



**Proceedings of the
64th ANNUAL**

EASTERN SNOW CONFERENCE

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St. John's, Newfoundland, Canada**

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Proceedings of the Eastern Snow Conference

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FOREWORD

This proceedings volume contains papers presented at the 64th Eastern Snow Conference (ESC) held 29 May – 1 June 2007 at Memorial University in St. John’s, Newfoundland, Canada. Sessions covering the snow-climate interactions, snow processes, cold regions hydrometeorology, glaciers and ice sheets, and remote sensing of snow were convened. This year’s meeting was convened in conjunction with The Canadian Meteorological and Oceanographic Society, the Canadian Geophysical Union, and the American Meteorological Society. It proved a real challenge to try and catch sessions in all of the various venues of interest.

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. Additional 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/>) were invited to join the ESC participants in the option to submit papers relevant to winter hydrology to the international journal, *Hydrological Processes*. These papers went 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 (USFS, Ft. Collins) and Andrew Klein (Texas A&M University) edited this special issue of *Hydrological Processes* dedicated to ESC/WSC papers.

We thank members of the Technical Communication Branch, Information Management Division, at the Engineering Research and Development Center, Cold Regions Research and Engineering Laboratory (ERDC-CRREL). Over the years this group has contributed considerable time to this publication and has enhanced the quality of these proceedings. We especially thank David Cate for his effort on behalf of these proceedings.

The 2006 meeting of the Eastern Snow Conference and these proceedings were made possible by sponsorship and Corporate Memberships by:

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We look forward to seeing many of you at the 65th Eastern Snow Conference meeting to be held 28 – 30 May 2008 at the Lake Morey Resort, Fairlee, Vermont, just up the road from CRREL. This year’s meeting theme is “Applied Uses of Snow and Ice Hydrology” with a special poster session highlighting “Instrumentation: Tools and Toys, Modeling and Hardware.”

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 64th annual meeting of the Eastern Snow Conference was held in St. Johns, Newfoundland from May 28th to June 1st, 2007. This year ESC was fortunate to be small part of this historic first joint meeting hosted by the Canadian Meteorological and Oceanographically Society (CMOS) and the Canadian Geophysical Society (CGU). The American Meteorological Society (AMS) was also a meeting sponsor. Conference participants could not help but come away quite impressed with both the wonderful city of St. Johns, but also the breadth and quality of the research in the geosciences currently happening in Canada, especially in areas related to snow.

The ESC sponsored several snow-related sessions including those on *Snow Cover & Climate, Remote Sensing of Snow Cover, Snowfall and Snow Cover Measurements* and *Snow Processes Measurements and Modelling*. In addition, the conference had numerous other sessions of interest to snow scientists including sessions on glaciers and ice sheets, sea ice and of course hydrology much of which had a strong emphasis on snow.

At this year's meeting, the Campbell Scientific (Canada) Award was presented to Gro Lilbaek, a student at the University of Saskatchewan, for her paper entitled *Ion enrichment of snowmelt runoff water caused by basal ice formation*, which employed a novel experimental setup. This year the Wiesnet medal for best student paper was not awarded, but we hope that it can be awarded at next year's meeting.

According to Miles Ecclestone, this meeting marks another first – the first time the ESC has met in Newfoundland. As a geographer, I would also like to note that it also marks the farthest east in North America the Eastern Snow Conference has met.

The organization continues to be quite healthy, both fiscally and in our numbers. The ESC should be proud that it continues to draw a number of snow scientists from outside of Eastern North America and I hope this trend continues.

It was noted in last year's presidential page that the Eastern Snow Conference Proceedings have been published for 63 years. Efforts by Susan Frankenstein and Robert Hellström continue this wonderful tradition and John Pomeroy continues at the helm of producing our special ESC issue in Hydrological Sciences. Miles Ecclestone is hard at work to ensure that in the near future the entire archive of ESC Proceedings will be available electronically. I would also like to thank the organization's two Secretary-Treasurers, Derrill Cowing and Miles Ecclestone, for making the ESC run so smoothly.

This year's conference could not have been a success without the efforts of the Vice-President and Program Chair Chris Derksen and the local arrangements committee of John Pomeroy and Jim Buttle who represented the ESC well in handling the complex arrangements of a joint large meeting.

I invite you to attend the 65th meeting of the Eastern Snow Conference to be May 28-30, 2008, in Fairlee (Lake Morey), Vermont. Please check out our website, www.easternsnow.org, for up-to-date details of this meeting.

Andrew Klein
64th President
Eastern Snow Conference