

PREFACE

Seasonal interactions between snow cover and the atmosphere and vegetation are being increasingly recognized as extremely important factors for the regulation of climate, terrestrial ecosystems, and water supply. These interactions are fundamental to cold regions hydrology and to water supply in the many temperate regions that rely on mountain or high-latitude snowpacks. However, recent intercomparisons of numerical snow models for open environments have shown widely divergent results and there is strong debate over the importance of forest and shrub cover on snow dynamics. Accurate and comprehensive inclusion of the relevant snow processes is critical to the development of improved conceptual and numerical models. This special section of the *Journal of Hydrometeorology* includes papers solicited from two International Commission on Snow and Ice (ICSI) working groups: the “Snow Vegetation Interactions Working Group” (Pomeroy et al. 2001) and the “Snow Model Intercomparison Working Group.” The purpose of this section is to examine snow processes and models in vegetation and in open areas in order to develop more consistent and realistic approaches to representing snow in numerical models. It is hoped that this will improve our understanding of complex snow–vegetation–atmosphere–water systems, and the robustness of representations of snow process in hydrological, soil–vegetation–atmosphere transfer (SVAT), and atmospheric models. Ultimately this should help to reduce the uncertainty in predictions of dynamical environmental systems where snow plays a role.

The six papers in this special section are drawn from the joint workshop, “Snow Processes: Representation in Atmospheric and Hydrological Models” sponsored by the International Association of Hydrological Sciences and the International Association of Meteorology and Atmospheric Science that was held at the International Union of Geodesy and Geophysics Congress in Sapporo, Japan, in July 2003. Thirty-five workshop presentations from Europe, Asia, and North America covered a range of topics from snow accumulation to ablation, and from process studies to modeling. The workshop papers in this section demonstrate notable improvements in how snow is understood and represented in complex environments over a range of scales. The advances in upscaling snow processes and in more realistic model parameterizations are also presented. In particular, vegetation effects on snow processes due to shrubs and forests are now described with increasing sophistication.

A synthesis discussion at the end of the second day of the workshop developed the following recommendations, toward which papers in this section make some progress:

- 1) snow modeling intercomparisons should now focus on vegetated sites, particularly forests (Gelfan et al.; Sicart et al.; Montesi et al.; Strack et al.),
- 2) atmospheric and hydrological models should include multilayer snow process representations that include snow interactions with canopy layers and sparse vegetation (Strack et al.; Bowling et al.; Essery and Pomeroy; Montesi et al.; Sicart et al.; Gelfan et al.),
- 3) advection of energy to snow and redistribution of snow over a range of scales need to be addressed in a greater number of atmospheric and hydrological models (Essery and Pomeroy; Bowling et al.; Gelfan et al.), and
- 4) field research should investigate environments such as leafless winter canopies, sparse vegetation, mixed vegetation, complex terrain, and the interaction of these processes with soils, hydrochemistry, and ecology (Strack et al.; Essery and Pomeroy).

The efforts of the two working groups are being carried on by a new ICSI working group on intercomparison of forest snow process models, led by Dr. Richard Essery. The convenors (listed below) thank the President of ICSI, Professor Gerald Jones for his encouragement and the support of ICSI for these working groups and for leading

in the development of snow ecology from which much of this research stems (Jones et al. 2001).

Convenors of the ICSI Snow Processes and Modeling Workshop:

John Pomeroy, Centre for Hydrology, University of Saskatchewan, Saskatoon, Canada

Richard Essery, Centre for Glaciology, University of Wales, Aberystwyth, United Kingdom

John King, British Antarctic Survey, Cambridge, United Kingdom

Lev Kuchment, Water Problems Institute, Russian Academy of Sciences, Moscow, Russia

Eric Martin, Météo-France/CNRM, Centre d'Etudes de la Neige, Saint-Martin d'Hères, France

Tetsuo Ohata, Institute of Low Temperature Science, Hokkaido University, Sapporo, Japan

REFERENCES

Jones, H. G., J. W. Pomeroy, D. A. Walker, and R. W. Hoham, 2001: *Snow Ecology: An Interdisciplinary Examination of Snow-Covered Ecosystems*. Cambridge University Press, 394 pp.

Pomeroy, J. W., P. Höller, P. Marsh, D. A. Walker, and M. Williams, 2001: Snow–vegetation interactions: Issues for a new initiative. *Soil, Vegetation, Atmosphere Transfer Schemes and Large Scale Hydrological Models*, IAHS Publication 270, A. J. Dolman et al., Eds., IAHS Press, 299–306.

John W. Pomeroy
Guest Editor