

NICHOLAS E. WAYAND

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ACADEMIC SUMMARY

University of Washington, Dept. of Civil & Environmental Engineering

Doctor of Philosophy (March 2016)

Dissertation Title: *Observation, Simulation and Evaluation of Snow Dynamics in the Transitional Snow Zone*

Dissertation Committee: Jessica D. Lundquist, Chris Bretherton, Martyn Clark, Bart Nijssen

Master of Science in Civil Engineering, with an emphasis on Hydrology (June 2012)

Thesis Title: *Intercomparison of Meteorological Forcing Data from Empirical and Mesoscale Model Sources in the N.F. American River Basin in Northern California*

University of Washington, Dept. of Atmospheric Sciences

Bachelor of Science in Atmospheric Sciences, Minor in Applied Mathematics (March 2010)

EMPLOYMENT HISTORY

Post-Doctoral Researcher, 2016 to present

Centre for Hydrology, University of Saskatchewan

- Used remotely sensed snowcover with the Google Earth Engine to constrain blowing snow models development in Alpine terrain across North America.
- Developed model chains to link weather forecasts to high-resolution snowmelt and runoff models over Canadian Rockies.

Graduate Student Research Assistant, 2010 to 2016

Civil and Environmental Engineering Dept., University of Washington

- Compiled 25 years of weather, snow, and soil observations at Snoqualmie Pass.
- Worked with WSDOT to evaluate WRF's precipitation partitioning at Snoqualmie Pass during large storms.
- Conducted field campaign in the Cedar River watershed to quantify impact of forest harvesting on snow persistence.
- Quantified snowmelt during historical rain-on-snow floods over western US.

Graduate Instructor, CEE 573 Snow Hydrology, Winter Quarter 2015

Civil and Environmental Engineering Dept., University of Washington

- Taught applied course on modeling, analysis, and theory of snow contributions to streamflow.

NCAR Graduate Researcher, September 2012 – June 2013

National Center for Atmospheric Research, Boulder, CO

- Developed and evaluated new hydrological modeling framework for understanding structural choices.

Valle Scholar, September 2011– June 2012

Universitetet i Bergen, Bergen, Norway

- Applied a linear precipitation model to predict orographic gradients over Norway and Washington Cascades.

Undergraduate Research Assistant, 2007 – 2009

Atmospheric Sciences Dept., University of Washington

- Deployed and monitored 18 precipitation gauges in the Olympic Mountains to evaluate UW weather forecasts.

SKILLS AND COMPETENCIES

Computer Languages

Proficient in: Python, Spark, C++, Matlab, ArcGIS, Bash, HTML

Familiar with: FORTRAN, IDL, Java, SQL

Geophysical Models

Atmospheric:

The Weather and Research Forecasting (WRF) Model
Simple Linear Precipitation Models

Hydrology:

Variable Infiltration Capacity (VIC) Model
The Canadian Hydrological Model (CHM)
Distribution Hydrology Soil and Vegetation Model (DHSVM)
Structure for Unifying Multiple Modeling Alternatives (SUMMA)
Snow Accumulation and Ablation Model (SNOW-17)
HSPF
USGS MODFLOW

MEDIA AND OUTREACH

Module on Rain-on-snow flooding for high school level - Inglemoor High School.

<https://pcc.uw.edu/education/curriculum/climate-teaching-modules/rain-on-snow-flooding-module/>
March 2015.

AGU Press release – *Improving forecasts for rain-on-snow flooding*.

<http://fallmeeting.agu.org/2014/press-item/improving-forecasts-for-rain-on-snow-flooding/>
December 2014.

Seattle Science Fellow – K-12 hands on activity: *How much water is contained in snow?*

<http://www.pacificsciencecenter.org/Articles/meet-nic-wayand> 2010 - 2013.

AWARDS AND FELLOWSHIPS

Best Paper Presentation at the Western Snow Conference 2017

For presentation on blowing snow indices using Google Earth Engine.

UW Panel on Climate Change Certificate, 2015

For developing a rain-on-snow module.

Distributed Research Infrastructure for Hydro-Meteorology Certificate, 2014

For completing course on chaining models for flood forecasting.

NASA Earth and Space Science Fellowship, 2013 - 2015

To support three years of PhD research on remote sensing of the Cryosphere.

National Science Foundation Grant, 2013 - 2015

To support three years of PhD research related to study of the Transitional Snow Zone.

Valle Scholarship, 2010 - 2011

To support research and education placement at the Universitetet i Bergen, Norway.

Graduate Student Panel on Climate Change Fellow, 2009 - 2010

Funded research on the suitability of meteorological forcing for hydrological models.

Atmospheric Sciences Richard J. and Joan M. Reed Endowed Scholarship, 2009

To support undergraduate study and research in atmospheric sciences.

PROFESSIONAL MEMBERSHIPS

American Geophysical Union member, 2010 – present

Canadian Geophysical Union member, 2017 – present

UW Panel on Climate Change member, 2010 – present

REVIEWER

NASA Panel Member, 2017

Journal of Geophysical Research Atmospheres

Journal of hydrology

Journal of hydrometeorology

Water Resources Research

Journal of Climatology

PUBLICATIONS

Dickerson-Lange, S.E., Gersonde, R.F., Hubbart, J.A., Link, T.E., Nolin, A.W., Perry, G.H., Roth, T.R., **Wayand, N.E.**, and Lundquist, J.D. (2017) Snow disappearance timing is dominated by forest effects on snow accumulation in warm winter climates of the Pacific Northwest, United States. *Hydrological Processes*, doi:10.1002/hyp.11144

Wayand, N. E., Clark, M. P., and Lundquist, J. D. (2016) Diagnosing Snow Accumulation Errors in a Rain-Snow Transitional Environment with Snow Board Observations. *Hydrological Processes*, doi:10.1002/hyp.11002.

Wayand, N. E., J. Stimberis, J. P. Zagrodnik, C. F. Mass, and J. D. Lundquist (2016), Improving simulations of precipitation phase and snowpack at a site subject to cold air intrusions: Snoqualmie Pass, WA, *Journal of Geophysical Research: Atmospheres*, 121, 9929–9942, doi:10.1002/2016JD025387.

Wayand, N. E., A. Massmann, C. Butler, E. Keenan, J. Stimberis, and J. D. Lundquist, (2015), A Meteorological and Snow observational data set from Snoqualmie Pass (921 m), Washington Cascades, U.S., *Water Resources Research*, doi:10.1002/2015WR017773.

Wayand, N. E., J. D. Lundquist, and M. P. Clark (2015), Modeling the influence of hypsometry, vegetation, and storm energy on snowmelt contributions to basins during rain-on-snow floods, *Water Resources Research*, 51, doi.org/10.1002/2014WR016576.

*Lundquist, J. D., N. E. **Wayand**, A. Massmann, M. P. Clark, F. Lott, and N. C. Cristea (2015), Diagnosis of insidious data disasters, *Water Resour. Res.*, 51, 3815–3827, doi:10.1002/2014WR016585. ***Winner of 2014 Water Resources Research Editor's Choice Award**

Wayand, N. E., A. F. Hamlet, M. Hughes, S. I. Feld, and J. D. Lundquist, 2013: Intercomparison of Meteorological Forcing Data from Empirical and Mesoscale Model Sources in the North Fork American River Basin in Northern Sierra Nevada, California, *J. Hydrometeorol.*, 14, 677–699. doi.org/10.1175/JHM-D-12-0102.1

Wayand, N., and Lundquist J., 2013: Observing the Elusive Intermittent Snow using Traffic Camera Images. 81st Annual Western Snow Conference. <http://www.westernsnowconference.org/sites/westernsnowconference.org/PDFs/2013Wayand.pdf>

Wayand, N., Lundquist J., Hughes M., and Hamlet A. Supplementing Sparse Observations of Temperature and Precipitation with a High Resolution Atmospheric Model. Western Snow Conference, South Lake Tahoe, April 18–21st, 2011. In: Freeman, Gary, *Proceedings of the 79th Annual Western Snow Conference*. <http://www.westernsnowconference.org/sites/westernsnowconference.org/PDFs/2011Wayand.pdf>

Forsyth, J., Lundquist J., and **Wayand N.** An Experimental and Modeling Investigation of the Impact of Silvicultural Manipulation on Snow Hydrology in the Cedar River Watershed, WA. Western Snow Conference, Logan, UT, April, 2010. In: Freeman, Gary, *Proceedings of the 78th Annual Western Snow Conference*. <http://www.westernsnowconference.org/sites/westernsnowconference.org/PDFs/2010Forsyth.pdf>

CONFERENCE PRESENTATIONS

Wayand, N. E., C. B. Marsh, and J. W. Pomeroy. Evaluation blowing snow and avalanche models over the Canadian Rockies. Canadian Geophysical Union Annual Meeting, Vancouver, British Columbia, May, 2017.

***Wayand, N. E.**, C. B. Marsh, J. M. Shea, and J. W. Pomeroy. Observing Snow Redistribution Impacts on snowcovered area over the Canadian Rockies using Remote Sensing. Western Snow Conference, Boise, Idaho, April, 2017. ***Winner of Best Paper Presentation.**

Wayand, N. E., J. Stimberis, J. P. Zagrodnik, C. F. Mass, and J. D. Lundquist. Improving Simulations of Precipitation Phase and Snowpack at a Site Subject to Cold Air Intrusions: Snoqualmie Pass, WA. American Geophysical Union Fall Meeting, San Francisco, California, December 12-16th, 2016.

Wayand, N. E., C. Marsh, and J. Pomeroy. Evaluating a variable-mesh hydrology model driven by GEM forecasts over the Canadian Rockies. The International Network for Alpine Research Catchment Hydrology, 2nd Annual Workshop, Grenoble, France, October 17-19th, 2016.

Wayand, N. E., C. Marsh, and J. Pomeroy. Evaluating a variable-mesh hydrology model driven by GEM forecasts over the Canadian Rockies. The Changing Cold Regions Network, Annual General Meeting, November 2-4th, 2016.

Wayand, N. E., Lundquist J., and Clark, M. Is snowmelt important for runoff during rain-on-snow floods over the Western U.S. Mountains? American Geophysical Union Fall Meeting, San Francisco, California, December 15-18th, 2014.

Wayand, N. E., Massmann A., Clark, M, and Lundquist J. Constraining snow model choices in a transitional snow environment with intensive observations. American Geophysical Union Fall Meeting, San Francisco, California, December 15-18th, 2014.

Wayand, N. E. and Lundquist J. Constraining snow model choices in a transitional and intermittent snow environment with intensive observations. The 71st Annual Eastern Snow Conference. Boone, North Carolina, June, 2014.

Wayand, N. E., Lundquist J., and Clark, M. Is snowmelt important for runoff during rain-on-snow floods over the Western U.S. Mountains? European Geophysical Union conference Fall Meeting, Vienna, Austria, April 2014.

Wayand, N. E., Lundquist, J., Hamlet, A. A Distributed Hydrological model Forced by DIMP2 Data and the WRF Mesoscale model. American Geophysical Union Fall Meeting, San Francisco, California, December 5-9th, 2010.

Wayand, N. E., Lundquist, J., Hamlet, A. The Applicability of Regional Climate Models for Distributed Hydroclimate Simulations of Snowpack. Graduate Climate Conference, Pack Forest Conference Center, Eatonville, Washington, October 26-28th, 2010.

Wayand, N. E., Minder, J., Durran, D., and Roe, G. The effects of a Warming Climate on snowpack accumulation in the Northern Cascades. Pacific Northwest Weather Workshop, NOAA Western Regional Campus, Seattle, March 20-21st, 2009.
