

Preface

Cold and mountain regions are the areas of the Earth where some of the earliest and most profound climate-induced changes of hydrological systems are expected, probably because of the dominant contribution of snow and ice to hydrological processes. These regions also represent one of the most severely ungauged basins and suffer from sparse meteorological observations. Our ability to understand changes in hydrological responses to a changing climate needs to improve through enhancement of the modelling tools and observation techniques used for future projections.

During the Joint IAHS-IAPSO-IASPEI Scientific Assembly “Knowledge for the Future”, 22–26 July 2013, in Göteborg, Sweden, a symposium entitled *Cold and mountain Region Hydrological Systems under Climate Change: Towards Improved Projections* was held. The symposium was organized by the International Commission for Snow and Ice Hydrology (ICSIH) together with the International Commission on the Coupled Land–Atmosphere System (ICCLAS). The symposium addressed major issues both in modelling cold and mountain regions’ hydrological processes, and in adapting these models to changing climatic conditions. Among the issues related to hydrological modelling, deepening the process understanding and physical foundation of models, adapting models to new data sources, and PUB-related issues were addressed. Among the issues related to model adaptability, problems of model parameterization, calibration and validation taking into account changing climate conditions, and the demonstration of a model’s readiness for use in cold environmental conditions, were examined. Also, this symposium brought together experimental and modelling experts to discuss a broad range of issues related to understanding specific features of the hydrological systems considered that are responsible for their visible sensitivity to climate change.

The importance of the symposium’s topics is reflected in the large number of contributions covering a broad range of problems related to cold region and mountain hydrology. Of these contributions, 25 papers from colleagues in 12 countries around the World were selected for this volume. The papers were grouped into three themes: (1) Mountain hydrological systems under changes; (2) Lowland cold regions: changes in river flow; and (3) Changes in cryo- and eco-systems. They demonstrate new research results obtained from both experimental and modelling studies of river basins, snow cover, permafrost, glaciers, ecosystems, etc. in regions located in very different physiographic and climatic conditions from the Andes to the Siberian tundra. Collectively, these studies provide opportunities to reveal physical mechanisms that control hydrological responses to climate change, to understand sources and magnitude of uncertainties, and, to improve projections of these responses under different geographical conditions and at various time scales. It is hoped that this book will be a step towards this improvement.

As the editors and the conveners of the symposium, we truly appreciate the contributions from our colleagues. We enjoy the interactions and communications with them regarding their

papers and the publication of this book. We gratefully acknowledge the assistance of the colleagues who shared with us the extremely important work on peer review of the papers. Special thanks to Dr. Olga Nasonova for this work. Many thanks to Penny Perrins and Cate Gardner of IAHS Press for their professional help with the processing of the book.

Alexander Gelfan

Water Problems Institute, Russian Academy of Sciences, Russia

Daqing Yang

National Hydrology Research Centre, Environment Canada, Canada

Yeugeny Gusev

Water Problems Institute, Russian Academy of Sciences, Russia

Harald Kunstmann

*Institute of Meteorology and Climate Research,
Karlsruhe Institute of Technology, Germany*