



**Proceedings of the
63rd ANNUAL**

EASTERN SNOW CONFERENCE

**7-9 June 2006
Newark, Delaware, USA**

ISBN 0-920081-28-2

ISSN: 0424-1932

Proceedings of the Eastern Snow Conference

Printed and Bound in the United States of America

FOREWORD

This proceedings volume contains papers presented at the 63rd Eastern Snow Conference (ESC) held 7–9 June 2006 at the University of Delaware in Newark, Delaware, USA. Sessions covering snow–climate interactions, snow processes, ground ice and periglacial processes, and remote sensing of snow were convened.

The ESC is a joint United States and Canadian forum for discussing recent work on operational, applied, and scientific issues related to snow and ice. It also retains an increasing interest as a symposium where novel approaches to cryospheric science of international significance are presented. The ESC has published an annual series of proceedings since 1952. Typical topics include studies of snow and ice as materials, snow removal, meteorological forecasting, river ice control, snow hydrology, snow chemistry, glaciology, remote sensing of snow and ice, and snow ecology. Membership in the ESC is open to all interested individuals and corporations. Additional copies of the current proceedings and all back issues can be obtained from the Secretary. More information about the Eastern Snow Conference may be found at <http://www.easternsnow.org/>.

We continue with an optional review process and authors may submit extended abstracts or full papers to the proceedings. Participants in the Western Snow Conference (WSC) (<http://www.westernsnowconference.org/>) have been invited to join the ESC participants in the option of submitting papers relevant to winter hydrology to the international journal *Hydrological Processes*. These papers have gone through a formal journal review, revision, and referee process, and many appear both in these proceedings and in the December 2006 issue of the journal. John Pomeroy (University of Saskatchewan), Kelly Elder (USDA Forest Service, Fort Collins, Colorado), and Andrew Klein (Texas A&M University) edited this special issue of *Hydrological Processes* dedicated to ESC/WSC papers.

We thank the editors at ERDC–CRREL. Over the years this group has contributed considerable time to this publication and has enhanced the quality of these proceedings.

The 2006 meeting of the Eastern Snow Conference and these proceedings were made possible by sponsorship and corporate memberships by the following:

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We look forward to seeing many of you at the 64th Eastern Snow Conference meeting to be held jointly with the Canadian Geophysical Union, Canadian Meteorological Society, and the American Meteorological Society, 28 May–1 June 2007 at Memorial University, St. John’s Newfoundland, Canada. The 2007 meeting theme is “Air, Ocean, Earth, and Ice on the Rock.” It should be exciting, especially with the addition of the other groups.

Robert Hellström and Susan Frankenstein
ESC Proceedings Co-Editors
Bridgewater State College and ERDC–CRREL

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STATEMENT OF PURPOSE

The Eastern Snow Conference (ESC) is a joint Canadian/U.S. organization founded in the 1940s, originally with members primarily from eastern North America. Our current members are scientists, snow surveyors, engineers, technicians, professors, students, and operational and maintenance professionals from North America, the United Kingdom, Japan, and Germany. There is a western counterpart to the ESC, the Western Snow Conference (WSC), which also is a joint Canadian/U.S. organization. Every fifth year the ESC and the WSC hold joint meetings.

The Eastern Snow Conference is a forum that brings the research and operations communities together to discuss recent work on scientific, applied, and operational issues related to snow and ice. The location of the conference alternates yearly between the United States and Canada, and attendees present their work by either giving a talk or presenting a poster. Most resulting papers are reviewed, edited, and published in our yearly *Proceedings of the Eastern Snow Conference*. In recent years, the ESC meetings have included sessions on snow physics, winter survival of animals, snow and ice loads on structures, river ice, remote sensing of snow and ice, and glacier processes. Volumes of the *Proceedings* can be found in libraries throughout North America and Europe, and the papers are also available through the National Technical Information Service (NTIS) in the United States and CISTI in Canada.

* * * * *

Le Colloque sur la neige-région est (ESC) est une organisation américain-canadienne fondée dans les années '40 et dont les membres provenaient à l'origine surtout de l'est de l'Amérique-du-Nord. Actuellement, les membres, qu'ils soient chercheurs, techniciens en enneigement, ingénieurs, techniciens, professeurs, étudiants, et spécialistes des services d'exploitation et d'entretien, viennent non seulement d'Amérique-du-Nord, mais aussi du Royaume Uni, du Japon, et d'Allemagne. Le Colloque sur la neige-région ouest (WSC), aussi une organisation américain-canadienne, est l'homologue de l'ESC pour l'ouest nord-américain. Tous les cinq ans, l'ESC et la WSC organisent des réunions en commun.

Le Colloque sur la neige-région est un forum qui rassemble chercheurs et responsables des services d'exploitation pour discuter des travaux récents sur les problèmes scientifiques, opérationnels, ou autres dus à la neige et à la glace. Le site de cette réunion annuelle alterne entre les États Unis et le Canada. Les participants y présentent les résultats de leurs travaux par des communications orales ou au moyen d'affiches. Ces communications, une fois revues et éditées, sont publiées dans les *Annales de l'ESC*. Dans les années récentes, les réunions de l'ESC ont inclus des sessions sur la physique de la neige, la survie hivernale de la faune, les forces exercées par la neige et la glace sur les structures et les bâtiments, la glace de rivière, la télédétection de la neige et de la glace, et les processus glaciaires. Les *Annales de l'ESC* sont accessibles dans la plupart des bibliothèques scientifiques d'Amérique-du-Nord et d'Europe. Des copies d'articles peuvent être obtenues du National Technical Information Service (NTIS) aux États Unis et son équivalent au Canada, le CISTI.

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THE PRESIDENT'S PAGE

The 63rd annual meeting of the Eastern Snow Conference (ESC) was held at the University of Delaware in Newark, Delaware (7–9 June 2006). There were sessions on snow and climate, remote sensing of snow processes, and glacial and periglacial processes. The quality of the presentations was exceptional and I thank all who shared their data at the meeting.

The success of the 2006 meeting rests with the Executive. I thank Delphis Levia, who, along with Andrew Klein and Miles Ecclestone, made all the local arrangements; our treasurers, Derrill Cowing and Miles Ecclestone, for keeping us in the black; and Claude Duguay (VP and Program Chair) for organizing and running the 63rd meeting. Andrew Klein, our Webmaster, has helped the ESC join the digital age. I also thank our Corporate members (listed in the Foreword) for their continued support of the ESC.

The winner of this year's Weisnet Medal for the best student paper was Y.C. Chung for his work on the influence of the snow–soil moisture flux on snowpack metamorphism. The Campbell Scientific Medal, which is awarded to the best student paper in which instrumentation plays a key role, was awarded to Gernot Koboltschnig for his investigation into the potential of using a water balance model with high temporal resolution for distributed modeling of melting at high elevation.

The *ESC Proceedings* have been published for 63 years. I find this a remarkable feat for a small organization run by a handful of researchers. Editing the proceedings is one of the most time-consuming jobs and I thank our Editors, Dr. Robert Hellström and Susan Frankenstein, for their hard work. This is also the eleventh anniversary of ESC's partnership with *Hydrological Processes*, in which a number of the papers presented at the conference are published. I thank *Hydrological Processes* for providing ESC participants the opportunity to publish in the journal, and Dr. John Pomeroy and Dr. Andrew Klein for handling the *Hydrological Processes* submissions.

I invite you to attend the 64th meeting of the Eastern Snow Conference, to be held in conjunction with the Canadian Meteorological and Oceanographic Society, the Canadian Geophysical Society, and the American Meteorological Society at the end of May 2007 in St. John's, Newfoundland. Please visit our Web site (www.easternsnow.org) for up-to-date details of this meeting.

Best Regards,

Claude Duguay
63rd President
Eastern Snow Conference