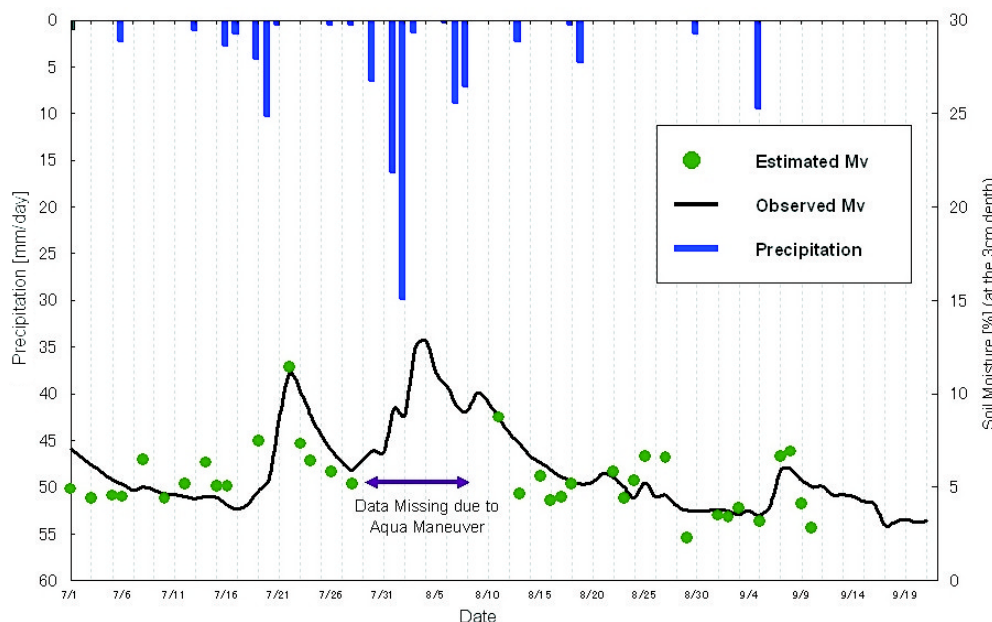


FIRST CEOP EOP-1 SATELLITE DATA COMPARISON WITH CEOP REFERENCE SITE DATA

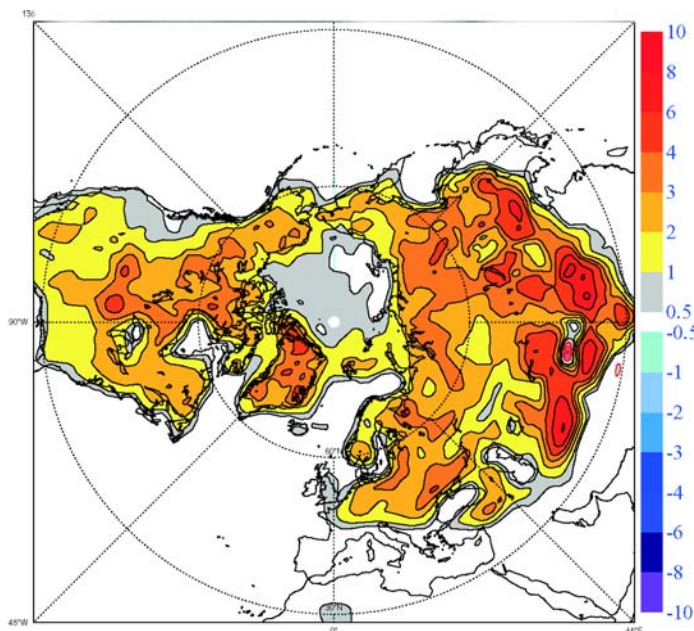


CEOP Mongolia Reference site data validation of AMSR-E soil moisture algorithm shows good agreement. (See article on Page 5)

INITIAL GABLS STUDY BEGINS WITH OVERLOOKED AREA IN CLIMATE RESEARCH

Most IPCC Models Predict Warming Under Stable Conditions Over Land Where Large Model Errors Still Occur (See Article on Page 7)

The first case of the GEWEX Atmospheric Boundary Layer Study (GABLS) focuses on the stable boundary layer over land. **Model differences in the mean temperatures over land areas can be larger than 10K.** The figure at the right shows the difference of the mean temperatures at a height of 2 meters for January 1996 between calculations with two versions of the stable boundary layer parameterization in the ECMWF model. (Figure courtesy of Anton Beljaars, ECMWF)



What's New

- IGPO seeks applicants for director position
- JSC supports GEWEX Phase 2 plans
- Long-term land-surface reanalyses show significant interannual variations
- GPCP workshop determines observation-based analyses vs 4DDA must be primary focus

COMMENTARY**GEWEX SUPPORT REAFFIRMED AT
RECENT WCRP/JSC MEETING****Soroosh Sorooshian, Chairman
GEWEX Scientific Steering Group**

At the March 2003 meeting of the WCRP Joint Scientific Committee (JSC) in Reading, UK, we presented the results from the January GEWEX SSG review and assessment of recent GEWEX accomplishments, along with the plans for our ongoing and new initiatives. GEWEX received strong support from the JSC, as well as guidance for future activities.

I was joined by Bob Schiffer, Jan Polcher and John Roads in making the GEWEX presentation. We also participated in the JSC discussions concerning a proposed "Banner" activity of the WCRP for the next 10–20 years to focus the aims and objectives of the WCRP. The central theme would address "to what extent climate can be predicted" and build up to a Global Climate and Weather Experiment beginning around 2010.

While a summary of the meeting appears on Page 3, let me mention here some of the JSC comments and recommendations.

a) In view of the importance of the key GEWEX observationally based global data sets, the plans for analyzing the internal consistency and providing comparisons with reanalyses were considered most important.

b) Considering the new series of Earth observation satellites, the JSC recommended that GEWEX work with the Space Agencies to develop a plan for cross-calibration of new experimental sensors and the intercomparison of derived products.

c) As a follow-up to the Workshop on Climate System Feedbacks organized jointly by the GEWEX Radiation Panel (GRP) and the JSC/CLIVAR Working Group on Coupled Models in November 2002, the JSC recommended that GRP continue its efforts and provide a status report on plans for making progress on cloud-radiation feedback.

d) Recognizing the need for model validation against precipitation, the JSC recommended that GEWEX take measures to ensure that its expertise on the water cycle be taken into account by the Intergovernmental Panel on Climate Change in planning for its next report.

e) The JSC recommended support for the involvement of GEWEX in the Atmospheric Model Intercomparison Project and the Global Land-Atmo-

sphere Coupling Experiment (co-sponsored by the GEWEX/Global Land/Atmosphere System Study and the CLIVAR/Working Group on Seasonal-to-Interannual Prediction) projects designed to assess the importance of land surface fluxes in climate simulations.

f) In response to the needs of the climate modelers, the JSC encouraged support for extending the International Satellite Land-Surface Climatology Project towards producing a 25-year data set for determining boundary conditions for seasonal prediction and longer climate runs.

g) The new WCRP Satellite Working Group, strongly supported by GEWEX, recommended: (1) final approval of the new space missions under study, focusing on the water cycle and cloud radiative processes and on ocean salinity and soil moisture; (2) increased resources for a more effective exploitation of current and planned satellite observations; and (3) a reinforcement of the interaction between WCRP and space agencies. The JSC endorsed these recommendations of the working group which should, during 2003, extend its consultations and propose a general strategy for the development, benchmarking and use of climate research products.

h) Considering the importance of the science understanding of the physical water cycle in the analysis of broader global water issues, the JSC supported the WCRP participation in the joint International Human Dimensions Programme, WCRP, International Geosphere-Biosphere Program and Diversitas Global Water System Project (GWSP) to ensure that GEWEX expertise and achievements are taken into account. The GEWEX Hydrometeorology Panel (GHP) Water Resource Applications Panel (WRAP) will have increasing involvement in the GWSP.

i) The JSC endorsed GEWEX plans to coordinate studies with the Stratospheric Processes and their Role in Climate (SPARC) Project on tropospheric chemistry and aerosols of importance to radiative forcing.

As you can see, GEWEX activities and interests span a wide range of the energy and water cycle initiatives cross-cutting many disciplines and organizations. This is often the most challenging area for our project and we sincerely appreciate the understanding and strong support we receive from many of the participating scientists in assisting in the broad international coordination of the wide-ranging GEWEX and WCRP initiatives. Keeping in mind, that as we improve our understanding and make significant advances in our ability to observe, model and predict the Earth system, we must continue and find new ways to address these complex interdisciplinary relationships that drive our environment.

GEWEX PROGRESS REPORTED TO WCRP JOINT STEERING COMMITTEE

**Robert Schiffer, Director
International GEWEX Project Office**

The January 2003 meeting of the GEWEX Scientific Steering Group (SSG) in Bangkok, Thailand, provided the opportunity to review and assess recent GEWEX accomplishments and examine the plans for continuing support of ongoing and new initiatives. This review and assessment was presented to the JSC in March 2003.

GEWEX presentations at the JSC were made by Soroosh Sorooshian, Robert Schiffer, Jan Polcher, and John Roads on GEWEX accomplishments, plans, and institutional arrangements. In addition, Gilles Sommeria, WCRP, reported on the conclusions of a satellite working group, several of which are relevant to GEWEX activities. A more complete report on the presentations can be found at www.gewex.org/reports.htm.

Soroosh Sorooshian presented the SSG's assessment of Phase I, their review of the recently completed first year of Phase II, and their guidance for continuing Phase II activities. GEWEX milestones for 2002 included: (1) The beginning of the build-up phase for the Coordinated Enhanced Observing Period (CEOP), with the joint commitments of the Continental-Scale Experiments (CSEs), the space agencies and the global modeling community; (2) advances in closing regional water budgets; (3) the reorganization of global data sets under a common umbrella; and (4) the start of new modeling activities in close coordination with the GCM community.

Key overarching SSG recommendations included: (1) completion of a review paper highlighting achievements of GEWEX Phase I and the development of a "roadmap" of activities focused on meeting the objectives of GEWEX Phase II; (2) development of cross-cutting activities relating to precipitation measurement and modeling, and data management; and (3) assisting the space agencies in planning for cross-calibration of new experimental sensors and intercomparison of derived products.

Robert Schiffer outlined the organizational structure of GEWEX, emphasizing the new cross-cutting activities that place emphasis on completing the key global data sets, and improving the understanding of precipitation processes for prediction. The JSC questioned plans for verifying the internal consistency of GEWEX global data sets and in particular, the

potential role of reanalysis. He then reported on GEWEX Radiation Panel (GRP) matters on behalf of William Rossow. The JSC was reminded that the sensitivity of climate depends mainly on couplings and feedbacks operating in the water and energy cycles, particularly those involving clouds, water vapor and snow/ice albedo. Resolving inconsistencies in relating the top of the atmosphere radiative fluxes with the precipitation record thus requires an improved description of surface fluxes. The main points made were: (1) The climate feedback issue is broader than the aspect addressed by the GRP and needs the attention of the entire WCRP community. GRP plans to define and apply a "standard" set of statistical and diagnostic analyses to all GEWEX global data products, to characterize the variability of all the measured quantities in one common manner as a prelude to a joint analysis. (2) Attention needs to be focused on the transitioning of key research observations into an operational long-term observing system; specifically, GEWEX was encouraged to work with Global Climate Observing System (GCOS) to ensure continuity of support for the Baseline Surface Radiation Network (BSRN) and its transition towards an operational system. (3) There is a concern that there is a general lack of plans to cross-calibrate new experimental sensors on TERRA, AQUA, ENVISAT, and ADEOS-2, and cross-compare data products. (4) A need exists for data management groups (or points of contact) within the Climate Variability and Predictability (CLIVAR) Programme and the Climate and Cryosphere (CliC) Project to collaborate with GRP satellite data projects

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for exchange of data sets and for conducting joint studies. Finally, GRP plans include a joint activity with the Stratospheric Processes and their Role in Climate (SPARC) Project on aerosols (Pinatubo), upper atmosphere water vapor and radiation, as well as proposing a joint workshop on polar clouds and precipitation with CliC.

Jan Polcher provided an update of activities of the GEWEX Modeling and Prediction Panel (GMPP). The goal of GMPP is to develop and validate models used to represent the water and energy exchange processes in the atmosphere and on continents. There is no closed theory of these processes at the macroscopic scale, although they are well understood at the microscopic scale. As a result, GMPP has had to deal with conceptual models (parameterizations). This research is coordinated through the GEWEX Cloud System Study (GCSS), the Global Land/Atmosphere Study (GLASS), and the GEWEX Atmospheric Boundary Layer Study (GABLS). GMPP will have achieved success if it leads to an improved representation of the water cycle in global models through better understanding of the interactions between the surface, the Planetary Boundary Layer (PBL) and the clouds. For example, Jan Polcher highlighted the cross-cutting Global Soil Wetness Project (GSWP-2), a multi-model investigation into the variability and predictability of the global water and energy cycles, intended to produce a model-based estimate of the global continental water fluxes with estimates for the errors linked to the modeling and the forcing fields. The major product of GSWP-2 will be a multi-model land-surface analysis for the International Satellite Land-Surface Climatology Project (ISLSCP) Initiative II period (1987–1995). For 2003, the GCSS will emphasize studies of tropical convection with a focus on the diurnal cycle. GLASS will examine the intensity of surface/atmosphere coupling in coupled models (GLACE) and continue the evaluation of the Project for Intercomparison of Land-Surface Schemes (PILPS). GABLS will focus on an arctic case. This will lead to a better understanding of the interactions between the land-surface, the PBL and clouds. The diurnal cycle was adopted as a theme for all GMPP elements.

John Roads reported on the accomplishments and research plans of the GEWEX Hydrometeorology Panel (GHP) and its components. The GHP represents the largest group of researchers working on GEWEX related activities, focused mainly upon GEWEX studies in the six individual Continental Scale Experiment (CSE) regions: the Baltic Sea Experiment (BALTEX), the GEWEX Asian Monsoon Experiment (GAME), the GEWEX Americas

Prediction Project (GAPP), the Large-Scale Biosphere-Atmosphere Experiment in Amazonia (LBA), the Mackenzie GEWEX Study (MAGS), the Murray-Darling Basin water budget project (MDB), and developing experiments in Africa (AMMA/CATCH) and South America (La Plata River Basin). The GHP also includes the ISLSCP effort, which is being used to drive the GMPP and GSWP models, and the Global Runoff Data Centre (GRDC), which provides an archive of global streamflow. Now that the CSEs and various GEWEX efforts are maturing, it is finally becoming more feasible to begin to develop more global cross-cutting activities. For example, the GHP Water and Energy Budget Studies (WEBS) addresses one of the major objectives of the CSEs, namely, to study the accuracy to which continental-scale water and energy budgets can be characterized and closed. WEBS has begun in all of the individual CSEs and plans are now underway to develop a GHP WEBS synthesis, which could provide a transition to more focused CEOP Water and Energy Simulations Prediction (WESP) activities described below.

The associated WESP element of CEOP is conducting a pilot 3.5 year synoptic climatological case study of regional and global water and energy budgets as a guide to the interpretation of longer term past and future analysis and observations. Starting with the current efforts to close simplified vertically integrated water and energy budgets with observations and models within the GHP WEBS activity, CEOP will begin to focus more on the global scale, including its vertical and diurnal land-atmosphere-ocean hydroclimatological characteristics. A brief report was presented on the Global Water System Project (GWSP) on behalf of Charles Vorosmarty and Dennis Lettenmaier and on the GHP Water Resources Application Project (WRAP) as well.

Gilles Sommeria summarized the conclusions of the WCRP Satellite Working Group set up during 2002 in order to update space mission requirements for WCRP, a large part of them emanating from the GEWEX community. The working group recommended that joint efforts of space agencies and research organizations should be made to integrate separate sensor/satellite data into high-quality, globally integrated climate products, building upon the experience acquired through GEWEX global data sets.

In summary, the JSC provided a timely opportunity to showcase recent GEWEX accomplishments and plans, which were favorably received. The Commentary on Page 2 summarizes the specific resulting JSC recommendations.

COMPREHENSIVE CEOP INTERCOMPARISONS OF IN-SITU DATA, SATELLITE PRODUCTS AND MODEL OUTPUTS ARE UNDERWAY

Katsunori Tamagawa¹, Toshio Koike²,
and Steve Williams³

¹Japan Science and Technology Corporation,
²University of Tokyo, ³University Corporation
for Atmospheric Research (UCAR)

Unified and integrated data set generation for the water cycle is the key objective of the Coordinated Enhanced Observing Period (CEOP) data correction phase. Composite products of the in-situ data at the reference sites, satellite data and model outputs are now being generated. The CEOP Central Data Archive at UCAR has completed the Enhanced Observing Period 1 (EOP-1) composite products for July to September 2001, in cooperation with the CEOP reference sites. The products are available via the web at <http://www.joss.ucar.edu/ghp/ceopdm/>.

The figure on Page 12 shows the intercomparison of the 10-day averages of net radiation, sensible heat flux and latent heat flux between the in-situ observation at Lindenberg, one of the CEOP reference sites of the Baltic Sea Experiment, and the Model Location Time Series (MOLTS) output provided by the National Aeronautics and Space Administration Data Assimilation Office. The largest differences are found in the net radiation.

The figure on Page 1 shows a result of the intercomparison between the spatially averaged surface soil moisture observed at the 12 points in the 120 km by 160 km rectangular area of the Mongolia reference site and the estimated one by applying one of the Advanced Microwave Scanning Radiometer (AMSR) research algorithms for soil moisture (Koike et al., 2000) to the Aqua/AMSR-E data provided by the National Space Development Agency of Japan. The satellite product is in good agreement with the temporal variation of soil moisture in Mongolia.

By using composite data sets from the 36 reference sites, which cover global climate variability, and using hydrometeorological products derived from the new generation of satellites, and model outputs provided by the nine numerical weather prediction centers, CEOP will be able to address comprehen-

sive intercomparison for validation and water cycle process studies.

Acknowledgments: *These analyses would not be possible without the strong support of the CEOP data providers and the reference site and modeling participants: Gombo Davaa, Institute of Meteorology and Hydrology; Ichirou Kaihotsu, Hiroshima University; Frank Beyrich, Meteorological Observatory, Lindenberg; Michael Bosilovich, NASA/DAO; and Naoto Matsuura, NASDA/EORC.*

Reference:

T. Koike, E. Njoku, T. Jackson and S. Palocia, 2000. Soil moisture algorithm development and validation for the ADEOS-II/AMSR. IGARSS 2000, IEEE, pp. 1253-1255.

GEWEX WELCOMES NEW SSG MEMBER

Anton Beljaars has been appointed to the GEWEX Scientific Steering Group (SSG).



He replaces Anthony Hollingsworth, who had been a member since 1989. Dr. Beljaars is Head of the Physical Aspects Section of the Research Department at the European Centre for Medium-Range Weather Forecasts. His areas of interest include numerical weather prediction, subgrid parametrization,

the hydrological cycle, and use of observations in model validation. He can be contacted via e-mail: Anton.Beljaars@ecmwf.int.

POSITION ANNOUNCEMENT DIRECTOR, IGPO

The World Climate Research Programme and the University of Maryland, Baltimore County invite applications for the position of Director of the International GEWEX Project Office located in the Washington-Baltimore area.

The full announcement is available at:
<http://www.gewex.org/GWXDirector.htm>

A 51-YEAR REANALYSIS OF THE U.S. LAND-SURFACE HYDROLOGY

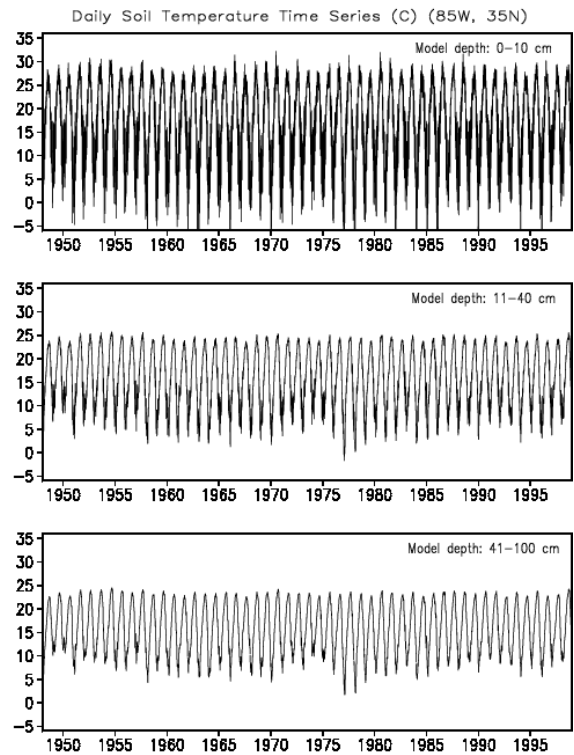
Yun Fan, Huug Van den Dool,
Ken Mitchell, Dag Lohmann

NOAA/NCEP Climate Prediction Center
and Environmental Modeling Center

A 51-year (1948–1998) run of the NOAA land model for the conterminous USA has been completed under Office of Global Programs – GEWEX Continental-scale International Project sponsorship. This NOAA model is also used in the North American Land Data Assimilation System (NLDAS) in which the VIC, Mosaic and Sacramento models also participate (Mitchell et al., 2000). The NLDAS activity has been primarily "real-time forward" from April 1999 onward. The primary reason for the 51-year reanalysis is to define climate, including interannual variability, placing extreme events in historical context, and to aid in forecast applications at the NCEP Climate Prediction Center (CPC), which currently runs a much simpler hydrological model (Huang et al., 1996; Van den Dool, 2003). Climatological applications require that the data sets be as homogeneous as possible. As a result, the forcing fields were selected on the basis of their availability over this time period. For example, real time NLDAS solar radiation is obtained through an algorithm based on satellite measurements; however, long-term data are not available. Therefore, the retroactive run is made with downward solar radiation from the global reanalysis (Kalnay et al., 1996).

The forcing input data consists of precipitation, downward solar and longwave radiation, surface pressure, humidity, 2m temperature and horizontal windspeed, all interpolated to the 1/8 by 1/8 degree grid and hourly time resolution. The output consists of soil temperature and soil moisture (both liquid and frozen) in four layers below the ground and the interface heat and moisture fluxes between the layers. At the surface itself we have all of the components of the energy and (water) mass balance, including snow cover, depth, and albedo. Runoff can be routed into streamflow. For more details see Fan et al. (2003).

A few samples of the output are shown in the figure. The greater interannual variance in temperature in winter (compared to summer) is very obvious in layer 3 (41–100 cm). The bottom figure on the back page shows temperature at the same point in all 4 layers in a single year. The amplitude



Daily soil temperature in layers 1-3 at 85W, 35N for 51 years, according to a retroactive analysis by the NOAA model.

and phase delay of the annual cycle as a function of depth are as expected.

Maurer et al. (2002) have completed a similar run with the VIC model. Apart from the model (NOAH vs VIC), the forcing data sets are quite different and instead of hourly, the VIC uses 3-hourly input. In the near future the Regional Reanalysis (RR) will offer further material for comparison. As a by-product of retroactive NLDAS we also have generated the precipitation input for RR. So the land surface hydrology in RR starts from the same precipitation input.

The reanalysis output is available in various forms. Potential users should contact yun.fan@noaa.gov to see how their needs can best be accommodated. Users who have an account at NCEP can access all (daily, 3-hourly) data. We can also provide this data via high storage tapes at a nominal fee. For the latest information on this project see: <http://www.cpc.ncep.noaa.gov/soilmst/index.htm>.

References:

Fan, Yun, et al. 2003. NWS-CPC'S monitoring and prediction of US soil moisture and associated land surface variables: Land Data Reanalysis. Proc. Climate Diagnostics and Prediction Workshop, 21–25 October, 2002, George Mason University, Virginia.

(Continued on Page 10)

GABLS INITIATES INTERCOMPARISON FOR STABLE BOUNDARY LAYER CASE

Albert A.M. Holtslag
Meteorology and Air Quality Section
Wageningen University, The Netherlands

The overall objective of the GEWEX Atmospheric Boundary Layer Study (GABLS) is to improve the understanding and the representation of the atmospheric boundary layer in regional and large-scale climate models. GABLS aims to provide a platform in which scientists working on boundary layers at different scales will interact. Such activity is important in itself and also very relevant for other activities in GEWEX, and more generally for the activities within WCRP and the International Geosphere-Biosphere Program (Holtslag and Randall, 2001).

The first focus of GABLS is on the representation of the stable atmospheric boundary layer (SBL). **It appears that much of the warming predicted by climate models occurs during stable conditions over land (either in winter or at night). This is documented in the latest Intergovernmental Panel on Climate Change report (see for example figure 9.10, pages 546–548 in Cubasch and Meehl, 2001). At the same time, it is realized that the understanding and parameterization of the SBL is still poor (e.g., Beljaars and Holtslag, 1991).** As an example, the figure on the bottom of Page 1 shows the difference in the temperature at a height of 2 meters for January 1996 as calculated from two model runs with the same forcings, but with (slightly) different stability functions in the mixing scheme of the ECMWF model in stable conditions (after Viterbo et al., 1999). The scheme with more mixing leads to

higher temperatures over continental areas in winter. To obtain the same synoptic evolution in the two simulations, gentle relaxation towards the analysis is applied above 500 m above the surface. Also, the same prescribed values for the sea surface temperature are used (see Viterbo et al., 1999 for more details). Notice that the differences in the mean temperatures over the land areas can take values up to 10K!

To review our understanding and to discuss future directions on stable boundary layers, a workshop was held at the European Center for Medium-Range Weather Forecasting (ECMWF) in Reading, UK, on March 25–27, 2002. The workshop agenda covered the following topics: Modeling and parameterization experiences at the large-scale modeling centers; progress in theory and understanding of SBLs; Large-Eddy Simulation (LES); and observational data sets (Cabauw, CASES, ARM, Lindenberg, and others). Discussion sessions were held on each of the above topics, and a planning session concluded the meeting. In total about 20 presentations were given by leading scientists and about 30 people attended the workshop.

At the ECMWF-workshop many questions were raised, such as: Why do (most) models like enhanced mixing in stable cases? What is the role of the atmosphere-land surface coupling for SBLs (see also Van de Wiel et al., 2002a, b)? How do models compare with the new data available (such as from CASES-99; see Poulos et al., 2002)? How important is model vertical resolution? Subsequently, the GABLS plans were presented at a meeting during the AMS 15th Symposium on Boundary Layers and Turbulence in Wageningen, the Netherlands. About 80 conference participants joined that meeting and overall very positive feedback was received.



The participants at the first GABLS workshop at ECMWF, March 25–27, 2002.

Initially a case study of a night in the CASES-99 data set (Poulos et al., 2002) was prepared for a benchmark study of one dimensional column and LES models over land (prepared by staff members at the Meteorology and Air Quality Section of Wageningen University, NL). However, it became clear that a benchmark case for a stable boundary layer over land is rather complex to start with and to compare the skills of LES and single column models. Therefore, it has been decided to first focus on a case for a SBL with less complexity. This case is based on the results presented in a study by Kosovic and Curry (2000). As such the boundary layer is driven by an imposed, uniform geostrophic wind, with a specified surface-cooling rate, which attains a quasi-steady state SBL. The case for the LES intercomparison is prepared and convened by Malcolm MacVean (Meteorological Office, UK). In addition, Joan Cuxart Rodamilans (University of the Balearic Islands at Mallorca) convenes the intercomparison of the single-column models for this case.

The selected case has already been distributed for a LES intercomparison, where the basic aim is to contribute towards a quantification of the reliability of stable boundary layers in LES. About 10 groups have already agreed to participate in this exercise. The purpose of this single-column intercomparison is to check the performance of any turbulence or vertical diffusion scheme for this shear-driven stably stratified case. The basic philosophy of this exercise is to make a run with every single-column model at exactly the same conditions as the LES, including physical setup and vertical resolution. This will make the comparison to the LES outputs more trustable. Single-column versions of operational models (either weather forecast or climate studies) are very welcome to participate.

The outcome of the model intercomparison study will be presented at a the GABLS Workshop on Model Intercomparison and Future Direction in Mallorca, Spain, 22–25 September 2003 (hosted by the University of the Balearic Islands). We strongly encourage the large-scale modeling centers to take part in the 1D model intercomparisons studies, as well as motivate their scientists to contribute and take part in the proposed activities.

In the future we hope that GABLS may also present an important opportunity for the set up of adequate data sets to be collected and for the consistent analysis of existing data for the improvement of stable atmosphere parameterizations in various conditions. Such improvements are of utmost impor-

tance to the study of regional and global climate change scenarios, among other important modeling uses. This issue will also be addressed in the upcoming workshop.

If you would like to participate in the model intercomparisons and/or in the workshop please send an e-mail to Bert Holtslag (Bert.Holtslag@wur.nl) for general information, to Joan Cuxart Rodamilans (joan.cuxart@uib.es) for the single-column model study, or to Malcolm MacVean (malcolm.macvean@metoffice.com) for the LES intercomparison. Please also consult <http://www.gewex.org/gabls.htm> for updates on GABLS activities in the near future.

Acknowledgments

This is a community effort, which needs the activity and creativity of many people to make real progress! In this respect, I thank all participants at the various meetings for their inputs and comments. In particular, I would like to acknowledge Ric Cederwall, Anton Beljaars, Malcolm MacVean, Joan Cuxart Rodamilans, Greg Poulos, and my staff members at the Meteorology and Air Quality Section of Wageningen University for their help and comments.

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WORKSHOP/MEETING SUMMARIES

GEWEX/GPCP WORKSHOP ON OBJECTIVE ANALYSIS OF PRECIPITATION

11–13 March 2003
Shinfield Park, Reading, UK

Masao Kanimitsu
Scripps Institution of Oceanography

Arnold Gruber
National Environmental Satellite Data and
Information Service, NOAA

The Workshop was sponsored by the GEWEX/Global Precipitation Climatology Project (GPCP) and the European Centre for Medium-Range Weather Forecasts. **The primary goals of the workshop were to improve our understanding of the issues involved in the objective analysis of precipitation using the many sources of information available (e.g., gauges, satellite-derived estimates, radar observations, and model output data); and to make recommendations for GPCP to advance its efforts to provide global analyses of precipitation.**

Twenty-six participants from seven different nations presented their latest work on analysis procedures, data assimilation and observational error characteristics. The various precipitation analysis methods were reviewed on the first day. The focus of the presentations was somewhat different between the observation only and data assimilation analysis groups. In the former, the center of attention was placed on the problem of precipitation observations, bias corrections and merging of different types of observations, while in the latter, the use of the observations were limited to the Tropical Rain Measuring Mission (TRMM) and radar/rain gauge measurements, and the focus was placed on the methods for using precipitation observations in the data assimilation system. This difference clearly contrasted the major interests of the two groups; one is more concerned with the precipitation observations themselves, while the other is concerned with the utilization methods. However, there are many common subjects between the activities of the two groups which came out as very useful working group recommendations. In the second day, quality control of precipitation observations, precipitation characteristics observed from TRMM,

and monitoring of the precipitation in polar region were discussed. The presentations were concluded by a talk promoting international collaboration through the International Precipitation Working Group.

The afternoon of the second day and the third day were used for the Working Group deliberations. The participants were separated into observation only analysis, data assimilation, and quality control groups. The discussions of these three groups are summarized in the following paragraphs.

The observation-only analysis needs to continue. **The precipitation analysis from advanced data assimilation is still not sufficiently accurate, and observation only analyses need to be used as a baseline.** The quality of the observation-only product should continue to improve. Various analysis issues, including data collection, bias correction and merge procedures should be also be investigated further. The requirements from the Numerical Weather Prediction (NWP) community were subdivided into the validation of the global model (analysis and forecast), climate (monthly data), the use of precipitation observations for data assimilation (6-hourly), and the validation of extreme event forecasts (hourly). It was stressed that all data levels should be made available to allow the wide range of applications of precipitation information in NWP. This includes Level 1b (calibrated, navigated raw instantaneous observations), Level 2 (first-order products; instantaneous), and Level 3 (merged, accumulated products; gridded) data of rainfall, rainfall frequency of occurrence, and associated errors. It was pointed out that for the optimum utilization of precipitation data in NWP data assimilation systems, a very close collaboration between algorithm/product developers and modelers is needed.

It is clearly recognized that there is a need for providing error statistics more useable for data assimilation. This includes error statistics of individual observations, rather than the merged products, of each component of errors, namely, the errors associated with (a) instruments, (b) physical retrieval, (c) assumptions on spatial representativeness, and (d) assumptions on temporal representativeness. It is also desirable to provide spatial and temporal correlations of observational error, error in precipitation detection and the uncertainties in the bias.

Active collaboration between modelling/observation/validation groups is needed for a complete description of the analysis errors: biases (their

uncertainties), error covariances, their state dependence, and methodologies for the description of their dependence on space and time scales and synoptic conditions. The GPCP analysis project can provide additional valuable information to the NWP community, but more communication between the two groups is needed. This can be achieved through the GPCP, the GEWEX Radiation Panel (GRP) and the International Precipitation Working Group.

As to the future analysis method for GPCP, the data assimilation group believes that developing an assimilation method is not recommended and some other more nonlinear methods (such as Krieger) suitable for analysis of precipitation should be developed. Such work will also complement the data assimilation analysis.

There was an indication that the data assimilation precipitation is known to be more accurate than satellite estimates over some areas, particularly in higher latitudes, orographic areas, snow covered areas and snowfall. Addition of data assimilation precipitation analysis into the observation-only analysis should be considered for providing more accurate, fully global precipitation analysis to general users. In this regard, the examination of the accuracy of data assimilation precipitation needs to be encouraged.

For the observation-only analysis, several improvements were discussed. The analysis of frozen/snow precipitation, analysis over complex terrain and the use of new satellite observations are the major recommendations.

Observations/products are required on smaller scales (space/time) because data assimilation will increasingly employ time-series of data and focus on more regional applications.

There is a need to continue developing high-quality, unbiased reference sites across the range of climate regimes for validation of precipitation analyses. There is also a need for research on radar precipitation estimates, which are increasingly used by regional data assimilation analysis.

Finally, the data assimilation analysis holds the key to the future for precipitation analysis, since its greatest advantage is that it can provide the analysis of observed and derived meteorological variables (together with precipitation) in a dynamically, physi-

cally and hydrologically consistent manner. However, it will take several more years before the assimilated precipitation analysis becomes as accurate as currently available observation-only analysis. The collaboration with the GPCP group will certainly accelerate this important development.

A 51-YEAR REANALYSIS...

(Continued from Page 6)

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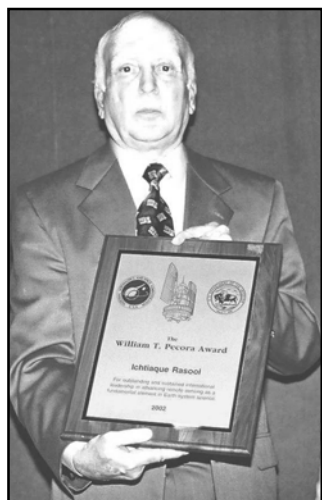
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GEWEX/BAHC INTERNATIONAL WORKSHOP ON SOIL MOISTURE MONITORING, ANALYSIS AND PREDICTION FOR HYDROMETEOROLOGICAL AND HYDROCLIMATOLOGICAL APPLICATIONS: Report on Workshop convened 16–18 May 2000, Norman, Oklahoma, USA. IGPO Publications Series No. 35.

GEWEX CLOUD SYSTEM STUDY (GCSS) SECOND SCIENCE AND IMPLEMENTATION PLAN. April 2000, IGPO Document Series No. 34.

ICHTIAQUE RASOOL AWARDED WILLIAM T. PECORA AWARD



Dr. Ichtaque Rasool, a long-time supporter of GEWEX, co-founder of the International Satellite Land-Surface Climatology Project, and one of the founders of the International Geosphere-Biosphere Program, was awarded the Department of the Interior and National Aeronautics and Space Administration jointly sponsored William T. Pecora Award for outstanding and sustained international leadership in advancing remote sensing as a fundamental element in the Earth system science. Dr. Rasool was cited for his scientific contributions in researching the Earth's climate and vegetation and the evolution of planetary atmospheres; guiding major governmental research and development programs in space-based remote sensing; envisioning and instigating the development of global environmental data sets; and organizing the international science community to tackle global environmental change research.

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GEWEX/WCRP MEETINGS CALENDAR

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

12–16 May 2003—GRP WORKING GROUP ON DATA MANAGEMENT AND ANALYSIS, Asheville, North Carolina, USA.

19–23 May 2003—IAEA'S 11TH ISOTOPE HYDROLOGY SYMPOSIUM, Vienna, Austria.

28–31 May 2003—INTERNATIONAL CONGRESS ON WATER RESOURCES AND ENVIRONMENT, University of San Carlos, Cebu City, Philippines.

3–6 June 2003—WORKSHOP ON IMPROVED QUANTIFICATION OF GLOBAL CARBON CYCLE FLUXES, Sheffield, UK.

17–18 June 2003—MAGS SCIENTIST USER WORKSHOP, Edmonton, Alberta, Canada.

19–24 June 2003—THIRD IGBP CONGRESS, Banff, Canada.

24–26 June 2003—3RD GLOBAL PRECIPITATION MEASUREMENT MISSION WORKSHOP, ESA/ESTEC, The Netherlands.

30 June – 11 July 2003—WORKSHOP ON ISOTOPE TRACERS IN WATER CYCLE MODELS, IAHS/IUGG, Sappora, Japan.

3–4 July 2003—2ND WRAP WORKSHOP ON WATER RESOURCES, Sappora, Japan.

21–24 July 2003—GAPP PIs MEETING, Seattle, Washington, USA.

15–19 September 2003—INTERNATIONAL CONFERENCE ON EARTH SYSTEM MODELLING, Max Planck Institute for Meteorology, Hamburg, Germany.

22–25 September 2003—GABLS WORKSHOP ON MODEL INTERCOMPARISON AND FUTURE DIRECTION, University of the Balearic Islands, Mallorca, Spain.

22–26 September 2003—9TH MEETING OF THE GEWEX HYDROMETEOROLOGY PANEL, GKSS, Geesthacht, Germany.

29 September - 3 October 2003—ILEAPS OPEN SCIENCE CONFERENCE, Helsinki, Finland.

15–17 October 2003—WCRP WORKING GROUP ON SATELLITES, Geneva, Switzerland.

27–31 October 2003—GCSS SSG MEETING AND GCSS WORKING GROUPS 1, 3, AND 4 WORKSHOPS, Broomfield, Colorado, USA.

10–13 November 2003—14TH SESSION OF THE GEWEX RADIATION PANEL, Victoria, British Columbia, Canada.

10–14 November 2003—19TH SESSION OF THE CAS/JSC WORKING GROUP ON NUMERICAL EXPERIMENTATION (WGNE)/7TH SESSION OF THE GEWEX MODELLING AND PREDICTION PANEL (GMPP), Salvador, Brazil.

11–14 November 2003—ACSYS FINAL SCIENCE CONFERENCE, AARI, St. Petersburg, Russia.

12–14 November 2003—MAGS ANNUAL MEETING #9, Montreal, Canada.

13–14 November 2003—WORKSHOP ON PROBLEMS WITH CLOUDS AND 3-D RADIATIVE TRANSFER, Victoria, British Columbia, Canada.

8–12 December 2003—AGU 2003 FALL MEETING, San Francisco, California, USA.

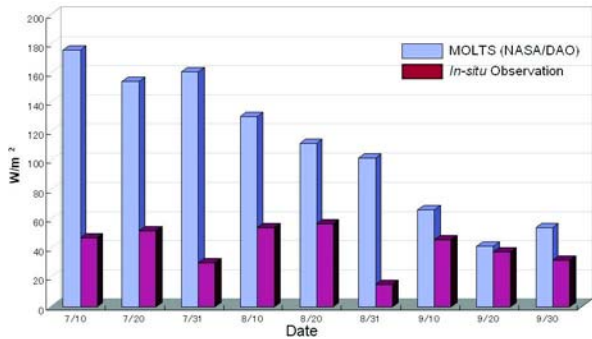
10–15 January 2004—84TH AMS ANNUAL MEETING, Seattle, Washington, USA.

26–30 January 2004—16TH SESSION OF THE GEWEX SSG, Marrakesh, Morocco.

2–4 February 2004—WORKSHOP ON SEMI-ARID REGIONS, Marrakesh, Morocco.

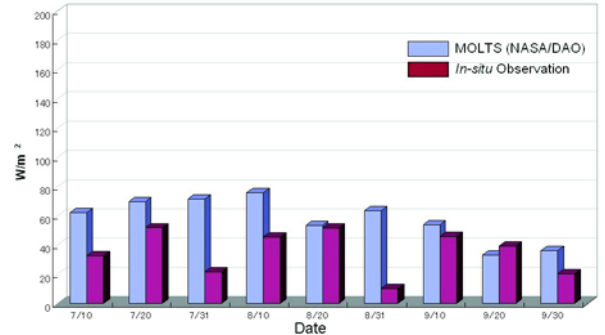
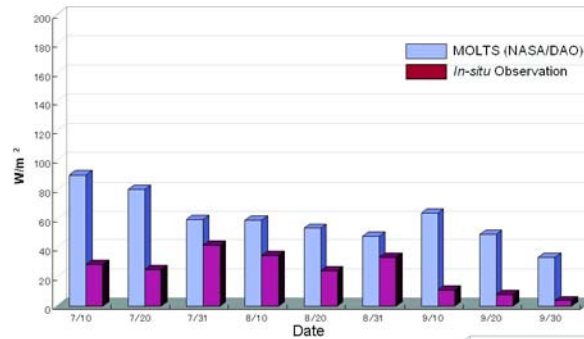
1–6 March 2004—25TH SESSION OF THE WCRP JOINT SCIENTIFIC COMMITTEE, Moscow, Russian Federation.

10–12 March 2004—THIRD CEOP IMPLEMENTATION PLANNING MEETING, Location TBD.

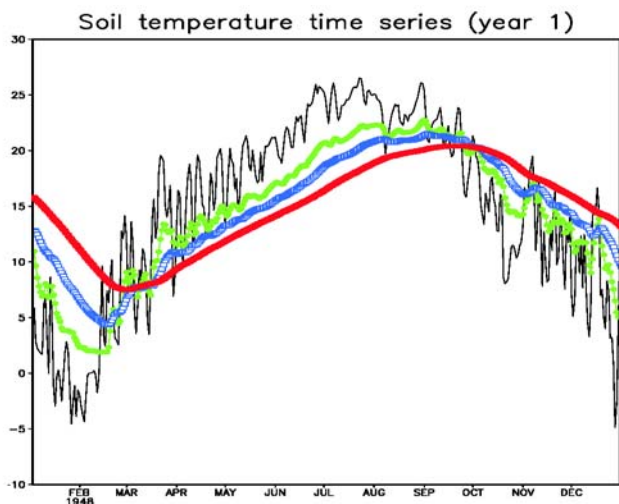


**MODEL AND REFERENCE SITE
CEOP INTERCOMPARISONS SHOW
LARGE DIFFERENCES IN
NET RADIATION**

(See Article on Page 5)



Ten days of the net radiation (top), sensible heat flux (center) and latent heat flux (right) at Lindenberg from June to September 2001.



**RESULTS FROM 51-YEAR
REANALYSIS OF U.S.
LAND-SURFACE HYDROLOGY**

(See Article on Page 6)

The amplitude and phase delay of the annual cycle as a function of depth are as expected in the figure at the left, which shows daily soil temperature in four layers at 85W, 35N for a single year (according to a retroactive analysis by the NOAA model). The black, green, blue and red curves apply to 1-10 cm, 11-40 cm, 41-100 cm and 101-200 cm respectively. See page 6 for more details.

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Dr. Robert Schiffer, Director

Editor: Dawn P. Erlich
Mail: International GEWEX Project Office
1010 Wayne Avenue, Suite 450
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Layout: Erin McNamara
Tel: (301) 565-8345
Fax: (301) 565-8279
E-mail: gewex@gewex.org

WWW Site: <http://www.gewex.org>