

Curriculum Vitae

Gerard H. Roe

Professor,

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EDUCATION

Massachusetts Institute of Technology, Cambridge, MA
Ph.D. in Atmospheric Science, June 1999. Dissertation under Prof. Richard Lindzen:
“The mutual interaction between the great continental ice sheets and atmospheric
stationary waves”.

Oriel College, University of Oxford, Oxford, UK
Bachelor of Arts degree in Physics. First Class Honors, June 1992.

PROFESSIONAL EXPERIENCE

September 2012 to present: Full Professor, Seattle, WA
September 2007 to 2012: Associate Professor,
January 2003 to 2007: Assistant Professor
University of Washington, Department of Earth and Space Sciences,
Adjunct Associate Professor, Dept. of Atmospheric Sciences

September 1999 to December, 2002: Postdoctoral Researcher, Seattle, WA
University of Washington, Quaternary Research Center/Joint Institute for The Study of
the Atmosphere and Ocean.

September 1993 – March 1999: Graduate Research Assistant, Cambridge, MA
March 1999 – July 1999: Post-doctoral Associate, Massachusetts Institute of
Technology, Program in Atmospheres, Oceans, and Climate.

CLASSES TAUGHT

ESS310: Mathematical methods in Earth Sciences, Spring, 2013, 2014
ESS/ATM/OCN586: Everything you always wanted to know about climate (but were
afraid to ask), Fall 2012
ESS 414/514: Geophysics - fluids, Spring, 2012; Winter, 2013.
ESS/ATM/OCN 589: Paleoclimate, Spring, 2011
ESS 201: The Earth system and climate, Winter, 2009, 2010
ESS exploration seminar Denmark and Greenland, August, 2008
ESS 590: Landscapes and Climate, Spring 2009

ENVIR 511 512: Graduate certificate in environmental management, City of Bellevue action plan for community greenhouse gas reduction, Winter, Spring 09
 ESS 314: Geophysics: expedition to planet Earth, Winter 2004, Fall, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2013.
 PCC/ATM/OCN/ESS 587: Climate dynamics, Fall 2003, 2004, 2005, 2006, 2007, 2008
 ESS 416/516: Geophysics: the atmosphere, Spring 2003, 2004, 2005, 2006.
 ESS 590: Special topics in climate: Heinrich events (seminar). Fall 2003, Winter, Spring 2004. Centennial variability (seminar), Winter 2005; African aridity (seminar), Winter, '06; The Holocene Express, Winter 2007.
 ESS/ATM 590: Knowability and no ability in climate and earth sciences (seminar), Spring '06, '08, '09, Winter 2014
 PCC 586: That sinking feeling: the thermohaline circulation (seminar). Spring, 2005.
 ESS 534/ATM 514: Ice and climate modeling, Winter 2001.
 ESS 431: Principles of glaciology (5 lecture model ice dynamics), Fall 2003.

GRADUATE ADVISEES

Alison Anders (ESS, PhD, 2005, Assoc. Prof., U. Illinois)[!], Michael O'Neal (ESS, PhD, 2005, Assoc. Prof, U. Delaware)[!], Drew Stolar (ESS, PhD, 2006, GE, Connecticut)[!], Noah Finnegan (ESS, PhD, 2006, Asst. Prof., UCSC)[!], Summer Rupper (ESS, MSc, 2004; ESS, PhD, 2007, Assoc. Prof., BYU)^{*}, Camille Li (ATM, PhD, 2007, Asst. Prof., U. Bergen)[#], Kevin Rennert (ATM PhD 2007, Staffer, Energy Committee, US Senate)[!], Kat Huybers (ESS, MSc 2007, PhD candidate)^{*}, Jane Locke (ESS PhD 2008, Chevron)[#], Jim Lutz (CFR PhD 2008, Scientist, CFR)[#], Robert Sheerer (ESS, MSc 2008)[#], Eric Buer (ESS, MSc 2008)[#], Jennifer Adams (CivE PhD 2007)[#], Justin Minder (ATM PhD, 2010, Asst. Prof. Suny Albany)^{*}, Kevin Wood (ESS PhD, 2010, scientist PMEL), Sandra Penny (ATM PhD 2013, Lecturer Bard College)^{*}, Michelle Koutnik (ESS PhD 2010, Asst.. Prof UWash.)[#], Rachel Headley (ESS, PhD 2011, Asst. Prof. U Riverside)[!], Erin Burke (ESS MSc, 2012, Oregon DoT)^{*}, Nichole Feldl (At. Sci. PhD 2013, Postdoc, Caltech)^{*}, Angela Pendergrass (PhD 2013, postdoc NCAR)^{*}, Kyle Armour (Physics, PhD 2012, Postdoc MIT)[!], Brian Smoliak (At. Sci., PhD 2013, Postdoc UMinn.)[#], Nicholas Siler (At. Sci, PhD candidate)^{*}, Nathan Steiger (At. Sci., PhD candidate)^{*}, Xiaojuan Li (At. Sci., PhD candidate)^{*}, Leif Anderson (U Colorado)[!].

*formal advisor or co-advisor, [!]major research advisor, [#]committee member (some research input)

PUBLICATIONS

In preparation:

Roe, G.H., 2014: The natural variability of glaciers, *In preparation*.

Roe, G.H., 2014: Reconstructing temperatures from past glacier fluctuations. *In preparation*.

Huybers, K.M, G.H. Roe, H. Conway, 2014: Differential stability of the West Antarctic Ice Sheet. *In preparation*.

Huybers, K.M., S.B. Rupper, and G.H. Roe, 2014: Lake level response to natural and forced variability, a case study of Great Salt Lake. *In preparation*.

Roe, G.H., and D.S. Battisti, 2014: Knowability and no ability in climate and earth sciences. *In preparation*.

Roe, G.H., N. Feldl, K.C. Armour, and D.M.W. Frierson, 2014: Regional climate predictability from regional feedbacks. *In preparation*.

Simon, J.D., and G.H. Roe, 2014: Significance tests for glacier trends. *In preparation*.

Roe, G.H., Q. Ding, and D.S. Battisti, 2014: The impact on Asian climate of the largest geologic changes of the past 50 Ma. *In preparation*.

Submitted:

Battisti, D.S., Q. Ding, and G.H. Roe, 2014: A coherent pan-Asian climate and isotopic response to precessional forcing. *In review*.

Roe, G.H., and M.B. Baker, 2014: The response of glaciers to climatic persistence. *In review*.

Ma, K., M. Brandon, G.H. Roe, 2014: Decoupling of mountain glaciers and climate over long timescales in the Patagonian Andes. *In review*.

Published/in press (peer-reviewed):

Roe, G.H., and M.B. Baker, 2014: Glacier response to climate perturbations: an accurate linear geometric model. *In review*

Siler, N., and G.H. Roe, 2014: How will orographic precipitation respond to surface warming? An idealized thermodynamic perspective. *Geophys. Res. Lett.* DOI: 10.1002/2013GL059095

Feldl, N., D.M.W. Frierson, and G.H. Roe, 2014: The influence of regional feedbacks on circulation sensitivity. *Geophys. Res. Lett.*, **41**, doi: 10.1002/2014GL059336.

Anderson, L.S., G.H. Roe, and R.S. Anderson, 2014: The effects of interannual climate variability on paleoclimate estimates derived from glacial moraines. *Geology*, **42**, 55-58.

Steiger, N.J., G.J. Hakim, E.J. Steig, D.S. Battisti, and G.H. Roe, 2014: Assimilation of time-averaged pseudoproxies for climate reconstruction, *Journal of Climate*, **27**, 426-441.

Burke, E.E., and G.H. Roe, 2014: The persistence of memory in the climatic forcing of glaciers, *Climate Dynamics*, DOI 10.1007/s00382-013-1758-0.

Roe, G.H., 2013: Costing the Earth: a numbers game, or a moral imperative? *Weather, Climate, and Society*, **5**, 378-380.

Feldl, N. and G.H. Roe, 2013: The nonlinear and nonlocal nature of climate feedbacks. *In press, Journal of Climate*.

Armour, K.C., C.M. Bitz, and G.H. Roe, 2013: Time-varying climate sensitivity from regional feedbacks. *Journal of Climate*, **26**, 4518-4534.

Feldl, N. and G.H. Roe, 2013: Four perspectives on climate feedbacks. *Geophys. Res. Lett.*, **40**, 4007–4011, doi:10.1002/grl.50711,

Penny, S.M., G.H. Roe, and D.S. Battisti, 2013: Interannual variability of the Pacific storm track. *Journal of Climate*, **23**, 634-648.

- Roe, G.H., and Y. Bauman, 2013: Should the climate tail wag the policy dog? *Climatic Change*, doi:10.1007/s10584-012-0582-6.
- Headley, R., B. Hallet, G.H. Roe, E.D. Waddington, and E. Rignot, 2012: Comparing observed and modeled velocities in Seward throat: implications for erosion beneath fast-moving ice streams, *J. Geophys. Res.*, **117**, doi: 10.1029/2011JF002291.
- Siler, N., G.H. Roe., and D.R. Durran, 2012: On the dynamical causes of variability in the rain-shadow effect: a case study of the Washington Cascades. *Monthly Weather Review*, **14**, 122-139.
- Headley, R., and G.H. Roe, and B. Hallet, 2012: Analytical solution of glacier-bed profiles, and comparison with observations, *Earth. Plan. Sci. Lett.*, **317-318**, 354–362.
- Roe, G.H., and K.C. Armour, 2011: How sensitive is climate sensitivity? *Geophys. Res. Lett.*, **38**, doi:10.1029/2011GL047913.
- Roe, G.H., and M.B. Baker, 2011: Comment on “Another look at climate sensitivity”. *Nonlinear Processes in Geophysics*, **18**, 125-127, doi:10.5194/npg-18-125-2011.
- Roe, G.H., 2011: What do glaciers tell us about climate variability and climate change? *J Glaciology*, **57**, 567-578.
- Armour, K., G.H. Roe, 2011: Climate commitment in an uncertain world, *Geophys. Res. Lett.*, **38**, doi:10.1029/2010GL045850.
- Penny, S. M., G.H. Roe, and D.S. Battisti, 2011: Reply to Comments on "The Source of the Midwinter Suppression in Storminess over the North Pacific" *J. Climate*, **24**, 5192-5194.
- Minder, J.R., D.R. Durran, and G.H. Roe, 2011: Mesoscale controls on mountainside snowline. *J. Climate*, **68**, 2107-2127.
- Pendergrass, A.G., G.J. Hakim, D.S. Battisti, and G.H. Roe, 2011: Coupled mixed-layer temperature predictability for climate reconstruction, *J. Climate*, **24**, 2483-2499.
- Feldl, N., and G.H. Roe, 2011: The shape of daily precipitation in the American West as a function of ENSO. *J. Climate*, **24**, 2483-2499.
- Feldl, N., G.H. Roe, 2011: Synoptic patterns associated with intense La Nina precipitation in the southwestern United States, *Geophys. Res. Lett.*, **37**, L23803, doi:10.1029/2010GL045439
- Roe, G.H., and M.T. Brandon, 2011: Critical form and feedbacks in mountain belt dynamics: the role of rheology. *J. Geophys. Res.*, **116**, B02101, doi: 10.1029/2009JB006571.
- Roe, G.H., 2010: Knowability and no ability in climate projections. *Report prepared for the Environmental Protection Agency. National center for environmental economics report no. 0564. Available at <http://yosemite.epa.gov/ee/epa/erm.nsf/vwAN/EE-0564-117.pdf>.*
- Roe, G.H., and M.B. Baker, 2010: Notes from a catastrophe - the descent into a snowball Earth. *J. Climate*, **22**, 4574-4589.
- Dayem, K, D.S. Battisti, G.H. Roe, P. Molnar, 2010: Lessons learned from the modern monsoon applied to the interpretation of paleoclimate records. *Earth. Plan. Sci. Lett.*, **295**, 219–230.

- Penny, S.M., G.H. Roe, and D.S. Battisti, 2010: The source of the midwinter suppression of the Pacific storm track. *J. Climate*, **23**, 634-648.
- Roe, G.H. and M.A. O'Neal, 2009: The response of glaciers to intrinsic climate variability: observations and models of late Holocene variations. *J. Glaciology*, **55**, 839-854.
- Minder, J.U., G.H. Roe, and D.R. Montgomery, 2009: Spatial patterns of rainfall and landslide hazard, *Water Resources Research*, **45**, W04419.
- Huybers, K.M., and G.H. Roe, 2009: Glacier response to regional patterns of climate variability. *J. Climate*, **22**, 4606-4620.
- Baker, M.B., and G.H. Roe, 2009: The shape of things to come: why is climate change so predictable? *J. Climate*, **22**, 4574-4589.
- Rupper, S.B., G.H. Roe, and A. Gillespie, 2009: Spatial patterns of glacier advance and retreat in Central Asia in the Holocene. *Quat. Res.*, **72**, 337-346.
- Minder, J.U. and G.H. Roe, 2009: Precipitation in mountainous terrain. To appear in the Encyclopedia of Snow, Ice and Glaciers. Edited by U.K. Haritashya, V. Singh, and P. Singh, Springer Press.
- Roe, G.H., 2009: Feedbacks, time scales, and seeing red. *Annual Reviews of Earth and Planetary Sciences*, **37**: 93-115.
- Roe, G.H., 2008: On the paleoclimate interpretation of Chinese loess. *Quat. Res.*, **71**, 150–161.
- Galewsky, J., and G.H. Roe, 2008: Climate over landscapes: The emerging links between geomorphology and the atmospheric sciences. *White paper, submitted to the National Research Council*.
- Roe, G.H., K.X. Whipple, J.K. Fletcher, 2008: Feedbacks between climate, erosion, and tectonics in a critical wedge orogen. *Amer. J. Sci.*, **308**, 815–842.
- Minder, J.U., D.R. Durran, and G.H. Roe, A.M. Anders, 2008: The climatology of small-scale orographic precipitation over the Olympic mountains: Patterns and processes. *Quat. J. Roy. Met. Soc.*, **134**, 817-839.
- Rennert, K., G.H. Roe, C.M. Bitz, J. Putkonen, and D. Fischer, 2008: Rain-on-snow in the circumpolar Arctic: climatology and impacts. *J. Climate*, doi: 10.1175/2008jcli2117.1
- Anders, A.M., and G.H. Roe, D.R. Montgomery, and B. Hallet, 2008: Coupled evolution of topography and orographic precipitation in varied climates. *Geology*, **36**, 479-482.
- Rupper, S.B., and G.H. Roe, 2008: Glacier changes and regional climate – a mass and energy balance approach. *J. Climate*, **21**, 5384- 5401.
- Owen, L.A., G. Thackaray, R.S. Anderson, J. Briner, D. Kaufman, G.H. Roe, W. Pfeffer, and C. Yi, 2008: Integrated research on mountain glaciers: Current status, priorities and future prospects. *Geomorphology*, doi:10.1016/j.geomorph.2008.04.019.
- Roe, G.H., and M.B. Baker, 2007: Why is climate sensitivity so unpredictable? *Science*, **318**, 629-632.
- Stolar, D.R., G.H. Roe, and S.D. Willett, 2007: Controls on the patterns of topography and erosion rate in a critical orogen at steady state, *J. Geophys. Res.*, **112**, F04002.
- Tomkin, J.T., and G.H. Roe, 2007: The response of a glaciated critical wedge orogen to changes in climate. *Earth. Plan. Sci. Lett.*, **262**, 385–397.

- Anders, A.M., G.H. Roe, D.R. Durran, and J.R. Minder, 2007: Small-scale spatial gradients in climatological precipitation on the Olympic Peninsula. *J. Hydromet.*, **8**, 1068-1081.
- Roe, G.H., 2006: In defense of Milankovitch. *Geophys. Res. Lett.* **33**, L24703, doi: 10.1029/2006GL027817.
- Roe, G.H., D. Stolar, and S.D. Willett, 2006: The sensitivity of a critical wedge orogen to climatic and tectonic forcing. in: S.D. Willett, N. Hovius, M. Brandon, D.M. Fisher, (Eds), *Tectonics, Climate, and Landscape Evolution: Geological Society of America Special Paper 398*, Geological Society of America, Boulder, CO, 227-239.
- Roe, G.H., and M. Baker, 2006: Microphysical and geometrical controls on the pattern of orographic precipitation. *J. Atmos. Sci.*, **63**, 861–880.
- Stolar, D., G.H. Roe, and S.D. Willett, 2006: Evolution of a critical orogen under various forcing scenarios: findings from a numerical sandbox. in: S.D. Willett, N. Hovius, M. Brandon, D.M. Fisher, (Eds), *Tectonics, Climate, and Landscape Evolution: Geological Society of America Special Paper 398*, Geological Society of America, Boulder, CO, 240-250.
- Anders, A.M., G.H. Roe, B. Hallet, D.R. Montgomery, N. Finnegan, and J. Putkonen, 2006: Spatial patterns of precipitation and topography in the Himalaya. in: S.D. Willett, N. Hovius, M. Brandon, D.M. Fisher, (Eds), *Tectonics, Climate, and Landscape Evolution: Geological Society of America Special Paper 398*, Geological Society of America, Boulder, CO, 39-53.
- Finnegan, N., G.H. Roe, D.R. Montgomery, B. Hallet, 2005: A scaling relationship for channel width in bedrock rivers. *Geology*, **33**, 229-232.
- Roe, G.H., 2005: Orographic precipitation. *Annual Review of Earth and Planetary Sciences*, **33**: 645-671.
- Anders, A.M., G.H. Roe, and D.R. Durran, 2004: Conference notebook Orographic precipitation and the form of mountain ranges. *Bulletin of the American Meteorological Society*. **85**, 498-499.
- Roe, G.H., and E. J. Steig, 2004: On the characterization of millennial-scale climate variability. *J. Climate*, **17**, 1929-1944.
- Bitz, C.M., and G.H. Roe, 2004: A physical explanation for the high rate of sea-ice thinning in the Arctic Ocean. *J. Climate*, **17**, 3623-3632.
- Rupper, S., E.J. Steig, and G.H. Roe, 2004: On the relationship between snow accumulation at Mt. Logan, Yukon, and climate variability in the North Pacific. *J. Climate*. **17**, 4724-4739.
- Roe, G.H., D.R. Montgomery, and B. Hallet, 2003: Orographic climate feedbacks on the relief of mountain ranges. *J. Geophys. Res.*, **108**, doi:10.1029/2001JB001521.
- Putkonen, J., and G.H. Roe, 2003: Rain-on-snow events, soil temperatures, and the sensitivity of ungulates to climate change. *Geophys. Res. Lett.*, **30**, doi: 10.1029/2002GL016326.
- Roe, G.H., 2002: Modeling orographic precipitation over ice sheets: an assessment over Greenland. *J. Glaciology*, **48**, 70-80.
- Roe, G.H., D.R. Montgomery, and B. Hallet, 2002: Effects of orographic precipitation variations on the concavity of steady-state river profiles. *Geology*, **30**, 143-146.

- Risbey, J.S., P.J. Lamb, R.L. Miller, M.C. Morgan, and G.H. Roe, 2002: Elucidating the structure of regional climate scenarios by combining synoptic and dynamic guidance and GCM output. *J. Climate*, **15**, 1036-1050.
- Roe, G.H., and R.S. Lindzen, 2001: The mutual interaction between continental-scale ice sheets and atmospheric stationary waves. *J. Climate*, **14**, 1450-1465.
- Roe, G.H., and R.S. Lindzen, 2001: A one-dimensional model for the interaction between ice sheets and atmospheric stationary waves. *Climate Dynamics*, **17**, 479-487.
- Roe, G.H., and M.R. Allen, 1999: Competing explanations for the 100,000-yr ice age cycle. *Geophys. Res. Lett.*, **26**, 2259-2262.
- Lindzen, R.S., and G.H. Roe, 1997: The effect of concentrated PV gradients on stationary waves: correction, *J. Atmos. Sci.*, **54**, 1815-1818.
- Roe, G.H., and R.S. Lindzen, 1996: Baroclinic adjustment in a two level model with barotropic shear, *J. Atmos. Sci.*, **53**, 2749-2754.

INVITED SEMINARS, TALKS, AND COURSES:

2014:

Woods Hole, Massachusetts, Summer 2014. Woods Hole summer school in geophysical fluid dynamics.

Disko Island, Greenland, August 2014. Advanced climate dynamics summer course, lecturer

Columbia University, Feb 2014: Humpty Dumpty and regional climate predictability. Dept Applied Math Seminar, New York.

Massachusetts Institute of Technology, Lorenz Center, Feb 2014: Regional climate predictability from regional patterns of feedbacks. 1st Lorenz Center workshop, Endicott House, Cambridge Ma

University of Washington, Feb 2014: Humpty Dumpty and regional climate predictability. Dept. Atmospheric Sciences, Dept. Seminar, Seattle.

2013:

Massachusetts Institute of Technology, Cambridge, MA, Nov 2013: Humpty Dumpty and regional climate variability. MASS seminar series.

Massachusetts Institute of Technology, Cambridge, MA, Nov 2013: The natural variability of glaciers. Oceanography Seminar series

NSF Himalaya-Karakoram-Tibet Workshop, Tübingen, Germany, June 2013: The influence of Tibet on the climate of Asia.

2012:

American Geophysical Union Fall Meeting: The case for regional feedbacks, December, 2012

American Geophysical Union Fall Meeting: Knowability and no ability in climate projections, December, 2012

European Geophysical Union, April 2012: Glacier long profiles in regions of active uplift, and their role in orogen dynamics.

Kaplan Workshop on Environmental Geochemistry, March 2012: The climate of Asia and Tibet and its relationship to paleoclimate proxies. Ein Gedy, Israel.

Kaplan Workshop on Environmental Geochemistry, March 2012: The natural variability of glaciers. Ein Gedy, Israel.

2011:

American Geophysical Union Fall Meeting: What do glaciers tell us about climate variability and climate change?, December, 2011.

Imperial College London, Dept. Seminar, The role of the tectonic governor in mountain belt dynamics, London, January, 2011.

University College London, Was there a little ice age? Dept. Seminar, London, February, 2011.

Stockholm University, Dept. of Meteorology, Was there a little ice age? Dept. Seminar, May 2011.

ICDP Workshop, Lake Issy-kul, Kyrgyzstan, The climate of Central Asia, June, 2011

International Association of Cryospheric Sciences, What do glaciers tell us about climate variability and climate change? Melbourne, July 2011.

Camp Davis, Wyoming: Short course on mountain ranges and climate, 6 lectures. August 2011.

Friday Harbor, Washington: Short course on warm climates, 1 lecture. September, 2011.

2010:

Environmental Protection Agency, Climate Damages Workshop, Washington D.C., Knowability and no ability in climate projections. Nov. 2010

Graduate Climate Conference, Pack Forest, Oct. 2010, Keynote speaker

Yale University, Directions in Crustal Geosciences Workshop: Geodynamics principles, not first principles are the principal route to progress, October, 2010

NSF Himalaya-Karakoram-Tibet Workshop, San Francisco, June 2010: Climate over Asia and Tibet, not just a simple monsoon.

American Institute for Chemical Engineers, First sustainability institute Seattle, May 2010: Climate change: certainties and uncertainties

Penn State University, Earth Science department colloquium, March, 2009: Was there a little ice age?

2009:

Gilbert Club, University of California at Berkeley, December 2009: The tectonic governor and the downsizing of the Alps.

American Geophysical Union Fall Meeting, December 2009: The interpretation of Chinese Loess as a paleoclimate proxy.

American Geophysical Union Fall Meeting, December 2009: Notes on a catastrophe: the descent into a snowball Earth.

Brown University, Geology department colloquium, October 2009. Department colloquium. The shape of things to come: what are the potentials and potential limits to global climate predictions?

Brown University, Geology department seminar, October 2009. Natural variability of glaciers in a constant climate.

University of Delaware, Geography department colloquium, April, 2009. The shape of things to come: what are the potentials and potential limits to global climate predictions?

University of Delaware, Geography department seminar, April, 2009. Was there a little ice age?

Yale University, Dept. seminar, April, 2009: Extreme weather and the downsizing of the Alps.

University of Edinburgh, School of Geosciences seminar, March 2009: Was there a little ice age?

University of Washington, Seattle, WA, February, 2009: Dept. Atmospheric Sciences colloquium: What do glaciers tell us about climate variability and change?

California Institute of Technology, Pasadena, CA, Environmental Science and Engineering colloquium January, 09: The shape of things to come: what are the limits to global climate predictions?