Preface

The reliability of hydrological predictions is limited in many regions of the world because local hydro-meteorological data are often sparse or non-existent. Data scarcity is an issue in both developed and developing countries, and is amplified by the marked declining trend in observational networks. New strategies are needed to help reduce the negative consequences of data scarcity and thereby improve water resources management; in particular this is necessary to better assess the increasing impacts of natural and anthropogenic climate change.

When data are scarce, hydrological predictions become unreliable mainly due both to the inability to specify model components and parameter values that consistently represent the dominant hydrological processes in a particular watershed, and due to the lack of high quality model forcing. In the context of these sources of unreliability, a number of important current research directions are being pursued, including: (1) *a priori* methods that help to infer model parameter values either directly from observable watershed characteristics (e.g. geology, topography, soils, land cover, etc.), or indirectly from regionalized parameter-to-watershed characteristics obtained from "hydrologically similar" gauged basins, (2) diagnostic model evaluation techniques that deal with powerful ways to extract hydrologically relevant information from available (sparse) data, and (3) techniques that properly account for uncertainty, heterogeneity, emergent processes, scaling, and interactions across scales.

Another important way to reduce the negative implications of the data scarcity problem is to draw upon other non-local sources of information, including, for example, remote sensing technology and coupled systems of hydro-meteorological predictions. New satellites and sensors can provide geo-physical information at a (quasi-) global extent and offer opportunities to obtain temporal and spatial details about components of the water cycle (i.e. precipitation, soil moisture, evaporation, etc.) for use in hydrological model development and evaluation. Nowadays, regional atmospheric models can be extended to describe more components of the Earth system – related in particular to surface hydrology and various pathways and cycles of matter and vegetation. By coupling large-scale regional atmospheric models with global climate models and land hydrology models we can achieve an effective way to overcome data scarcity, while helping to integrate climate feedbacks into water resources management and decision making.

This publication contains a selection of peer-reviewed papers presented at the symposium HS.2: *New Approaches to Hydrological Prediction in Data-sparse Regions* that was held during the 8th IAHS Scientific Assembly and 37th IAH Congress, in Hyderabad, India, 6–12 September 2009. The symposium was jointly sponsored by the following IAHS international commissions and working groups: ICCLAS, ICSIH, ICWRS, ICRS and PUB. The volume contains 40 papers from over 20 countries, reflecting the international dimension of the symposium.

The contents of this volume have been subdivided into four sections with specific themes:

1. *Hydrological Modelling in Poorly-gauged and Ungauged Basins* includes 18 papers with a focus on modelling and calibration strategies for poorly-gauged basins, *a priori* parameter estimation techniques (both local and regional) for parameter estimation, scaling, data assimilation and uncertainty estimation techniques, hill slope characterization and modelling, artificial neural network and wavelet modelling of time series and groundwater resource estimation.

2. *Hydrometeorology and Climate Change Assessment* includes eight papers that investigate coupling of hydrological models with regional atmospheric and global climate models,

downscaling methods, uncertainty estimation, assessment of climate change on water resources, and statistical methods to estimate floods from hydro-meteorological data.

3. *Remote Sensing Applications in Hydrology* includes seven papers related to the use of remote sensing methods to estimate precipitation and evapotranspiration and their utility in hydrological predictions.

4. *Characterizing Rainfall Variability and Its Impacts on Hydrological Modelling* includes seven papers with a focus on characterization of space–time variability and uncertainty in rainfall and its impact on hydrological predictions.

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