Christopher **Marsh**

chris.marsh@usask.ca chrismarsh.ca

Interests

Cryosphere-hydrology, numerical modelling, field work, programming, high-performance computing, the outdoors

Education

2012–2019 **Ph.D.** in Physical Geography
University of Saskatchewan, Saskatoon, SK
Supervisors: Dr. John Pomeroy, Dr. Howard Wheater
Multi-Scale Modelling of Cold Regions Hydrology

2009–2012 **M.Sc.** Physical Geography
University of Saskatchewan, Saskatoon, SK
Supervisors: Dr. John Pomeroy, Dr. Raymond Spiteri
Implication Of Mountain Shading And Topographic Scaling On Energy For Snowmelt

2005–2009 **B.Sc. Honours** Physical Geography, Minors: Math and Comp. Sci.
University of Saskatchewan, Saskatoon, SK
High Resolution Radiation Modelling In Complex Terrain

Awards & Grants

2016 **AGU Flash Freeze competition**
American Geophysical Union

2016 **AGU Outstanding Student Paper Award in Cryosphere**
American Geophysical Union, student presentation

2014–2016 **NSERC Alexander Graham Bell**
Natural Sciences and Engineering Research Council of Canada (NSERC)

2014 **CGU Stan Patterson award in Glaciology**
Canadian Geophysical Union

2014 **Saskatchewan Innovation and Opportunity**
University of Saskatchewan and Gov. Saskatchewan research in a signature area

2013 **J.H. Richards Graduate Award**
University of Saskatchewan, highest average

2012 **AGU Outstanding Student Paper Award in Cryosphere**
American Geophysical Union, student presentation

2011 **D.M. Gray Hydrology Award**
CGU-HS, top student paper and presentation

2009–2012 **Graduate Student Scholarship**
University of Saskatchewan, academic performance

2009 **Canadian Association of Geographers**
Most distinguished geography undergraduate

2008 **Honours scholarship**
University of Saskatchewan, academic performance

Research Experience

2012–present
Research assistant
Coordinated purchases, configuration, and on-going support of the shared workstations used for numerical simulations
Center for Hydrology, University of Saskatchewan

2012–2019
Field work for PhD.
Canmore, AB; Whitehorse, YK
Snow surveys, meteorological site maintenance, ground control of historical sites

2012
CRHM Tools developer
Supervisor: John Pomeroy
Lead developer on the Cold Regions Hydrological Model (CRHM) Tools project at the University of Saskatchewan

2009–2012
Field work for M.Sc.
Canmore, AB
Installing radiometers and time lapse cameras, snow surveys, and meteorological site maintenance

2009
MITACS summer employment with Environment Canada
Supervisor: Bruce Davison and Raymond Spiteri
Improved MESH efficiency via parallelization and code optimization

2008
Modelling with the Cold Regions Hydrological Model (CRHM) for work in ungauged basins
Supervisor: John Pomeroy

Spring 2008
International Polar Year
Inuvik, NWT
Field assistant for instrument installation (water level recorders, snow surveys, vegetation surveys, and surveying (Total Station)

Spring 2006
NHRC, Environment Canada
Inuvik, NWT
Field assistant for instrument installation of water level recorders and surveying

Teaching experience

2016–2019
Lecturer
Geography 290, University of Saskatchewan
Delivered lectures for two weeks on remote sensing and GIS. Prepared material and taught the associated labs, as well as providing 1-on-1 teaching

2016
Teaching assistant
Geography 225, University of Saskatchewan
2nd year general hydrological course. Lead labs and provided 1-on-1 teaching

2016
Teaching assistant
Geography 290, University of Saskatchewan
2nd year introduction to field methods. Assisted in the field with students

2014
Teaching assistant
Geography 225, University of Saskatchewan
2nd year general hydrological course. Lead labs and provided 1-on-1 teaching

Other Experience

2006–2009
Salesperson and customer service
Saskatoon, SK
Boomtown Outfitters

Scientific service

2016–2017	**Young Hydrologic Society (YHS) Canada branch** Chair and founding member
2010–present	**CRYOLIST.org** Co-manager of the listserv
2012–2018	**Global Institute for Water Security (GIWS) student group** Founding member and committee member University of Saskatchewan
2012	**Canadian Geophysical Union Hydrology Section (CGU-HS) student conference** Principal organizer Saskatoon, SK

Peer review

- Atmosphere-Ocean
- Computers and Geoscience
- The Cryosphere
- Journal of Hydrology
- Water Resources Research

Skills

Languages

- Native English
- French immersion (Grade 12)

Technical skills

- Programming: C, C++11, R, Matlab, Python, OpenMP, some MPI, git
- GIS: ArcGIS, SAGA GIS, QGIS, GDAL
- Office: MS Office, Photopshop, LaTeX
- OS: Linux (Fedora, Ubuntu), Windows, MacOS

Field work

- Dataloggers
- Site maintenance
- Meteorological site installation
- Snow surveys

Instruction

- CRCA Canoe Moving Water Level 1 and 2
- CRCA Canoe Moving Water 1 Instructors
- CSIA Downhill Skiing Level 1 Instructors

Safety

- Rescue 3 International SwiftWater Rescue Technician Unit 1
- OHS Standard Level First Aid and CPR Level C
- Over 15 years of extensive remote outdoor experience such as wilderness camping and canoeing

Publications

Peer-reviewed journal

(In review) Marsh, C.B, J.W. Pomeroy, R.J. Spiteri, and H.W Wheater (2019), A finite volume blowing snow model for use with variable resolution meshes, Water Resources Research.

(In review) Marsh, C.B, J.W. Pomeroy, and H.W Wheater (2019), The Canadian Hydrological Model (CHM): A multi-scale, multi-extent, variable-complexity hydrological model – Design and overview, Geoscientific Model Development Discussions, pp. 1–44, DOI: 10.5194/gmd-2019-109.

Marsh, C.B, R.J. Spiteri, J. W. Pomeroy, and H.S. Wheater (2018), Multi-objective unstructured triangular mesh generation for use in hydrological and land surface models, Computers & Geosciences **119**, pp. 49–67, DOI: 10.1016/j.cageo.2018.06.009.

Wayand, N. E., C.B. Marsh, J. M. Shea, and J. W. Pomeroy (2018), Globally scalable alpine snow metrics, Remote Sensing of Environment **213**, pp. 61–72, DOI: 10.1016/j.rse.2018.05.012.

Marsh, C.B., J.W. Pomeroy, and R.J. Spiteri (2012b), Implications of mountain shading on calculating energy for snowmelt using unstructured triangular meshes, Hydrological Processes **26**(12), pp. 1767–1778, DOI: 10.1002/hyp.9329, URL: http://doi.wiley.com/10.1002/hyp.9329.

Conferences (Oral presentation)

Marsh, C.B., V. Vionnet, K. Green, R. Spiteri, N. Wayand, H. Wheater, and J.W. Pomeroy (2019), Multiscale snow hydrology modelling, IUGG-CGU (invited speaker); July 8-18; Montreal, Quebec, Canada.

Marsh, C.B. (2017), Simulating Complex, Cold-region Process Interactions Using a Multi-scale, Variable-complexity Hydrological Model (OSPA Invited), AGU; Dec 11-15; New Orleans, LA, USA.

Marsh, C.B., J.W. Pomeroy, H. Wheater, N. Wayand, and R. Spiteri (2017a), Simulating blowing snow with the Canadian Hydrological Model, AGU; Dec 11-15; New Orleans, LA, USA.

– (2017b), Simulating steady-state blowing snow with the Canadian Hydrological Model, CGU-HS; May 29-31; Vancover, BC, Canada.

Marsh, C.B., N. Wayand, R. Spiteri, J.W. Pomeroy, and H. Wheater (2017c), Towards Large-Scale Simulations in the Yukon with the Canadian Hydrological Model, Wolf Creek Research Basin 25th Anniversary Science Summit; September 28-29; Whitehorse, Yukon, Canada.

Marsh, C.B., J.W. Pomeroy, and H. Wheater (2016), Testing warranted model complexity using a multi-scale, variable-complexity hydrological model, CGU-HS; May 29-June 2; Fredericton, NB, Canada.

Marsh, C.B., N. Wayand, J.W. Pomeroy, and H. Wheater (2016a), The Canadian Hydrological Model: a Multiscale, Multiphysics, Variable Resolution Mesh Simulation System for Cold Regions, AGU; Dec 12-16; San Francisco, CA, USA.

– (2016b), The Canadian Hydrological Model: a Multiscale, Multiphysics, Variable Resolution Mesh Simulation System for Cold Regions, AGU Flash Freeze; Dec 12-16; San Francisco, CA, USA.

Marsh, C.B., J.W. Pomeroy, and H. Wheater (2015), Robustness in the spring surface energy balance in a mountain basin, CGU-HS; May 3-7; Montreal, QC, Canada.

– (2014), Impacts of spatial scaling of unstructured meshes on calculating surface irradiance, CGU-HS; May 4-8; Banf, AB, Canada.

Marsh, C.B., J.W. Pomeroy, R.J. Spiteri, D. Marks, M. Hayashi, S. Munro, M. Demuth, and H. Wheater (2013), Impacts of spatial scaling of unstructured meshes on calculating surface irradiance, CGU-HS; May 27-30; Saskatoon, SK, Canada.

Marsh, C.B., J.W. Pomeroy, and R.J. Spiteri (2012a), Implication of mountain shading and topographic scaling on energy for snowmelt, AGU Dec 3-7 (invited speaker); San. Francisco, Calif. , USA.

– (2011a), Implication of mountain shading and topographic scaling on energy for snowmelt, CGU-HS student conference Jan 29; Calgary, Alberta, Canada.

– (2011b), Implication of mountain shading and topographic scaling on energy for snowmelt, CGU-HS May 15-18; Banff, Alberta, Canada.

Conferences (Posters)

Marsh, C.B. and J.W. Pomeroy (2018), PBSM3D: A complex terrain blowing snow model for use with variable resolution meshes, INARCH February 8-9; Environmental Research Station Schneefernerhaus, Germany.

Headstrom, N., R. Granger, S. Miller, M. Marsh, and C.B. Marsh (2013), Effect of Buoy Motion on Eddy Flux Measurements over Lakes, CGU-HS May 27-30; Saskatoon, SK, Canada.

Marsh, C.B. and J.W. Pomeroy (2013), Automated Hydrological Response Unit create for use with CRHM, CGU-HS May 27-30; Saskatoon, SK, Canada.

Marsh, C.B., J.W. Pomeroy, and R.J. Spiteri (2011c), Implication of mountain shading and topographic scaling on energy for snowmelt, CGU-HS Student conference, Jan 29; Calgary, Alberta, Canada.

Marsh, P., S. Endrizzi, C. Derksen, M. Russell, C. Onclin, H. Wilson, J. Pomeroy, and C.B. Marsh (2010), Factors controlling the spatial variability in end of winter snowcover and spring melt at an arctic tundra site, AGU Dec 13-17; San Francisco, California, USA.

Marsh, C.B., R.J. Spiteri, and B. Davison (2009a), Improved MESH efficiency via parallelization and code optimization, P3/WC2N Annual conference, Oct 14-17; Lake Louise, Alberta, Canada.

Marsh, C.B., S. Pohl, and G.E. Liston (2007), Impact of increased shrub density on snow accumulation and melt in the Arctic tundra, IUGG; Perugia, Italy.

Thesis

Marsh, C.B. (2019), Multi-Scale Modelling of Cold Regions Hydrology, Ph.D, University of Saskatchewan.

– (2012), Implications of mountain shading on calculating energy for snowmelt using unstructured triangular meshes, M.Sc. University of Saskatchewan.

Technical report

Marsh, C.B., R.J. Spiteri, and B. Davison (2009b), Improved MESH efficiency via parallelization and code optimization, tech. rep., Department of Computer Science, The University of Saskatchewan, URL: `http://www.cs.usask.ca/content/researchinfo/techreports/2009/TR-2009-02.pdf`.