

PUB: Promise and Progress: Introduction

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BACKGROUND TO PUB

This book presents the proceedings of Symposium S7: *Predictions in Ungauged Basins (PUB): Promise and Progress*, convened as a part of the VIIth IAHS General Assembly that was held at Foz do Iguaçu, Brazil, in April 2005. The timing of the Foz do Iguaçu symposium coincided with the completion of Phase 1 (the preparation phase) of the PUB initiative, which was officially launched at the end of a workshop held at Brasilia in November 2002, and is intended to run for 10 years.

In the two and a half years since its launch, and by the time of the PUB Symposium at Foz do Iguaçu, the PUB initiative had successfully reached a number of significant milestones. First, the PUB Science and Implementation Plan was developed, discussed at length, and then approved by the IAHS Bureau and General Assembly at Sapporo, Japan, in July 2003. It was subsequently published in the *Hydrological Sciences Journal* (Sivapalan *et al.*, 2003) and widely publicised through other scientific media (e.g. Wagener *et al.*, 2004).

The PUB vision, objectives and activities have been propagated within the global hydrological community through the organization of many national and international workshops (e.g. Perth, Yellowknife, Moscow, Menaggio, Kyoto, Foz do Iguaçu). Proceedings of some of these have now been published (Franks *et al.*, 2005; Spence *et al.*, 2005). The current volume represents the latest in this series of publications, recording the gradual progress that has been achieved in the PUB movement. As envisaged in the PUB Implementation Plan, a number of national and international PUB Working Groups (WGs) have been formed, and there are now ongoing PUB-related activities in all parts of the world coordinated through these WGs. More information about PUB and the WGs can be found at <http://www.iahs.info>.

PROGRESS AT FOZ DO IGUAÇU

Although it is still early days for the PUB movement, the PUB Symposium at Foz do Iguaçu provided the opportunity for the global PUB community to get together to discuss the progress that has been achieved to date, to identify areas of weakness or lack of activity, reiterate the plans and promises of PUB, and to make necessary modifications or refinements to the PUB implementation activities with a view to achieving faster and more demonstrable progress in the future.

By any measure, the PUB Symposium was an outstanding success. Over 200 papers (both oral presentations and posters) were presented during the seven sessions arranged under the umbrella of the PUB Symposium. In addition, over 100 papers were presented in other PUB-related sessions outside of the Symposium. This volume includes 51 peer-reviewed articles selected from these presentations. Guided by the PUB Science and Implementation Plan, these papers are organized into five sections that focus on the distinct PUB themes:

- 1 Model Improvements Through Detailed Process Studies;
- 2 Model Evaluation and Comparison: Uncertainty Analysis and Diagnostics;
- 3 New Data Collection Approaches and Model Development;
- 4 New Modelling Approaches and Methods for Testing Models Against Observations;
- 5 Progress in PUB Implementation: PUB Working Groups.

Each section begins with a brief summary of the papers, written by the one or more editors who were responsible for the convening of the appropriate session and for organizing the peer-reviews and editing of the submitted papers. These summaries (Wagener, this volume; Uhlenbrook & Liang, this volume; Zehe & Tachikawa, this volume; Lakshmi, this volume; Sivapalan, this volume) discuss the progress that has been made in each of these theme areas and the work that remains to be done in the future; these will not be repeated here.

The over-riding impression that one gets from perusing the large number of papers included in this volume and the summaries written by the section editors/session conveners is that there is considerable PUB-related activity around the world. The formation of over 20 PUB Working Groups so far is another example of this heightened level of interest and activity. Nevertheless, at the end of Phase 1, a negative consequence of the diversity of worldwide initiatives and activities under PUB may be a possible loss of focus or coherence. This has to do with the broad range of interests and problems that motivate hydrologists within one country or even within one research area, not to mention different perspectives that arise from having to deal with different hydro-climates and different sets of prediction problems. It is becoming increasingly important to prioritize future PUB activity around a small number of themes or questions, in a staged fashion, so that progress can be achieved within a short period of time. It may also be important that all Working Groups, including national or regional ones, identify themselves with one or two themes so that research efforts can be more targeted and progress is demonstrable.

FUTURE PERSPECTIVES

The section summaries point to a small number of crucial research areas/themes that, should become the focus of much more targeted activities over the next 2–3 years. These include:

- (1) understanding of dominant structures in landscapes and their roles in controlling hydrological functioning in different hydro-climates;
- (2) a theoretical framework to generalize knowledge and understanding gained from small-scale field studies to larger domains, and to incorporate these into predictive models;
- (3) a new modelling framework and novel model structures that can naturally deal with multi-scale variabilities, and are capable of progressively incorporating new process understanding gained through field studies;
- (4) ways to characterize (e.g. with remote measurements, hydrogeophysics, etc.) and deal with spatial heterogeneities of land surface properties, and to parameterize the effects of the subscale heterogeneities on hydrological process descriptions at the catchment scale;
- (5) an uncertainty framework for the development and evaluation of scientific hypotheses and modelling studies, including an improved understanding of sources and magnitudes of existing uncertainties, improved methods of model diagnostics, and guidelines for selecting appropriate uncertainty methods; and
- (6) new types of data sources, including the use of soft data to improve model predictions and reduce predictive uncertainty, and new empirical data analysis techniques that enable comparisons between different catchments and across different scales.

The original PUB Science Steering Group (SSG) handed over to a new SSG at the end of the Foz do Iguaçu General Assembly. It is heartening to see that the new SSG has adopted a similar viewpoint, and has restructured the PUB implementation activities around a small number of themes which are not very different from the list above. We expect to see a more coherent picture emerging at the next IAHS General Assembly, which will be held during the IUGG Congress in Perugia, Italy, in July 2007.

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