a significant contribution toward the development of coherent programs of model development and field activity dealing with atmospheric/land-surface coupling within GEWEX. The discussions provided especially useful guidance to the newly formed GEWEX Numerical Experimentation Panel, some members of which participated in the Workshop.

The GCIP Science Panel held its fifth session on 3 and 4 November 1994. Dr. Michael Coughlan, GCIP Project Manager, informed the Panel Session that GCIP had completed its implementation planning during the past year with the publication of Volumes II and III of the GCIP Implementation Plan. He also informed the Panel that the GCIP Integrated Systems Test was successfully completed during the summer of 1994 in the Arkansas-Red River basin in the southwestern part of the Mississippi River basin. Early results from this test show that GCIP can be ready to begin the 5-year Enhanced Observing Period in 1995. The Major Activities Plan for 1995, 1996 and Outlook for 1997, recently released, outlines the specific efforts required to merge the research, data and other support activities into an overall action plan.

A GCIP Poster Session was held on Thursday evening, 3 November, in conjunction with a reception hosted by the UCAR/OFPS. Twenty posters presented specific GCIP research results. One of the highlights of this poster session was a demonstration of the use of Internet World Wide Web (WWW) with Mosaic as the infrastructure for the GCIP Data Management and Service System. Wayne Faas from the NOAA/NCDC prepared a GCIP "home page" as part of this demonstration while Steve Williams and his associates at the UCAR/OFPS demonstrated the use of the WWW in accessing GCIP data (see article by Williams and Faas on the availability of GCIP data through the WWW, page 4 of this issue). Alan Rea provided a demonstration of the use of the GCIP Reference Data Set which he is preparing and which will be published by the U.S. Geological Survey in early 1995.

Dr. Harry Lins of U.S. Geological Survey, (right) discussing hydrology modeling with Prof. Alan Robock, University of Maryland at the GCIP poster session, Boulder, Colorado, November 1994. (NCAR photograph by Bob Bumpas).

The GCIP Science Panel, under the chairmanship of Dr. John Schaake, conducted a final, critical review of the research activities laid out in the GCIP Major Activities Plan. The Panel unanimously agreed that the scientific material and technical demonstrations presented at the different sessions during the week provided convincing evidence that GCIP was making a successful transition from an implementation phase to an execution phase.

WCRP/GEWEX MEETINGS CALENDAR

6–10 March 1995—SECOND INTERNATIONAL STUDY CONFERENCE ON GEWEX IN ASIA AND GAME, Pattaya, Thailand. To obtain information, contact Prof. K. Musiake, 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

13–18 March 1995—WCRP JOINT SCIENCE COMMITTEE, JPL, Pasadena, California. By invitation only.

28–31 March 1995—GPCP THIRD ALGORITHM INTERCOMPARISON PROGRAMME (AIP-3) WORKSHOP. Melbourne, Australia.

10–11 April 1995—CLIVAR GOALS SSC Melbourne, Australia.

18–19 April 1995—ISLSCP SCIENCE PANEL, Washington, DC.

April 1995—LAMBADA BATERISTA-AMBIACE (LBA) Group Meeting, Miami, Florida.

1–12 May 1995—NATO ADVANCED STUDY INSTITUTE on Remote Sensing of Processes Governing Energy and Water Cycles in the Climate System, Plön, Germany. For additional information, contact Professor Erhardt Raschke, ASI-Director, GKSS Research Center, D-21502 Geesthacht, Germany, Tel: +49 4152 871833; Fax: +49 4152 872020; E-mail: raschke@dvmc10.gkss.de

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. For more information, contact the workshop organizing committee chairman, Dr. Tom Carroll at Tel: 612–725–3039; Fax: 612–725–3338; E-mail: tcarroll@snow.nohrsc.nws.gov; or Dr. Terry Krauss at Tel: 306–975–4215; Fax: 306–975–5143; E-mail: krausst@nhrisv.nhrc.sk.doe.ca

5–12 June 1995—XVIII PACIFIC SCIENCE CONGRESS, Beijing, China. 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

3–7 July 1995—JOINT IAHS/IAMAS SYMPOSIUM ON CLOUDS CONVECTION AND LAND-SURFACE PROCESSES, At International Union of Geodesy and Geophysics XXI General Assembly, Boulder, Colorado. For additional information write: IUGG XXI General Assembly, c/o American Geophysical Union, 2000 Florida Ave., NW, Washington, DC 20009, U.S.A., or contact Dr. J. Schaake, National Weather Service, Office of Hydrology (W/OHx2), 1325 East-West Highway, Silver Spring, MD 20910, U.S.A.; Tel: 301–713–1660; Fax: 301–713–1051.

9–11 July 1995—GEWEX RADIATION SCIENCE PANEL, Ft. Collins, Colorado. By invitation only.

28 August – 1 September 1995—FIRST STUDY CONFERENCE ON BALTEX, Visby, on the Island of Gotland, Sweden. 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

4–8 September 1995—THIRD INTERNATIONAL CONFERENCE ON MODELLING OF GLOBAL CLIMATE CHANGE AND VARIABILITY, Hamburg, FRG. For information contact: Dr. Lydia Dumenil, Max-Planck-Institut für Meteorologie, Bundesstrasse 55, D-20146 Hamburg, Germany. Tel: 49–40–41173–310; Fax: 49–40–41173–366.

12–15 September 1995—WCRP ARCTIC CLIMATE SYSTEM STUDY SOLID PRECIPITATION CLIMATOLOGY WORKSHOP, Washington, DC. For information, contact Prof. R. Barry, NSIDC/CIRES, University of Colorado, Boulder, CO 80309, U.S.A.; Tel: 303–492–5488; Fax: 303–492–2468; E-mail: rbarry@kryos.colorado.edu.

November 1995—GCIP SCIENCE PANEL MEETING.

GEWEX REPORTS AND DOCUMENTS
(Available from IGPO)

GEWEX CONTINENTAL-SCALE INTERNATIONAL PROJECT (GCIP) Major Activities Plan for 1995, 1996 and Outlook for 1997. December 1994, IGPO Publications Series 12.

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 Series No. 10.

IMPLEMENTATION PLAN FOR GEWEX CONTINENTAL-SCALE PROJECT (GCIP), VOLUME III: Strategic Plan for Data Management. March 1994, IGPO 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 CON- TINENTAL-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 available)

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Large-scale atmospheric modelers with frontal and cirrus-cloud modelers are shown on 4 November 1994, at the European Centre for Medium-range Weather Forecasts (ECMWF) GEWEX Cloud System Study Workshop at Reading, U.K. (Photography courtesy of ECMWF, photograph by Robert Hine).

Following 2½ days of presentations the participants separated into four working groups: (1) Large-scale Modelling, (2) Validation and Assimilation, (3) Cloud Resolving Models, and (4) Observational Studies. The workshop summaries presented on the last day clearly reflected the success of the workshop, with large-scale and cloud-resolving modelers, and scientists addressing microphysical cloud effects, jointly charting efforts to improve assimilation of clouds in large-scale numerical models.

LATE NEWS

The recent GEWEX Science Steering Group (SSG) meeting (30 January – 3 February 1995) was held in Melbourne, Australia and received significant local media attention, including over 10 radio and television interviews. More on the SSG meeting in the next issue.

The Global Climate Observing System (GCOS) has initiated a newsletter. To receive the GCOS Newsletter, contact the GCOS Joint Planning Office, c/o World Meteorological Organization, P.O. Box No. 2300, CH-1211 Geneva 2, Switzerland (Tel: +41 22 730 8401; Fax: +41 22 740 1439)

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