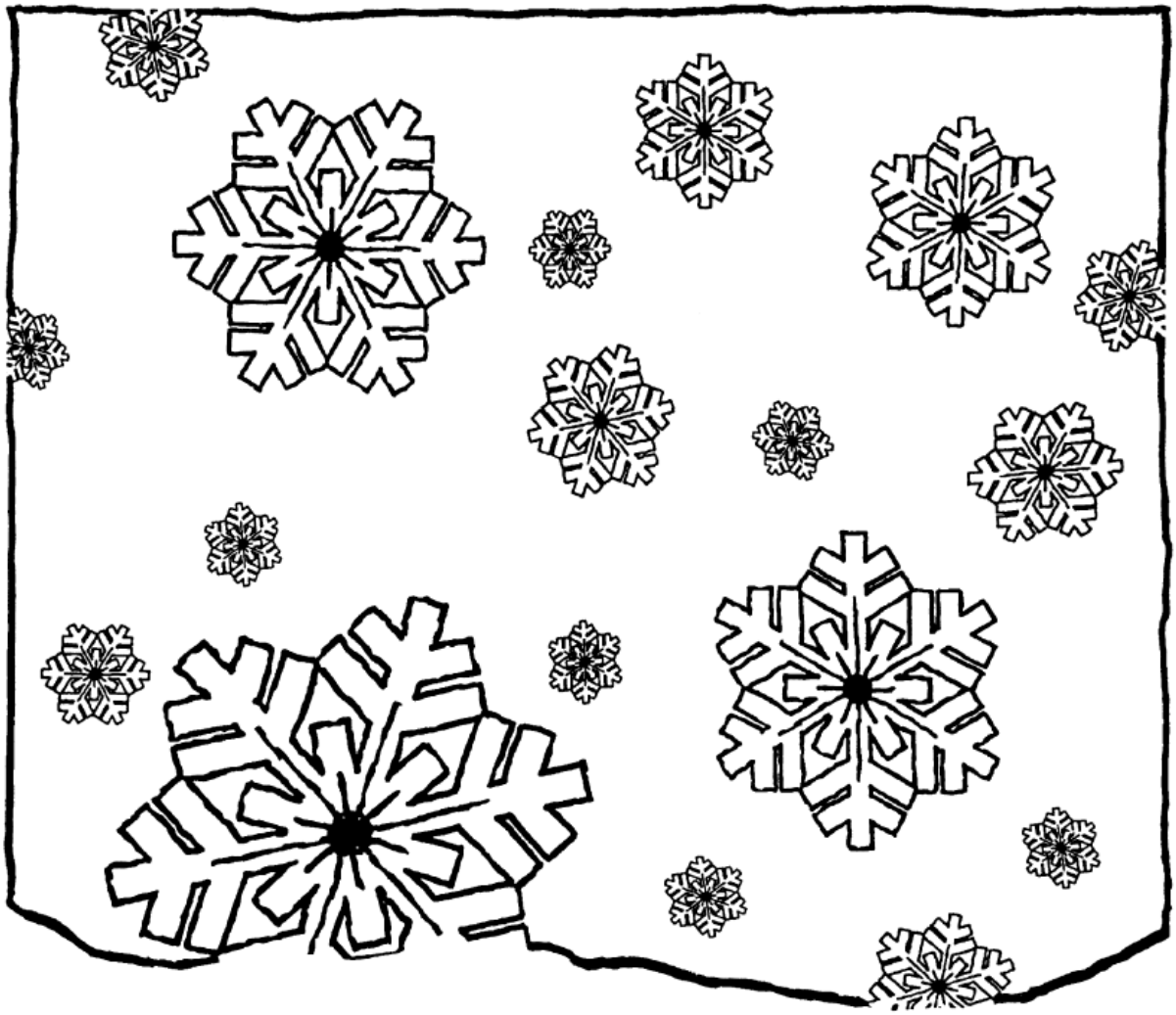

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Dr. Joshua King
1984-2023

The Proceedings of the 79th Eastern Snow Conference is dedicated to snow scientist and ESC Executive Member Joshua King, who passed away on February 21, 2023 in Toronto, Ontario, Canada, at the age of 38.

CONTENTS

Dedication iii

Table of Contents v

Foreward xi

Statement of Purpose xiii

Executives for the 79th Eastern Snow Conference xv

President's Page xvii

Life Members xix

Awards xxi

Oral Session #1

Eastern Snow Conference 2020-2022: The Virtual Years 3
KRYSTOPHER CHUTKO

NASA SnowEx 2023 Tundra and Boreal Field Campaign in Alaska, U.S. 4
CARRIE VUYOVICH, SVETLANA STUEFFER, HANS PETER MARSHALL, MICHAEL DURAND, KELLY ELDER, DRAGOS VAS, BATUHAN OSMANOGLU, CHRISTOPHER LARSEN, DANIEL HODKINSON, KELLY GLEASON, ANNE NOLIN, MEGAN MASON, ARTHUR GELVIN, AND ELIAS DEEB

Application of a Deep Learning Nested U-Net for Reflectivity Inpainting in Spaceborne Radar Blind-Zones 6
FRASER KING, CLAIRE PETTERSEN, AND CHRISTOPHER FLETCHER

Modelling and Analysis of Cross-Polarized Radar Backscatter at C, X, and Ku Bands for SWE Retrieval Algorithm 7
FIROZ BORAH, ZHENMING HUANG, LEUNG TSANG, AND EDWARD KIM

Spatiotemporal Prediction of Snow Accumulation with Recurrent Graph Convolutional Networks 8
BENJAMIN ZALATAN AND MARYAM RAHNEMOONFAR

Influence of Snow Capture by Forest Canopy for a Seasonal Snowpack in the Adirondack Mountains, NY 9
MADISON WOODLEY, HEATHER GUNN, AND SAMUEL TUTTLE

Poster Session #1

Retrieving Snow Density from Ground-Based Radar and Airborne Lidar Observations and Spatial Prediction for Distributed Snow Water Equivalent in Sub-Alpine Mountain Environments 13
TATE MEEHAN, SHAD O'NEEL, HP MARSHALL, ELIAS DEEB, AHMAD HOJATIMALEKSHAH, ZACHARY KESKINEN, AND BRENT WILDER

Implementation and Field Validation of a Passive Radioisotope SWE Sensor in the Catskill Mountains, NY 15
DAVID KELLEY

Bulk Snow Density Retrievals from Passive Microwave Remote Sensing and Automatic Weather Stations in a Tundra Environment 16
JEFFREY WELCH AND RICHARD KELLY

Post Processing Techniques for better Surface Density Estimates for use in Wildlife Tracking Applications 17
JACK DECHOW, MICHAEL DURAND, LAURA PRUGH, JESSICA LUNDQUIST, BEN SULLENDER, CALLUM CUNNINGHAM, CASSIE LUMBRAZO, AND KATHERINE BREEN

Passive Microwave Remote Sensing of Snowmelt and Freeze/Thaw in the Kuparuk Basin, Alaska, using Calibrated Enhanced-Resolution Brightness Temperature (CETB) from SSMI/S and SMAP 18
VICKI JAGDEO, JOAN RAMAGE, MAHBOUBEH BOUESHAGH, AND MARY BRODZIK

Comparing Active and Passive Observations of Snowmelt Refreeze in the Sierra Nevada 19
GEORGE DUFFY, SAM TUTTLE, CARRIE VUYOVICH, ELIAS DEEB, AND ANGELA RIENZO

Altimetric Ku-band Radar Observations of Snow on Sea Ice Simulated with SMRT 20
JULIEN MELOCHE, MELODY SANDELLS, HENNING LÖWE, NICK RUTTER, GHISLAIN PICARD, RANDY SCHARIEN, JOHN YACKEL, AND ALEXANDRE LANGLOIS

Oral Session #2

Examination of Microwave Backscatter of Freshwater Lake Ice using Polarimetric Decomposition 23
CONNOR MCRAE-PHARO AND GRANT GUNN

Remote Sensing and Cloud Computing: Determining Lake Ice Phenology using Google Earth Engine and Sentinel-1 SAR Imagery 24
BRENDAN WARK AND GRANT GUNN

Monitoring Lake Ice Thickness Changes using Interferometric SAR 25
JAKE FERGUSON AND GRANT GUNN

Snow Depth Mapping on Canada's Sub-Arctic Lakes 26
ALICIA POUW, ALEX MACLEAN, AND HOMA KHEYROLLAH POUR

Oral Session #3

It's all about Timing: Exploring the Relationship between Snowmelt and Caribou (*Rangifer tarandus*) Migration in the Northwest Territories of Canada 29
MARIAH MATIAS, JOAN RAMAGE, AND MARY BRODZIK

SWE Retrieval Algorithm Advances using X- and Ku-band Radar 31
EDWARD KIM, FIROZ BORAH, LEUNG TSANG, AND DK KANG

Using ICESat-2 Altimetry to Derive Snow Depth over the Boreal Forests and Tundra of Alaska in Support of the SnowEx 2022/2023 Campaign 32
ZACHARY FAIR, CARRIE VUYOVICH, AND TOM NEUMANN

Verification and Analysis of the NOASS/NWS Baltimore/Washington Weather Forecast Office Winter Storm Threat Experimental Product 33
CONNOR BELAK AND BRIAN LASORSA

Characteristics of Extreme Daily Snowfall Events near Arctic Coastal Regions 34
ALEKSANDRA ELIAS CHEREQUE, PAUL KUSHNER, LAWRENCE MUDRYK, AND CHRIS DERKSEN

Poster Session #2

Daily Continental Scale Snow Water Equivalent Data for North America 37
BIDHYANANDA YADAV, MICHAEL DURAND, JACK DECHOW, SUJAY KUMAR, AND MELISSA WRZESIEN

The Application of Disdrometers and Present Weather Detectors to Improve the Automated Measurement of Solid Precipitation 38
CRAIG SMITH AND AMBER ROSS

Detecting Snow in Western New York and Eastern California using Sentinel-1a SAR and VIS/NIR Snow-Cover Maps 39
DOROTHY HALL, NICOLO DIGIROLAMO, AND GEORGE RIGGS

Retrieval of Snowpack Density and Ice Grain Radius from Time-Domain Diffuse Optical Measurements 52
CONNOR HENLEY, JOSEPH HOLLMANN, COLIN MEYER, AND RAMESH RASKAR

MODIS-VIIRS Snow Cover Extent Data Product Continuity 53
GEORGE RIGGS AND DOROTHY HALL

Interpreting Cosmic Ray Neutron-Based Snow Water Equivalent Estimates from Heterogenous Snow Distributions 62
HAEJO KIM, MADISON WOODLEY, ERIC SPROLES, JED EBERLY, AND SAM TUTTLE

Ku- and L-band SAR Observations of Terrestrial Seasonal Snow and Lake Ice in Ontario during Winter 2023 using the CryoSAR Airborne System 63
RICHARD KELLY, AARON THOMPSON, PETER TOOSE, CHRIS DERKSEN, ALEX ROY, LAURA BROWN, ALEX LANGLOIS, AARON BERG, ARVIDS SILIS, WEI WANG, ZEINAB AKHAVAN, JEFF WELCH, LINA ZSCHENDERLEIN, AND ALEX GELINAS

SWE Impact Index: Toward Identifying Critical Regions with SWE Observational Needs 64
EUNSANG CHO, CARRIE VUYOVICH, SUJAY KUMAR, ETHAN GUTMANN, BATUHAN OSMANOGLU, JAIME BARDAJI, PAUL GROGAN, AND KWO-SEN KUO

Bias Correction of an Ensemble Mean Reanalysis-Based Permafrost Soil Temperature Product using Snow Cover and Vegetation 65
TYLER HERRINGTON, ANDRE ERLER, AND CHRISTOPHER FLETCHER

Refining and Automating DAV Snow Melt Algorithms using Passive Microwave Calibrated Enhanced-Resolution Brightness Temperature (CETB) Data in Alaska Watersheds 66
MAHBOUBEH BOUESHAGH, JOAN RAMAGE, VICKI JAGDEO, AND MARY BRODZIK

Comparing Passive Microwave Snowmelt Detection Methods using Ground-Based Snowmelt Observations 67
ANGELA RIENZO, SAMUEL TUTTLE, GEORGE DUFFY, ELIAS DEEB, AND CARRIE VUYOVICH

Multidisciplinary Observatory for Arctic Climate Change and Extreme Events Monitoring (MOACC) 68
DANIEL KRAMER

Oral Session #4

How Representative are Low Resolution Sea Ice Concentration Products of Conditions at Coastal Sites along the Central Western Antarctic Peninsula? 71
ANDREW KLEIN, CARLY CASPER, JESSICA FITZSIMMONS, DARREN HENRICHS, CHARLES AMSLER, MARGARET ANSLER, KATRIN IKEN, AARON GALLOWAY, SABRINA HEISER, ALEX LOWE, JULIE SCHRAM, AND ROSS WHIPPO

Validation of Snow Water Equivalent Products: Dialed in for Non-Mountainous Regions but Challenges Remain in Complex Terrain 72
COLLEEN MORTIMER, LAWRENCE MUDRYK, EUNSANG CHO, CHRIS DERKSEN, AND CARRIE VUYOVICH

Assimilation of Airborne Gamma-Ray Observations Provides Utility for SWE Estimation in Forested Environments of the Northeastern United States 73
EUNSANG CHO, YONGHWAN KWON, SUJAY KUMAR, AND CARRIE VUYOVICH

Improving our Understanding of ICESat-2 Ice Thickness Estimates in the Canadian Arctic Archipelago using *in situ* and Drone Measurements 74
PETER TOOSE, JOSHUA KING, MIKE BRADY, COLLEEN MORTIMER, BENOIT MONTPETIT, CHRIS DERKSEN, STEPHEN HOWELL, AND ARVIDS SILIS

Ruminations of Machine Learning and Snow Mass 75
BARTON FORMAN, GOUTAM KONAPALA, AND SUJAY KUMAR

Snow Water Equivalence and Stratigraphy Records from White Glacier, Axel Heiberg Island, Nunavut: 1959-2023 76
LAURA THOMSON AND MILES ECCLESTONE

Oral Session #5

Using Lakes as Snow Pillows: Monitoring Snowfall from Lake Water Pressure in the Adirondack Mountains, NY 79
SAMUEL TUTTLE, COLIN BEIER, JAMES MILLS, AND HAMISH PRITCHARD

Comparative Analysis of NOAA and NASA Snow Cover Extent Products 80
DAVID ROBINSON, THOMAS ESTILOW, DOROTHY HALL, AND GEORGE RIGGS

Evolution of Global Snow Cover – Analysis of 23 Years of DLR's Global SnowPack and Latest Processor Developments 94
SEBASTIAN RÖßLER AND ANDREAS DIETZ

Characteristics of the Vermont Snowpack 95
KATHERINE HALE, ANNA GRUNES, BEVERLEY WEMPLE, ARNE BOMBLIES, JAMES SHANLEY, AND ANDREW SCHROTH

Canadian Snow Radar Satellite Mission Science Readiness Advancements 96
BENOIT MONTPETIT, JOSHUA KING, CHRIS DERKSEN, RICHARD KELLY, PAUL SIQUEIRA, PETER TOOSE, AARON THOMPSON, ALEXANDRE ROY, ALEXANDRE LANGLOIS, JULIEN MELOCHE, VINCENT VIONNET, AND ANNA WENDLEDER

Sno-Foo Award 97

FOREWORD

This proceedings volume contains papers presented at the 79th Eastern Snow Conference (ESC) held 6-8 June 2023 at the Nurture Nature Center in Easton, Pennsylvania. The meeting featured oral and poster presentations covering a wide array of cryospheric science, including but not limited to the remote sensing of lake ice phenology, snow water equivalent estimation in forested and tundra environments, snow satellite mission advancements, and the observation and modeling of snow processes.

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 thank members of the ESC executive committee for their continued work toward making each annual meeting a success. This includes, but is not limited to, the work of the Research Committee who evaluate all student presentations and recommend awardees for the three student prizes.

The 2023 meeting of the Eastern Snow Conference and these Proceedings were made possible in part by Corporate membership from Campbell Scientific Canada, Geonor, Gradient Wind Engineering, and Hoskin Scientific Ltd. Printing of the Proceedings was supported by the Centre for Hydrology, University of Saskatchewan.

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We look forward to seeing you at the 80th Eastern Snow Conference meeting to be held 6-8 June 2024 at the University of Waterloo in Waterloo, Ontario, Canada.

Krystopher Chutko and Craig Smith
ESC Proceedings Co-Editors
University of Saskatchewan and Environment and Climate Change Canada

STATEMENT OF PURPOSE

The Eastern Snow Conference (ESC) is a joint Canadian/US 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 around the world. There is a western counterpart to the ESC, the Western Snow Conference (WSC), which also is a joint Canadian/US organization.

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. All volumes of the Proceedings are now available at *easternsnow.org*.

* * * * * * * * *

Le Colloque sur la neige région Est (ESC) est une organisation américaine-canadienne fondée dans les années ’40 et dont les membres provenaient à l’origine principalement de l’est de l’Amérique-du-Nord. Actuellement, les membres, qu’ils soient chercheurs, techniciens, ingénieurs, 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 américaine-canadienne, est l’homologue de l’ESC pour l’ouest nord-américain.

L’ESC 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. Toutes les volumes des *Annales de l‘ESC* sont maintenant disponibles sur *easternsnow.org*.

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THE PRESIDENT'S PAGE

The 79th annual Eastern Snow Conference, and our first in-person ESC meeting since 2019, was held in Easton Pennsylvania 6-8 June 2023. It was great to see everyone in person once again, but intertwined with that celebration were somber moments as we mourned the loss of our friend, colleague, and ESC Executive Josh King who tragically passed away on February 21st of this year. It was heartening to see Josh being remembered and honored throughout the meeting, and although it feels miniscule considering what Josh accomplished in his short time as a research scientist, the ESC would like to dedicate these proceedings to his memory. He is missed tremendously by this community.

The 79th ESC was a resounding success, with 54 total registrants, 17 of which were students. On behalf of all the participants, I would like to thank Joan Ramage, our Vice President and Program Chair, and her team of local volunteers for putting together an interesting and diverse scientific program and arranging some fun-filled social events. Congratulations to our student award winners: Jake Ferguson for winning the Wiesnet Medal for best student paper and Vicki Jagdeo for winning the David Miller Prize for best student poster. Well deserved, and best of luck to all of our student presenters with their continued academics and early careers. I hope to see many of you back again next year, and for many ESC meetings to come.

It was my honour to present ESC Life Membership Awards to two very deserving candidates, Miles Ecclestone and Dorothy Hall, and it was very enjoyable to hear them both give keynote addresses at the banquet, sharing stories of their careers that are intertwined with their long and outstanding (and very much appreciated) involvement with the ESC. Life Members Barry Goodison and James Foster were also in attendance.

Always a highlight of the week was the presentation of the coveted Sno-foo award, presented by Benoit Montpetit to our colleague Peter Toose for proudly producing, choreographing, and distributing videography of the ill-fated demise of his research drone. Well done Peter!

With my term as ESC president ended, I would like to extend my gratitude to Past-President Krys Chutko who tirelessly serves as registrar, webmaster, and guidance counselor, alongside his regular duties as Secretary-Treasurer (Canada) and ESC Proceedings Editor. His "corporate memory" keeps the organization running smoothly and the traditions alive.

As much fun as it was to get together in-person in Easton, I think that we should do it all again next June in Waterloo. I have every confidence that our new Vice President, Grant Gunn, with help from his local team and with full support from the ESC Executive, will organize another fantastic meeting.

One last point in closing, I would like to reaffirm the commitment of the ESC to equity, diversity, and inclusion. We aren't always perfect, but it is up to all of us to strive to be better examples for the next generation of snow researchers.

See you next June in Waterloo!

Craig D. Smith
79th President, Eastern Snow Conference

LIFE MEMBERS OF THE EASTERN SNOW CONFERENCE

The Eastern Snow Conference gratefully recognizes individuals who have made lifelong contributions to the study of snow and for their support of this organization.

MILES ECCLESTONE

JAMES FOSTER

BARRY GOODISON

DOROTHY HALL

GERRY JONES

JOHN METCALFE

HILDA SNELLING

DONALD WIESNET

In memoriam

PETER ADAMS

DON DUNLAP

ART ESCHNER

AUSTIN HOGAN

ROBERT B. SYKES

ESC Life Members Barry Goodison, James Foster, Dorothy Hall, and Miles Ecclestone at the 79th Annual Eastern Snow Conference, 2023.

Wiesnet Medal

The Eastern Snow Conference encourages student research through its Wiesnet Medal. This medal is presented annually to the best student paper presented at the conference.

Year	Winner	Affiliation
2023	Jake Ferguson	University of Waterloo
2022	Megan Verfaillie	University of New Hampshire
2021	Daniela Krampe	Alfred-Wegener-Institut
2019	Zhibang Lv	University of Saskatchewan
2018	Jiyue Zhu	University of Michigan
2017	Caroline Dolant	Université de Sherbrooke
2016	Syed Mousavi	University of Michigan
2015	Nicolas Leroux	University of Saskatchewan
2014	Justin Hartnett	Syracuse University
2013	Andreas Dietz	Earth Observation Center/DFD, Germany
2012	Elizabeth Burakowski	University of New Hampshire
2011	Kathryn Semmens	Lehigh University
2010	Simon von de Wall	University of Victoria
2009	Si Chen	Dartmouth College
2008	Chris Fuhrmann	University of North Carolina at Chapel Hill
2007	*Not awarded*	
2006	Y.C. Chung	University of Michigan
2005	M. Javan-Mashmool	Université du Québec à Chicoutimi
2004	J. Farzaneh-Dehkordi	Université du Québec à Chicoutimi
2003	Alexandre Langlois	Université de Sherbrooke
2002	Patrick Ménard	Université de Laval
2001	C. Tavakoli	Université du Québec à Chicoutimi
2000	*Not awarded*	
1999	S. Brettschnieder	Université du Québec à Chicoutimi
1998	Andrew Grundstein	University of Delaware
1997	Newell Hedstrom	University of Saskatchewan
1996	Suzanne Hartley	University of Denver
1995	Paul Wolfe	Wilfred Laurier University
1994	G.E. Mann	University of Michigan
1993	G. Devarennes	Université du Québec à Québec
1992	D.W. Cline	University of Colorado
1991	D. Samelson	Cornell University
1990	A.K. Abdel-Zaher	University of New Brunswick
1989	A. Giguere	McGill University
1988	Mauri Pelto	University of Maine
1987	Cameron Wake	Wilfred Laurier University
1986	Craig Allan	Trent University
1985	Robert Speck	Rensselaer Polytechnic Institute
1984	N.K. Kalliomaki	Laurentian University
1983	David Beresford	Trent University
1982	*Not awarded*	
1981	Jeffrey Patch	University of New Brunswick
1980	Bryan Wolfe	Trent University
1979	Margaret Leech	McGill University
1978	Michael English	Trent University
1977	Don McLaughlin & George Duggan	Rensselaer Polytechnic Institute
1976	Dwayne McMurter	Trent University
1975	Nigel Allan	Syracuse University
1974	*Not awarded*	
1973	Stan Mathewson	Trent University

David Miller Award

The David Miller Award is presented to the best student poster at the annual Conference.

Year	Winner	Affiliation
2023	Vicki Jagdeo	Lehigh University
2022	Mariah Matias	Lehigh University
2021	Madison Woodley	Syracuse University
2019	Gaohong Yin	University of Maryland
2018	Justin Pflug	University of Washington
2017	Elizabeth Ryan	University of Maryland
2016	Oliver Wigmore	The Ohio State University
2015	Charles Papasodoro	Université de Sherbrooke
2014	Laura Thomson	University of Ottawa
2013	Nastaran Saberi	University of Waterloo
2012	Johnathan Sugg	Appalachian State University
2011	*Not awarded*	
2010	Nicolas Svacina	University of Waterloo
2009	Iliyana Dobreva	Texas A&M University
2008	Christopher Karmosky	Pennsylvania State University

Campbell Scientific Canada Prize

The Campbell Scientific Canada prize is awarded to student research showing the most innovative use of technology in the gathering of data.

Year	Winner	Affiliation
2023	*Not awarded*	
2022	Alicia Pouw	Wilfred Laurier University
2021	Fraser King	University of Waterloo
2019	Alex Mavrovic	Université de Sherbrooke
2018	*Not awarded*	
2017	Abigail Dalton	University of Ottawa
2016	*Not awarded*	
2015	*Not awarded*	
2014	Aaron Campbell	University of Waterloo
2013	*Not awarded*	
2012	Andrew Kasurak	University of Waterloo
2011	Mathieu Beaulieu	University of British Columbia
2010	*Not awarded*	
2009	*Not awarded*	
2008	Nicholas Kinar	University of Saskatchewan
2007	Gro Lilbaek	University of Saskatchewan
2006	Gernot Koboltschnig	University of Natural Resources and Applied Life Sciences, Vienna
2005	Warren Helgason	University of Saskatchewan