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EDUCATION

Ph.D., Earth and Space Sciences, University of Washington, 2018. Dissertation: *Investigations of physical processes in polar firn through modeling and field measurements*. Advisor: Edwin D. Waddington

B.A., Mathematics, Physics, *Cum Laude*, Colorado College, 2005

RESEARCH EXPERIENCE

University of Washington, Department of Earth and Space Sciences

Advisors: Ed Waddington, Howard Conway

September 2010 – present

- Collaborative Research: Characterization of upstream ice and firn dynamics affecting the South Pole Ice Core (SPICE)
Collaborators: Michelle Koutnik, Howard Conway, Ed Waddington, David Lilien, T.J. Fudge, Bob Hawley, Mary Albert, Erich Osterberg, David Clemens-Sewell
 - Gather firn compaction data from site near South Pole
 - Compare firn-model results to measured compaction rates
 - Develop constitutive relationship for firn-densification physics based on compaction-rate data
- Quantifying Firn Compaction and its Implications for Altimetry-based Mass Balance Estimates of the Greenland Ice Sheet
Collaborators: Ed Waddington, Michael MacFerrin, Waleed Abdalati
 - Gather firn compaction data from 8 sites in Greenland
 - Compare firn-model results to measured compaction rates
 - Develop physics based on compaction-rate data
- A Community Firn Model for Firn Evolution and Firn Air
Colleagues: Ed Waddington, Jessica Lundin
October 2010 - present
 - Develop an open source transient model of firn densification and temperature.
 - Develop an open source transient model gas transport in firn.
- Firn-Model Inter-comparison Experiment (FirnMICE)
Collaborators: Jessica Lundin, Ed Waddington, Jesse Johnson, Rob Arthern, Christo Buizert, Anais Orsi, Sebastian Simonsen, Richard Essery, Stephan Ligtenberg, Will Leahy, Paul Harris
November 2012 – February 2017
 - Compiled firn-model outputs from 11 different firn models forced with consistent

- boundary conditions.
 - Investigated differences amongst models in steady-state and transient response to climate-change forcings.
- Glacier Retreat, Outburst Floods, and Kinematic Waves - Nisqually Glacier Changes Related to Climate
 - Colleagues: Howard Conway, Paul Kennard
 - January 2013 – December 2015
 - Assembled and digitize Nisqually Glacier survey data
 - Analyzed and summarized Nisqually Glacier changes identified from transect surveys in context of mass balance, glacier extent, ice activity, and seasonal and long-term climate
- East Antarctic outlet glacier dynamics: investigations of Beardmore Glacier
 - Colleagues: Howard Conway, Michelle Koutnik, Paul Winberry
 - October 2013 – June 2015
 - Analyzed radargrams from Beardmore Glacier, Antarctica
 - Built coarse digital elevation model of glacier bed topography and glacier thickness

Field Work

- Collaborative Research: Characterization of upstream ice and firn dynamics affecting the South Pole Ice Core (SPICE) (3 field seasons)
 - Principal Investigator: Michelle Koutnik
 - December 2016 – January 2017; December 2017 – January 2018; December 2018 – January 2019
 - Drilled and logged firn cores to 125 meters
 - Installed firn-compaction instruments
 - Surveyed stakes with geodetic GPS
- Quantifying Firn Compaction and its Implications for Altimetry-based Mass Balance Estimates of the Greenland Ice Sheet (3 field seasons)
 - Collaborators: Michael J. MacFerrin, Ed Waddington, Waleed Abdalati
 - April – June 2015; April – May 2016; April – May 2017
 - 3-week snowmobile traverse and 2-week air-supported field campaigns
 - Drilled and logged firn cores, installed firn-compaction instruments
- East Antarctic outlet glacier dynamics: investigations of Beardmore Glacier
 - Advisers: Howard Conway, Michelle Koutnik, Paul Winberry
 - December 2013 – January 2014
 - 5 weeks on the Beardmore Glacier in the Transantarctic Mountains, Antarctica
 - Assisted in collection of active seismic and radar data

TEACHING EXPERIENCE

Higher Education

Teaching Assistant, ESS 102: Space and Space Travel
 University of Washington Department of Earth and Space Sciences
 Winter and Spring Quarters 2012

- Taught lab sessions
- Graded assignments

High School

Physics and Math Faculty

High-School High Scholar Program, Colorado Rocky Mountain School, Carbondale, CO

Summer 2013

- Taught physics and calculus classes daily to high-school students from underprivileged backgrounds
- Planned curriculum and daily lessons
- Mentored teaching assistants

Teaching Fellow

Colorado Rocky Mountain School, Carbondale, CO

2009 - 2010

- Assisted teaching Algebra 2
- Supervised students in dormitories
- Led students in campus service work program
- Coached alpine ski team

Outdoor Education

Course Leader

National Outdoor Leadership School (NOLS), Lander, WY

2006 – 2014

- Led wilderness whitewater courses in Colorado, Utah, Idaho, the Yukon and India
- Instructed students in the areas of leadership, risk management, environmental studies, and sport specific skills
- Supervised and coached junior staff
- Planed and implemented curriculum specific to each course

PUBLICATIONS

Verjans V, Leeson A, **Stevens CM**, MacFerrin M, Noël B and van den Broeke MR (2019) Development of physically based liquid water schemes for Greenland firn-densification models. *Cryosph. Discuss.* (doi:10.5194/tc-2019-21)

Lilien DA, Fudge TJ, Koutnik MR, Conway H, Osterberg EC, Ferris DG, Waddington ED and **Stevens CM** (2018) Holocene Ice-Flow Speedup in the Vicinity of the South Pole. *Geophys. Res. Lett.* 45(13), 6557–6565 (doi:10.1029/2018GL078253)

Lundin JMD, **Stevens CM**, Arthern RJ, Buizert C, Orsi A, Ligtenberg SRM, Simonsen SB, Cummings E, Essery R, Leahy W, Harris P, Helsen MM and Waddington ED (2017) Firn Model Intercomparison Experiment (FirnMICE). *J. Glaciol.* 63(239), 401–422 (doi:10.1017/jog.2016.114)

Shean DE, Christianson K, Larson KM, Ligtenberg SRM, Joughin IR, Smith BE, **Stevens CM**, Bushuk M and Holland DM (2017) GPS-derived estimates of surface mass balance and ocean-induced basal melt for Pine Island Glacier ice shelf, Antarctica. *Cryosphere* (doi:10.5194/tc-11-2655-2017)

Sommers AN, Rajaram H, Weber EP, MacFerrin MJ, Colgan WT and **Stevens CM** (2017)

Inferring Firn Permeability from Pneumatic Testing: A Case Study on the Greenland Ice Sheet.
Front. Earth Sci. 5, 1–12 (doi:10.3389/feart.2017.00020)

ORAL PRESENTATIONS

Firn strain-rate observations compared with firn model predictions in Greenland

Stevens, C.M., MacFerrin M., Waddington, E.D., Abdalati, W.

EGU General Assembly, Vienna, April 12, 2019

Holocene ice flow, accumulation, and firn dynamics affecting SPICEcore

Stevens, C.M., Lilien D.A., Fudge, T.J., Koutnik, M.R., Waddington, E.D., Conway, H., Hawley, R., Osterberg, E.C., Albert, M.

South Pole Ice Core Science Meeting, Seattle, WA, September 11 – September 12, 2018

Comparison of Greenland firn compaction-rate and stratigraphy data to model predictions from the Community Firn Model

Stevens, C.M., MacFerrin, M., Waddington, E., Abdalati, W., Vandecrux, B., Heilig, A.

UW ESS Research Gala, Seattle, WA, March 30, 2018

Challenges in modeling firn evolution in the percolation zone

Stevens, C.M., MacFerrin, M., Waddington, E.D., Abdalati, W.

IARPC Glaciers and Sea Level Collaboration Team Meeting, Online, October 27, 2017

Modeling Nisqually Glacier surface-elevation and length changes using a mass-balance record derived from reanalysis and weather-station data

Stevens, C.M., Conway, H., Koutnik, M., Rasmussen, A., Greenberg, H., Kennard P.

GSA Annual Meeting, Seattle, WA, October 22, 2017

Comparison of Greenland firn compaction-rate and stratigraphy data to model predictions from the Community Firn Model

Stevens, C.M., MacFerrin, M., Waddington, E., Abdalati, W., Vandecrux, B., Heilig, A.

Northwest Glaciologists’ Meeting, Vancouver, Canada, October 13-14, 2017

Comparison of Greenland firn compaction-rate and stratigraphy data to model predictions from the Community Firn Model

Stevens, C.M., MacFerrin, M., Waddington, E., Abdalati, W., Vandecrux, B., Heilig, A.

Retain workshop on Modeling Meltwater in Snow and Firn: Processes, Validation, Intercomparison and Model uses of Optical Remotely Sensed Data, Copenhagen, Denmark, September 20, 2017

Modeling 20th-century Nisqually Glacier changes

Stevens, C.M., Conway, H., Koutnik, M., Rasmussen, A., Kennard, P.

Mt. Rainier Glaciers Meeting, Pacific Lutheran University, Tacoma, WA, March 3, 2017

Quantifying firn-model contribution to uncertainty in calculations of ice-sheet mass balance

Stevens, C.M., Vo, H., Yoon, M., Waddington, E.D.

UW ESS Research Gala, April 1, 2016

Comparing firn-density models with the Community Firn Model and the role of field measurements in developing next-generation firn models

Stevens, C.M., MacFerrin, M.J., Vo, H., Yoon, M., Waddington, E.D.

Northwest Glaciologists Meeting, Portland, OR, October 16, 2015

Comparing firn-density models with the Community Firn Model and the role of field measurements in developing next-generation firn models

Stevens, C.M., MacFerrin, M.J., Vo, H., Yoon, M., Waddington, E.D.

PIRE-ICEICS/MicroDICE Meeting, Grenoble, France, September 10, 2015

Developing a Community Model for Firn Evolution and Gas Transport in Firn and the Firn Model Inter-Comparison Experiment (FirnMICE)

Stevens, C.M., Lundin, J., Yoon, M., Harris, P., Leahy, W., Waddington, E.D.

Northwest Glaciologists Meeting, Fairbanks, AK, October 17, 2014

Updates on the PIRE-funded Community Firn Model and the Firn Model Inter-Comparison Experiment (FirnMICE)

Stevens, C.M., Lundin, J., Vo, H., Yoon, M., Harris, P., Leahy, W., Waddington, E.D.

PIRE-ICEICS Meeting, Helsingør, Denmark, August 27, 2014

The effect of climate changes on gas transport in polar firn

Stevens, C.M., Lundin, J., Harris, P., Leahy, W., Waddington, E.

ESS Research Gala, University of Washington, Seattle, April 3, 2014

Firn Physics at the UW and East Antarctic Outlet Glaciers: Pretty Pictures from the Beardmore Glacier

Stevens, C.M.

Presentation to the Antarctic Research Centre, Victoria University of Wellington, Wellington, New Zealand, January 2014

A Community Model for Transient Firn Evolution and Firn-Air Transport

Stevens, C.M., Lundin, J., Leahy, W., Harris, P., Waddington, E.

Northwest Glaciologists Meeting, Vancouver, B.C., October 18-19, 2013

Progress update on the development of the PIRE Community firn-air model

Stevens, C.M., Lundin, J., Leahy, W., Harris, P., Waddington, E.

PIRE-ICEICS Meeting, La Jolla, CA, September 22-23, 2013

Glacier Retreat, Outburst Floods, and Kinematic Waves - Nisqually Glacier Changes Related to Climate

Stevens, C.M., Conway, H., Kennard, P.

Earth and Space Sciences Research Gala, University of Washington, April 4-5, 2013

Glacier Retreat, Outburst Floods, and Kinematic Waves - Nisqually Glacier Changes Related to Climate

Stevens, C.M., Conway, H., Kennard, P.

Nisqually Glacier Research Symposium, Ashford, WA, February 19, 2013

Firn modeling at UW: A community approach

Stevens, C.M., Lundin, J., Waddington, E.

Northwest Glaciologists Meeting, Seattle, WA, October 19-20, 2012

Progress update on the development of the PIRE Community Firn-Air model

Stevens, C.M., Lundin, J., Leahy, W., Harris, P., Waddington, E.

PIRE-ICEICS Meeting, La Londe, France, September 2012

Building a Community Gas Diffusion Model for Polar Firn

Stevens, C.M., Waddington, E.

Northwest Glaciologists Meeting, Portland, OR, October 14-15, 2011

POSTER PRESENTATIONS

Model-predicted firn-property changes in West Antarctica using the Community Firn Model

Stevens, C.M., Horlings, B.I., Horlings, A.N., Kahle, E., Christianson, K., MacFerrin, M., Waddington, E.D.

WAIS Workshop, Coupeville, WA, October 8-11, 2017

Evolution of air content in Greenland firn using the UW Community Firn Model

Stevens, C.M., Horlings, B.I., Horlings, A.N., Kahle, E., Christianson, K., Steig, E., Waddington, E.D.

UW ESS Research Gala, Seattle, WA, March 30-31, 2017

Comparing measured and modeled firn compaction rates in Greenland

Stevens, C.M., MacFerrin, M.J., Yoon, M., Vo, H., Waddington, E.D.

Northwest Glaciologists Meeting, Seattle, WA, October 14 -15, 2016

Comparing measured and modeled firn compaction rates in Greenland

Stevens, C.M., MacFerrin, M.J., Yoon, M., Vo, H., Waddington, E.D.

American Geophysical Union Fall Meeting, San Francisco, CA, December 14-18, 2015

Effects of Climate Changes on Firn Properties and Gas Transport in Firn

Stevens, C.M., Lundin, J., Vo, H., Yoon, M., Waddington, E.D.

American Geophysical Union Fall Meeting, San Francisco, CA, December 15-19, 2015

A Community Model for Transient Firn Evolution and Firn-Air Transport,

Stevens, C.M., Lundin, J., Leahy, W., Harris, P., Waddington, E.

WAIS-Divide Meeting, La Jolla, CA, September 24-25, 2013

A community model for transient evolution of firn density and firn air

Stevens, C.M., Lundin, J., Leahy, W., Harris, P., Waddington, E.

American Geophysical Union Fall Meeting, San Francisco, CA, December 3-7, 2012

A web-based community model for transient thermo-mechanical evolution of firn density and firn air

Stevens, C.M., Lundin, J., Leahy, W., Harris, P., Waddington, E.

Graduate Climate Conference, Pack Forest, WA, October 26-28, 2012

AWARDS AND HONORS

Communication Fellow, February 2012 – December 2013

Pacific Science Center, Seattle, WA

- Took a course in effectively communicating science to the public
- Developed an outreach activity for Polar Science Weekend appropriate for all ages

Research Grant Recipient, 2011

American Alpine Club

- Monetary award to pursue avalanche research

Geophysics Graduate Student Research Award, 2011

University of Washington Department of Earth and Space Sciences

- Monetary award to pursue avalanche research

Program on Climate Change Fellow, 2010 – 2011 Academic Year

University of Washington Program on Climate Change

- Tuition and stipend paid for an academic year

“Top Scholar” Award, 2010

University of Washington Department of Earth and Space Sciences

Phi Beta Kappa, 2005

Colorado College

David and Karen Smith Cowperthwaite Award for Excellence in Physics, 2005

Colorado College

- Annual award for one graduating physics major

PROFESSIONAL, OUTREACH, AND SERVICE ACTIVITIES

Volunteer, Pacific Science Center Polar Science Weekend, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017

- Ran glaciology outreach exhibits
- Interacted with museum patrons ranging in age from young children to the elderly.

Volunteer, “Rockin Out”, 2015 – 2017

- Visited local schools to teach glaciology

Organizer, Northwest Glaciologists Meeting, 2012, 2016

- Assisted in planning logistics for the meeting
- Created a website for the 2012 meeting

Volunteer, University of Washington College of the Environment Science Inside Out, 2013

- Explained ice-core science to College of the Environment donors.

Member, American Geophysical Union, 2012 - present

WORKSHOPS AND MEETINGS ATTENDED

GSA Annual Meeting

Seattle, WA, October 22-25, 2017

Northwest Glaciologists’ Meeting

Vancouver, BC, October 13-14, 2017

WAIS Workshop

Coupeville, WA, October 8-11, 2017

RETAIN Workshop on Modeling Meltwater in Snow and Firn: Processes, Validation, Intercomparison and Model Uses of Optical Remotely Sensed Data
Copenhagen, Denmark, September 20-22, 2017

Northwest Glaciologists’ Meeting
Seattle, WA, October 2016

Snow Science Winter School
Preda, Switzerland, February 14-20, 2016

Northwest Glaciologists’ Meeting
Seattle, WA, October 14-15, 2016

American Geophysical Union Fall Meeting
San Francisco, CA, December 14-18, 2015

Northwest Glaciologists’ Meeting
Portland, OR, October 16-17, 2015

American Geophysical Union Fall Meeting
San Francisco, CA, December 15-19, 2014

Northwest Glaciologists’ Meeting
Fairbanks, AK, October 17-18, 2014

Northwest Glaciologists’ Meeting
Vancouver, BC, October 18-19, 2013

American Geophysical Union Fall Meeting
San Francisco, CA, December 3-7, 2012

Northwest Glaciologists’ Meeting
Seattle, WA, October 19-20, 2012

International Snow Science Workshop
Anchorage, AK, September 16-21, 2012

Northwest Glaciologists’ Meeting
Portland, OR, October 14-15, 2011

University of Washington Program on Climate Change Summer Institute
The Water Cycle in a Changing Climate
Friday Harbor Labs, San Juan Island, WA, September 14–16, 2011

University of Washington Program on Climate Change Summer Institute
Climate Feedbacks
Friday Harbor Labs, San Juan Island, WA, September 15–17, 2010