Edward Blanchard-Wrigglesworth

Contact Information
Department of Atmospheric Sciences
University of Washington
Box 351640
Seattle, WA 98195-1640
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http://www.atmos.washington.edu/~ed/

Education

University of Washington, Seattle, USA

Ph. D., in Atmospheric Sciences,   Aug 2013

- Advisor: Professor Cecilia Bitz
- Thesis topic: On the predictability of sea ice

University of Cambridge, Cambridge, UK

M. Phil., in Polar and Glacier Studies   July 2005

- Advisor: Professors Julian Dowdeswell and Hans Graf
- Thesis topic: Ocean-Atmosphere variability in the Arctic and polar North Atlantic

B.A., in Geography (Part II) and Natural Sciences Tripos (Part I)   June 2003

- *First Class Honours*
- Thesis topic: Atmospheric forcing of glacier mass balance in Scandinavia and North America

Professional positions held

- 2017 March - present: Research Assistant Professor, Department of Atmospheric Sciences, University of Washington, Seattle, USA
- 2015 Apr - May: Visiting Research Associate, Catalan Institute for Climate Science, Barcelona, Spain
- 2013 Sep - 2017 Feb: Research Associate, Department of Atmospheric Sciences, University of Washington, Seattle, USA
- 2010 Jul - Sep: Visiting Research Assistant, National Center for Atmospheric Research, Boulder, USA
- 2007 - 2013: Research Assistant, Department of Atmospheric Sciences, University of Washington, Seattle, USA

Publications (peer reviewed)

- McGraw, M.C., Blanchard-Wrigglesworth, E, Clancy, R.P., and Bitz, C.M., Understanding the Predictability of Arctic Sea Ice Loss on Subseasonal Timescales, in press, Journal of Climate
- Roach, L. A., Eisenman, I., Wagner, T. J. W., Blanchard-Wrigglesworth, E., and Bitz, C.M., Asymmetry in the seasonal cycle of Antarctic sea ice due to insolation, in press, Nature Geoscience

- Clancy, R., Bitz, C. M., Blanchard-Wrigglesworth, E., McGraw, M. C., Cavallo, S. M. (2021). A cyclone-centered perspective on the drivers of asymmetric patterns in the atmosphere and sea ice during Arctic cyclones. Journal of Climate, 1-47.

- Clancy, R., Bitz, C.M., and Blanchard-Wrigglesworth, E., 2021, The influence of ENSO on Arctic sea ice in large ensembles and observations, Journal of Climate, 34(24), 9585-9604.

- Andersson, T. R., Hosking, J. S., Prez-Ortiz, M., Paige, B., Elliott, A., Russell, C., ... & Shuckburgh, E. (2021). Seasonal Arctic sea ice forecasting with probabilistic deep learning, Nature Communications, 12, 5124, https://doi.org/10.1038/s41467-021-25257-4

- Steele, M., Eicken, H., Bhatt, U., Bieniek, P., Blanchard-Wrigglesworth, E., Wiggins, H., ... & Wang, M. (2021). Moving Sea Ice Prediction Forward Via Community Intercomparison. Bulletin of the American Meteorological Society, 1-7.

- Blanchard-Wrigglesworth, E., Donohoe, A., Roach, L. A., DuVivier, A., and Bitz, C. M. (2021). High-Frequency Sea Ice Variability in Observations and Models. Geophysical Research Letters, 48(14), e2020GL092356.

- MacGregor, Joseph A., Linette N. Boisvert, Brooke Medley, Alek A. Petty, Jeremy P. Harbeck, Robin E. Bell, J. Bryan Blair et al. (2021) The Scientific Legacy of NASA's Operation IceBridge. e2020RG000712.

- Zhang, Y. F., Bitz, C. M., Anderson, J. L., Collins, N. S., Hoar, T. J., Raeder, K. D., and Blanchard-Wrigglesworth, E. (2021). Estimating parameters in a sea ice model using an ensemble Kalman filter. The Cryosphere, 15(3), 1277-1284.

- Blanchard-Wrigglesworth, E., Roach, L.A., Donohoe, A., and Ding, Q., (2021) Impact of winds and Southern Ocean SSTs on Antarctic sea ice trends and variability, Journal of Climate 34 (3), 949-965

- Bushuk, M., Winton, M., Bonan, D., Blanchard-Wrigglesworth, E., and Delworth, T., (2020) A mechanism for the Arctic sea ice spring predictability barrier, Geophysical Research Letters, p.e2020GL088335

- Song, Y., Behrangi, A., Blanchard-Wrigglesworth, E., (2020) Assessment of Satellite and Reanalysis Precipitation Estimates over Arctic Sea Ice, Geophysical Research Letters, 47(16), p.e2020GL088970

- Horvat, C., Blanchard-Wrigglesworth, E., and Petty, A. (2020). Observing waves in sea ice with ICESat?2. Geophysical Research Letters, 47(10), e2020GL087629.

- Donohoe, A., Blanchard-Wrigglesworth, E., Schweiger, A., and Rasch, P., (2020) Ice albedo feedback: comparison of model and observational based estimates, Journal of Climate, 33(13), pp.5743-5765

- Brennan, M.K., Hakim, G.J., and Blanchard-Wrigglesworth, E., (2020), Arctic sea ice variability during the Instrumental Era, Geophysical Research Letters, 47, e2019GL086843. https:// doi.org/10.1029/2019GL086843

- Bonan, D., and Blanchard-Wrigglesworth, E., (2020), Nonstationary teleconnection between the Pacific Ocean and Arctic sea ice, Geophysical Research Letters, 47, e2019GL085666. https://doi.org/10.1029/2019GL085666

- Blanchard-Wrigglesworth, E., and Ding, Q., (2019) Tropical and mid-latitude impacts on polar predictability in the Community Earth System Model, Journal of Climate, doi: 10.1175/JCLI-D-19-0088.1

- Wayand, N, Bitz, C, and Blanchard-Wrigglesworth, E, (2019) A Year-Round Subseasonal-To-Seasonal Sea Ice Prediction Portal, Geophysical Research Letters, 46 (6), 3298–3307

- Qinghua Ding, Axel Schweiger, Michelle L'Heureux, Eric J. Steig, David S. Battisti, Nathaniel C. Johnson, Eduardo Blanchard Wrigglesworth, Stephen Po-Chedley, Qin Zhang, Kirstin Harnos, Mitchell Bushuk, Bradley Markle, Ian Baxter, (2019) Fingerprints of internal drivers of Arctic sea ice loss in observations and model simulations, Nature Geoscience, 12(1), p.28.

- Blanchard-Wrigglesworth E, and Bushuk, M. (2019) Robustness of Arctic sea-ice predictability in GCMs, Climate Dynamics, 52 (9-10), 5555-5566

- Goldenson, N., Leung, L.R., Bitz.C.M., and Blanchard-Wrigglesworth E., (2018) Influence of atmospheric river events on mountain snowpack in the Western U.S., Journal of Climate, 31(24), pp.9921-9940.

- Ordonez, A.C., Bitz, C.M., and Blanchard-Wrigglesworth E., (2018) Processes controlling Arctic and Antarctic sea ice predictability in the Community Earth System Model, Journal of Climate, 31(23), pp.9771-9786.

- Massonnet, F, Vancoppenolle, M, Goose, H, Docquier D, Fichefet, F, Blanchard-Wrigglesworth, E., (2018) Arctic sea-ice change tied to its mean state through thermodynamic processes, Nature Climate Change, 8, 599-603

- Blanchard-Wrigglesworth, E., Webster, M., Farrell, S., and Bitz, C.M., (2018) Reconstruction of snow on Arctic sea ice, Journal of Geophysical Research: Oceans 123, 3588?3602, DOI:10.1002/2017JC013364

- Ding, Q., Schweiger, A., L'Hereux, M., Battisti, D., Po-Chedley, S, Johnson, N., Blanchard-Wrigglesworth, E., Harnos, K, Zhang, Q., Eastman, R, and Steig, E (2017) Influence of high-latitude atmospheric circulation change on summertime Arctic sea ice, Nature Climate Change, doi: 10.1038/nclimate3241

- Cheng, W., E. Blanchard-Wrigglesworth, C. M. Bitz, C. Ladd, and P. J. Stabeno, (2016), Diagnostic sea ice predictability in the pan-Arctic and U.S. Arctic regional seas, Geophysical Research Letters, 43, doi:10.1002/2016GL070735.

- Blanchard-Wrigglesworth E, A. Barthélemy M. Chevallier R. Cullather N. Fučkar F. Massonnet P. Posey W. Wang J. Zhang C. Ardilouze C. M. Bitz G. Vernieres A. Wallcraft M. Wang, (2016) Multi-model seasonal forecast of Arctic sea-ice: forecast uncertainty at pan-Arctic and regional scales, Climate Dynamics, doi: 10.1007/s00382-016-3388-9

- Guemas, V., Blanchard-Wrigglesworth, E., Chevallier, M., Day, J.J., Dqu, M., Doblas–Reyes, F.J., Fuckar, N.S., Germe, A., Hawkins, E., Keeley, S. and Koenigk, T., (2016) A review on Arctic sea-ice predictability and prediction on seasonal to decadal time-scales. Quarterly Journal of the Royal Meteorological Society, 142(695), pp.546-561.

- Blanchard-Wrigglesworth E, Farrell S, Newman, T, and Bitz, C. M., (2015) Snow cover on Arctic Sea ice in observations and an Earth System Model, Geophysical Research Letters, 42, doi:10.1002/2015GL066049

- Blanchard-Wrigglesworth E, Cullather, R, Wanqiu, W, Zhang, J, and Bitz, C. M., (2015) Model skill and sensitivity to initial conditions in a sea-ice prediction system, Geophysical Research Letters, 42, doi:10.1002/2015GL065860

- Dukhovskoy D, Ubnoske J, Blanchard-Wrigglesworth E, Heister H, and Proshutinsky A Y (2015) Skill metrics for evaluation and comparison of sea ice models, Journal of Geophysical Research: Oceans, doi:10.1002/2015JC010989

- Stroeve, J, Blanchard-Wrigglesworth E, Guemas, V. Howell, S. Massonnet, F, and Tietsche, S (2015) Improving predictions of Arctic sea ice extent, EOS, 96, doi:10.1029/2015EO031431

- Blanchard-Wrigglesworth, E., and C. M. Bitz (2014), Characteristics of Arctic sea ice thickness variability in GCMs, Journal of Climate, 27, 8244-8258, doi: 10.1175/JCLI-D-14-00345.1

- Stroeve, J. Hamilton, L. C. Bitz, M. and Blanchard-Wrigglesworth E (2014) Predicting September sea ice: Ensemble skill of the SEARCH Sea Ice Outlook 2008-2013 Geophysical Research Letters, 41(7), 2411-2418

- Holland, M. M., E. Blanchard-Wrigglesworth E., J. E. Kay, and S. Vavrus (2013) Initial-Value predictability of Antarctic sea ice in the community climate system model 3, Geophysical Research Letters, doi: 10.1002/grl.50410

- Kay, J. E., M. M. Holland, C. M. Bitz, E. Blanchard-Wrigglesworth, A. Conley, A. Gettelman, and D. Bailey (2012) The influence of local feedbacks and northward heat transport on the equilibrium Arctic climate response to increased greenhouse gas forcing in coupled climate models, Journal of Climate, 25, 5433-5450, doi:10.1175/JCLI-D-11-00622.1

- Blanchard-Wrigglesworth E., C. M. Bitz and M. M. Holland (2011) Influence of initial conditions and climate forcing on predicting Arctic sea ice, Geophysical Research Letters, 38, L18503, doi: 10.1029/2011GL048807

- Armour K. C., I. Eisenman, E. Blanchard-Wrigglesworth, K. E. McCusker, and C. M. Bitz (2011) The reversibility of sea ice loss in a state-of-the-art climate model, Geophysical Research Letters, 38, L16705, doi: 10.1029/2011GL048739

- Blanchard-Wrigglesworth, E., E. DeWeaver, K. Armour, and C. M. Bitz, (2011): Persistence and inherent predictability of Arctic sea ice in a GCM ensemble and observations, Journal of Climate, 24, 231-250, doi: 10.1175/2010JCLI3775.1

- Cía, J. C., A. J. Andrés, J L Peña Monné, and E. Blanchard Wrigglesworth (2000) Dinámica de los glaciares del Pirineo aragonés: resultados de la campaña glaciológica del año 1998, Boletin Glaciológico Aragones

- Blanchard-Wrigglesworth, E. (1999), The 1997 veranillo of San Miguel in northeastern Spain, Weather, 54, 114-119, DOI: 10.1002/j.1477-8696.1999.tb06437.x

Manuscripts in review or submitted

- Roach, L. A., and Blanchard-Wrigglesworth, E., Observed winds crucial for September Arctic sea ice loss, in review, Geophysical Research Letters

- Kay, J.E., DuVivier A. K, Blanchard-Wrigglesworth, E., Deser, C., Jahn, A., Singh, H., Smith, M., Webster, M. A., Edwards, J., Lee, S. S., Rodgers, K. B., and Rosenbloom, N. Less surface sea ice melt in the CESM2 improves Arctic sea ice simulation with minimal non-polar climate impacts, submitted to JAMES

Publications (non-peer reviewed)

- Holland, M and Blanchard-Wrigglesworth, E., How predictable are Arctic sea ice conditions?, in Study of Environmental Arctic Change Science Brief AA-019 (2018).

- Donohoe, A and Blanchard-Wrigglesworth, E., What processes drive Southern Ocean sea ice variability and trends?, in US CLIVAR Variations Newsletter, Summer 2017, Vol. 15, No. 3.

Presentations

- AGU Annual General Meeting, virtual meeting, Dec 2021.High-frequency Sea Ice Variability in Observations and Models and its Coupling to Atmospheric Circulation and Ocean Wave State"

- SIPN2 Post-season webinar, October 2021. "Summary of skill of 2021 SIO extent and sea ice probability forecasts across models"

- Euro-Mediterranean Center on Climate Change (CMCC), October, 2021. "Towards operational sea ice forecasts: challenges and opportunities"

- American Meteorological Society 16th Conference on Polar Meteorology and Oceanography, June 2021. "Impact of winds and Southern Ocean SSTs on Antarctic sea ice"

- AGU Annual General Meeting, virtual meeting, Dec 2020. "Impact of mid-latitude/polar winds on Antarctic sea ice and tropical climate"

- Atmospheric Sciences Dynamics seminar, University of Washington, Seattle, May 2020. "Impact of winds on Antarctic sea ice trends and variability"

- Climate Variability and Change Working Group workshop, Boulder, CO, March 2020. "Can winds explain sea ice variability and trends?"

- NASA Snow on Sea Ice Meeting, Greenbelt, MD, February 2020, "Arctic snow on sea ice in CMIP6: early results"

- Polar Climate Working Group workshop, Boulder, CO, February 2020, "Sea ice variability across timescales in CESMx and observations"

- AGU Annual General Meeting, San Francisco, CA., Dec 2019. "Tropical and mid-latitude impact on Arctic seasonal predictability in the Community Earth System Model"

- US CLIVAR summit, Long Beach, CA, USA, August 2019, "Status of Arctic sea ice forecasting: challenges and opportunities" (*Invited speaker*)

- American Meteorological Society 15th Conference on Polar Meteorology and Oceanography, Boulder CO, May 2019. "Robustness of Arctic sea ice predictability in GCMs"

- American Meteorological Society 15th Conference on Polar Meteorology and Oceanography, Boulder CO, May 2019. "Tropical and mid-latitude impact on seasonal polar predictability in the Community Earth System Model"

- Atmospheric Sciences Dynamics seminar, University of Washington, Seattle, Feb 2019. "Tropical and mid-latitude impact on polar predictability in the Community Earth System Model"

- Polar Climate Working Group Meeting, NCAR, Boulder, CO, Feb 2019. "Tropical and mid-latitude impact on polar predictability in the Community Earth System Model"

- NASA-ESA Snow on Sea Ice Meeting, Greenbelt, MD, Jan 2019. "Intercomparison of Arctic snow reconstructions"

- AGU Annual General Meeting, Washington D.C., Dec 2018. "Reconstruction of snow on Arctic sea ice" (*Invited speaker*)

- AGU Annual General Meeting, Washington D.C., Dec 2018. "Quantifying local versus remote sources of polar predictability"

- WholeU talk series, University of Washington, Seattle, WA, November 2018, "Snow in the Pacific Northwest: expected changes and impact"

- Polar Prediction workshop, NCAR, Boulder, CO, August 2018, "Introduction to prediction science" (*invited speaker*)

- NASA IceBridge meeting, University of California, Irvine, CA, June 2018, "OIB, ICESat-2 and sea ice assimilation"

- Arctic System Change workshop, NCAR, Boulder, CO, April 2018, "How much does the Arctic care about others?"

- NASA IceBridge meeting, University of Maryland, MD, Jan 2018, science team presentation.

- NASA IceBridge meeting, University of Maryland, MD, Jan 2018, "What is the impact of assimilating spring OIB ice thickness measurements?"

- NASA-ESA Snow on Sea Ice workshop, University of Maryland, MD, Jan 2018, "Reconstruction of snow on sea ice"

- Interagency Arctic Research Policy Committee (IARPC) Collaborations webinar, October 2017, "Sea Ice Prediction Network (SIPN) update: how did the Sea Ice Outlook do in summer 2017?"

- Massonnet Sea ice predictability workshop, July 2017, Seattle, WA, "Forecast skill, Ice Thickness and Snow. What does it all mean"

- NASA IceBridge meeting, University of California, Irvine, CA, June 2017, science team presentation

- CESM Climate Variability and Change Working Goup annual meeting , Boulder, CO, March 2017. "Robustness of atmospheric teleconnections in a GCM"

- CESM Polar Climate Working Group annual meeting, Boulder, CO, Feb 2017. "Reconstruction of snow on Arctic sea ice in observations and CESM"

- National Snow and Ice Data Center, Boulder, Colorado, USA, February 2017 "Butterflies and Polar bears: understanding sea ice predictability" (*Invited speaker*)

- American Meteorological Society Annual Meeting, Seattle, WA, January 2017 "Stability of atmospheric teleconnections in dynamical models"

- Sea Ice Thickness workshop, National Center for Atmospheric Research, Boulder, Colorado, USA, November 2016 "Sea Ice Thickness" (*Invited speaker*)

- Scripps Institute of Oceanography, La Jolla, California, USA, November 2016 "Butterflies and Polar bears: understanding sea ice predictability"

- FAMOS school lecture, Woods Hole Oceanographic Institute, Massachussets, USA, November 2016 "Butterflies and Polar bears: understanding sea ice predictability" (*Invited speaker*)

- Interagency Arctic Research Policy Committee (IARPC) Collaborations webinar, October 2016, "The 2016 Sea Ice Outlook (SIO) - Post Season Discussion"

- Barcelona Supercomputing Center, Barcelona, Spain, September 2016. "Multimodel seasonal forecast of Arctic sea-ice: forecast uncertainty at pan-Arctic and regional scales".

- Year of Polar Prediction workshop, ECMWF, Reading, UK, September 2016. "Lessons from multi-model experiments in the Sea Ice Prediction Network"

- Polar Predictability Workshop, Palisades, NY, USA, May 2016. "Lessons from a multi-model SIO experiment"

- CESM Polar Climate Working Group annual meeting, Boulder, CO, Feb 2016. "Arctic sea ice forecasting: an update from the trenches" (*Invited speaker*)

- AGU Annual General Meeting, San Francisco, CA, Dec 2015. "Recent Seasonal Forecast Skill in a Sea-Ice Prediction System. Have We Entered a Period of Inherently Low Predictability?" (*Invited speaker*)

- AGU Annual General Meeting, San Francisco, CA, Dec 2015. "The Impact of Model Uncertainty on Seasonal Sea Ice Forecasts" (*Invited speaker*)

- Year of Polar Prediction (YOPP) summit, UN, Geneva, Switzerland, July 2015. "The Sea Ice Prediction Network" (*Invited speaker*).

- NCAR CESM Annual Workshop, Breckenridge, CO, June 2015. "Arctic sea ice predictability - or can we forecast September sea ice extent at seasonal lags" (*Invited speaker*).

- CMOS Annual General Meeting, Whistler, BC, Canada, June 2015. "Model skill and sensitivity to initial conditions in a sea-ice prediction system".

- Institut Català de Ciències del Clima (IC3), Barcelona, Spain, May 2015. "Developing a seasonal statistical sea ice model".

- MeteoFrance, Toulouse, France, May 2015. "Model skill and sensitivity to initial conditions in a sea-ice prediction system" (*Invited speaker*).

- Polar Predictability Workshop, Reading University, Reading, UK, April 2015. "Model skill and sensitivity to initial conditions in a sea-ice prediction system".

- Courant Insitute, New York University, NY, April 2015. "Model skill and sensitivity to initial conditions in a sea-ice prediction system" (*Invited speaker*).

- National Center for Atmospheric Research, Boulder, CO, Feb 2015. "Model skill and sensitivity to initial conditions in a sea-ice prediction system" (*Invited speaker*).

- National Aeronautics and Space Administration, Goddard, ME, Jan 2015. "Snow cover on Arctic sea ice in Icebridge and the NCAR Community Earth System Model - mean state, variability, and impacts on sea ice predictability" (*Invited speaker*).

- Polar-lower latitude linkage workshop, Barcelona, Spain, Dec 2014. " Snow cover on Arctic sea ice in Icebridge and the NCAR Community Earth System Model - mean state, variability, and impacts on sea ice predictability" (*Invited speaker*).

- EGU Annual General Meeting, Vienna, Austria, May 2014. "General characteristics of sea ice thickness variability in GCMs."

- Sea-ice Predictability Workshop, National Center for Atmospheric Research, Boulder, CO, April 2014. "Advancing predictability thinking outside the box".

- Polar Climate Working Group Workshop, Boulder, Co. Feb 2014. "Worrying about snow"

- AGU Annual General Meeting, San Francisco, CA, Dec 2013. "General characteristics of sea ice thickness variability in GCMs."

- AGU Annual General Meeting, San Francisco, CA, Dec 2012. "Seasonal predictability of Arctic Sea Ice: assessing its limits and potential in a GCM and implications for observations." (*Invited speaker*)

- Reading University, Reading, UK, Nov 2012. "Mechanisms for Arctic sea ice predictability"

- Institut Català de Ciències del Clima (IC3), Barcelona, Spain, Nov 2012. "Seasonal predictability of Arctic sea ice: assessing its limits and potential in a GCM and implications for observations."

- National Research Council Arctic Sea Ice Prediction Workshop, Boulder, Co, May 2012.

- Polar Climate Working Group Workshop, Boulder, Co. Feb 2012. "Atmosphere - Sea ice interations in the Arctic. Non stationarity and implications for predictability"

- University of Washington, Seattle, WA, Nov 2011. "Arctic Sea Ice Predictability: assessing its range and constraints from a GCM and observations"
- WCRP Open Science Conference, Denver, Co. Oct 2011. "The Influence of initial conditions and climate forcing on Arctic Predictability" (poster)
- AGU Annual General Meeting, San Francisco, CA, Dec 2010. "The Influence of initial conditions on predictability in the Arctic" (poster)
- IGS Annual General Meeting, Tromso, Norway, Jun 2010. "The Persistence of Arctic Sea Ice in a GCM and Observations"
- CCSM Annual Workshop, Breckenridge, CO, June 2009. "Temporal characteristics of Arctic sea ice in CCSM and observations: implications for seasonal predictability".

Awards   WCRP

- WCRP Open Science Conference poster award, Oct 2011

University of Washington

- Top Scholar award, The Graduate School, 2007

University of Cambridge

- Girton College Emily Davies Scholarship, 2003
- Girton College Janet Chamberlain Dissertation Prize, 2003
- Cambridge University William Vaughan Lewis Dissertation Prize, 2003

Seveonoaks School

- Alan Tammadge mathematics scholarship, 1997-1999

Teaching, mentorship, and fieldwork experience

University of Washington, Seattle, USA
Graduate supervisor for Ellen Koukel, fall quarter 2020 to present
Undergraduate advisor for David Bonan, Spring quarter, 2019
Graduate committee member for Katie Brennan, 2019 to present
Graduate committee member for Robin Clancy, 2018 to present
Master's committee member for Molly Wieringa, 2020 to present
Master's committee member for Ursula Jongebloed, 2020 to present
Master's committee member for Kaitlyn Confer, 2020 to present
Post-doc co-supervisor for Lettie Roach, July 2019 to present
Post-doc co-supervisor for Marie McGraw, June 2019 to present
Post-doc co-supervisor for Nic Wayand, March 2018 to January 2019
Post-doc co-supervisor for Yongfei Zhang, March 2017 to August 2018
PhD external examiner for Arlan Dirkson, University of Victoria, BC, Canada, November 2017
Guest instructor for NSF Polar Predictability workshop, NCAR, Boulder, August 2018
Substitute lecturer ATM S 211 – Climate and climate change   Spring 2017
Guest lecturer ATM S 220 – Exploring the Atmospheric Sciences   Summer & fall 2016, spring & fall 2017, winter 2018
ATM S 111 Global Warming: Understanding the Issues   Winter 2018

Joint Ocean and Ice Studies, Beaufort Gyre, Arctic
Fieldwork Assistant,   September - October 2015

- Arctic sea ice fieldwork aboard the Louis S St-Laurent icebreaker

University of Washington, Seattle, USA
Grader for ATM S 501– Fundamentals of Physics   September 2011 to Dec 2011
and Chemistry of the Atmosphere

Teaching Assistant,   April 2009 to June 2009

- Instructor for undergraduate Weather 101 course

University of Washington, Seattle, USA
Fieldwork Assistant,   May 2010

- Glacier survey work on Mt Olympus, Olympic National Park, WA

Cambridge Tutors, Cambridge and London, UK
Private tutor,   Sep 2005 to May 2006

- Tutor for undergraduate Mathematics and Physics

University of Cambridge, Cambridge, UK
Teaching Assistant,   March 2005 to June 2005

- Instructor for undergraduate Physical Geography course

North Cascades Glacier Climate Project, Washington, USA
Fieldwork Assistant,   August 2002

- Focus: analysis of glacier mass balance in the North Cascades

ETH, Glacier d'Arolla, Swiss Alps, Switzerland
Fieldwork Assistant,   July 2001 to August 2001

- Focus: analysis of glacier mass balance and surface fluxes on Glacier d'Arolla

North Cascades Glacier Climate Project, Washington, USA
Fieldwork Assistant,   July 2000 to August 2000

- Focus: analysis of glacier mass balance in the North Cascades

British Antarctic Survey, Cambridge, UK
Data Analyst Assistant,   June 1999 to July 1999

- Focus: analysis of ground penetrating radar data from Antarctica

Pyrenees Glacier Fieldwork, Huesca, Spain
Fieldwork Leader,   August 1998 to September 1998

- Focus: analysis of glacier retreat in the Spanish Pyrenees

British Antarctic Survey, Cambridge, UK

Laboratory Assistant,   June 1998 to July 1998

- Focus: ice core treatment in ice and climate research group

Professional service and outreach

Sea Ice Prediction Network,
Leadership team member   Oct 2013 to present

NASA Operation IceBridge,
Science team member   2017 to 2020

American Meteorological Society,
Polar Meteorology and Oceanography committee vice-chair and chair   Jan 2015 to 2020

Technical contributor for the 4th National Climate Assessment FAQs April 2017

CMOS-AMS annual meeting, Instructor for short course: 'A practical guide to using the Community Earth System Model and Regional Arctic System Model for polar climate research', June 2015

Reviewer for: *Nature Geoscience, Geophysical Research Letters, Journal of Climate, Climate Dynamics, Journal of Geophysical Research-Atmospheres, Deep Sea Research Part I, Environmental Research Letters, Bulletin of the American Meteorological Society, Monthly Weather Review, Advances in Space Research, Geoscientific Model Development*

Content consultant for *Melting Arctic Ice* high-school book for Red Line Editorial, Winter 2017

Session convener for Polar Climate Predictability and Prediction, EGU General Assembly 2015, 2016, 2017, Vienna, Austria

Lead organizer for Sea Ice Prediction Network Workshop, Boulder, CO, April 2014; Polar Prediction Workshop, Bremerhaven, Germany, March 2017; Massonnet Sea Ice Predictability workshop, Seattle, WA, July 2017; AMS 15th Conference on Polar Meteorology and Oceanography, Boulder CO May 2019.