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Preface

For the uninitiated reader of this issue, the first and most obvious question must be "what is PILPS?". The answer involves a tour through the somewhat obtuse alphabet soup of the international science bureaucracy. PILPS is the Project for Intercomparison of Land-surface Parameterization Schemes, which in turn is part of the Global Land Atmosphere System Study (GLASS). GLASS in turn is part of GEWEX, the Global Energy and Water Experiment, which is a program of the World Climate Research Programme (WCRP). In the end, though, PILPS, like all international activities that accomplish anything substantive, is a collaboration of scientists with a common interest. In the case of PILPS, that interest is to improve the accuracy and physical realism of the land-surface parameterizations (LSPs) used in numerical weather prediction and climate models.

Current state-of-the-art LSPs represent the dynamics of moisture storage at and near the land surface (mostly as soil moisture and snow, but in a few cases in lakes and wetlands as well), and controls on moisture fluxes from land to the atmosphere by vegetation and soil moisture. The Budyko–Manabe "bucket" schemes used by most coupled land–atmosphere models a decade or so ago are largely a thing of the past. As a result of this transition, the complexity of LSPs has increased substantially, and their verification and testing at the scale at which they are intended to be applied—typically from fractions of to several degrees latitude by longitude—are an important challenge.

Wood et al. (1998), in an introduction to the PILPS Phase 2(c) (Arkansas-Red River) experiment, provide a history of the evolution of PILPS, as do Henderson-Sellers et al. (1993, 1995). This history does not bear repeating here, aside from noting some aspects in the evolution of off-line PILPS experiments (in which models are provided with surface moisture and energy forcings, in contrast to coupled model applications, which account for land–atmosphere feedbacks). Early PILPS experiments used point forcings taken from a climate model, and evaluations were limited to consistency tests, e.g., closure of surface energy and water balances. Subsequent experiments took model forcings from observations, and diagnosed model performance using observations of moisture fluxes and state variables taken from flux towers. PILPS Phase 2(c) provided model participants with model forcings on a grid mesh (1° resolution in the case of PILPS Phase 2(c)) over a relatively large area (about 500,000 km^2), which was intended to be typical of an area over which the models might be applied in practice. Furthermore, it was a river basin over which it was possible to perform both atmospheric and land surface water balance estimates. PILPS Phase 2(c) can be considered as a template for PILPS Phase 2(e) in terms of the study design. While the PILPS Phase 2(e) study domain (58,000 km^2) is considerably smaller than the Arkansas-Red, its representation at 1/4° spatial resolution resulted in model forcing data sets that were somewhat larger than those used in PILPS Phase 2(c) (1° spatial resolution). More importantly, the Torne–Kalix River basin, which is within the GEWEX BALTEX (Baltic Sea Experiment) domain, is relatively well instrumented for a high latitude watershed of moderate area.

In the context of the evolution of PILPS, I would like to comment on a few aspects of PILPS Phase 2(e) that I believe are noteworthy:

- The three PILPS Phase 2(e) overview papers in this special issue (Bowling et al., 2003a,b; Nijssen et al., 2003, respectively) describe the experiment in detail, but there are a few aspects of PILPS Phase

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2(e) in particular, and the evolution of PILPS in general, that the reader might not extract from these papers. PILPS Phase 2(e) was the prototype application for a GLASS initiative called Assistance for Land-surface Modeling Activities (ALMA), the intent of which is to streamline model intercomparisons like PILPS experiments, and to make it possible for others to conduct their own post-experiment evaluations using the original data sets[1]. As part of ALMA, NetCDF was specified as the standard file format for model input and output. Although the implementation of the ALMA/NetCDF protocols was with complications, they seemed to simplify the process of extracting graphical comparisons of models considerably. For instance, one participant in the post-experiment workshop provided their model's output the weekend before the workshop, but all plots distributed to the workshop participants included this model's results along with all the others. From our experience with previous PILPS experiments, this would not have been possible without the ALMA protocols. Furthermore, one model that was not a participant in the experiment was able to use the archived model forcings to perform all of the simulations, and to process, using utilities prepared in cooperation with ALMA, model output into comparative plots similar to those shown in papers in this issue.

- Another important aspect of PILPS Phase 2(e) is that, despite model output volumes that were about an order of magnitude larger than those produced in PILPS Phase 2(c) (around 10 Gb vs. about 1 Gb), all model output was provided to the organizers via the internet. At the time of the PILPS Phase 2(c) experiment, model output was provided on 8-mm tapes, the reading of which created a considerable burden on the organizers—not to speak of delays resulting from mailing of tapes.
- One observation that is more cultural than scientific has to do with the willingness of participants to release model results. In PILPS Phase 2(c) (with which I am most familiar, although I suspect that this observation applies to other earlier PILPS experiments as well), there was considerable sensitivity to releasing model results prior to finalization of the experiments. For this reason, the PILPS Phase 2(c) workshop report identified models only by letter, a convention that we adopted as well. The rationale apparently was to avoid negative implications with respect to models that might not have performed as well as others, until the participants had time to fully evaluate performance of their model relative to observations. Subsequently, there was a lengthy process of obtaining releases from each of the participants to agree to labeling of the results in the papers resulting from the experiment, and one participant declined, the result of which was that results from the model in question were removed from the papers. In PILPS Phase 2(e), such sensitivities were virtually nonexistent. Although we disguised specific models in the workshop report, the attitude of most participants seemed to be "why bother", and there were no complications in obtaining releases from the participants and coauthors. I suspect that this can be attributed to two causes. First, the land surface community has now participated in enough PILPS and other intercomparison experiments that the idea of comparing and evaluating models is now viewed more as an opportunity than a risk. Second, in contrast to PILPS Phase 2(c), most of the participants in the post-experiment workshop (and in turn authors of the papers) were junior scientists who seemed to be less concerned about appearances and programmatic issues than in understanding how their models performed, and in diagnosing problems. One hopes that this is a trend, and not an anomaly—and I suspect it is.

A few brief comments about the papers in this special issue seem in order. The primary focus is on PILPS Phase 2(e), results and interpretation of which are described in detail in the three-part paper by Bowling et al. (this issue a,b) and Nijssen et al. (this issue). This issue was also intended as an outlet to document changes in models that have participated in various PILPS experiments. The main intended contribution of PILPS activities is to facilitate model improvements, so one of course expects the models themselves to evolve over time. For most models, there

[1] For more information about GLASS and ALMA, see http://hydro.iis.u-tokyo.ac.jp/GLASS.

are papers in the archival literature describing model development, but quite often, the models as implemented in PILPS, and other investigations, are substantially different than the forms described in the "standard" references. We therefore encouraged inclusion in this issue of short "model update" papers, which are intended to act as an archival supplement documenting the most important changes to the LSPs over time. In addition to these model update papers, various papers are included that have further analyzed various aspects of model performance in PILPS Phase 2(e), and other PILPS experiments.

In concluding, I want to express my own appreciation for the efforts of Dr. Laura Bowling of the University of Washington, who led PILPS Phase 2(e) from the initial 1998 planning meeting in Koblenz, through development and distribution of the data sets, planning of the March 2000 workshop in Seattle and writing and publication of the three-part paper that follows. Somehow Laura found the time along the way to write a PhD dissertation as well. Thanks are also due to Dr. Bart Nijssen, now of the University of Arizona, who assisted with handling the model output data sets, preparation of analyses for the workshop and various "fire fighting" activities associated with preparation for the workshop and analysis of model results thereafter. Dr. Phil Graham of the Swedish Meteorological and Hydrological Institute (SMHI) provided the quality controlled data sets from which the model forcings were derived, and we thank both Phil for his efforts and the other BALTEX scientists who were involved in collection and processing of the data. Jan Polcher, LMD/CNRS, helped with development of the ALMA protocols as applied in PILPS Phase 2(e). And, I especially want to thank all of the participants in the experiment for their collegiality—working with you has been most gratifying.

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