

DR. MADISON SMITH

MS#12, Woods Hole Oceanographic Institution, 266 Woods Hole Road ◊ Woods Hole, MA 02543
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EDUCATION

- University of Washington, Seattle** *2016-2019*
Ph.D in Civil & Environmental Engineering
Dissertation: The role of waves in the autumn Arctic Ocean
Advisor: Jim Thomson
- University of Washington, Seattle, Washington** *2014-2016*
M.S. in Civil & Environmental Engineering
Thesis: Surface waves in the Beaufort Sea
Advisor: Jim Thomson
- Bowdoin College, Brunswick, Maine** *2010-2014*
B.A. with Honors in Earth & Oceanographic Science, and Environmental Studies
Honors Thesis: Sediment Transport in Katama Bay and Inlet, Martha's Vineyard, MA

RESEARCH EXPERIENCE

- Woods Hole Oceanographic Institution** 2022-Present
Assistant Scientist
Applied Ocean Physics & Engineering
- Applied Physics Lab, University of Washington** 2019-2022
Postdoctoral Research Associate
Polar Science Center
Advisors: Bonnie Light and Marika Holland
- Applied Physics Lab, University of Washington** 2014-2019
Graduate Research Assistant
Air-Sea Interaction & Remote Sensing Group
- Bowdoin College, Department of Earth & Oceanographic Science** 2012-2014
Undergraduate Research Assistant
- Woods Hole Oceanographic Institution** 2013
NSF REU Summer Student Fellow
Advisor: Britt Raubenheimer

TEACHING EXPERIENCE

- CHES Winter School, Svalbard** 2022
Lecturer
Atmosphere-Ocean-Sea Ice Interaction Processes

University of Washington <i>Guest lecturer</i> Principles of Glaciology (Sea Ice)	2020
University of Colorado, Boulder <i>Guest lecturer</i> Our Changing Environment (Cryosphere)	2019
University of Washington <i>Graduate Teaching Assistant</i> Coastal Engineering	2018
University of Washington <i>Graduate Teaching Assistant</i> Undergraduate Fluid Mechanics	2016
Bowdoin College <i>Laboratory Teaching Assistant</i> Environmental Hydrology & Geology	2013-2014

FIELD WORK

65 day cruise in the Central Arctic aboard R/V Polarstern <i>Leg 4 MOSAiC: Multidisciplinary drifting Observatory for the Study of Arctic Climate, funded by Alfred-Wegener Institute/National Science Foundation.</i>	June-August 2020
30 day cruise in the Beaufort Sea aboard R/V Sikuliaq <i>Stratified Ocean Dynamics of the Arctic (SODA), funded by Office of Naval Research.</i>	Sept 2018
65 day cruise in the Ross Sea aboard R/V Palmer <i>Polynyas and Ice Production and Export in the Ross Sea (PIPERS), funded by NSF.</i>	Apr-June 2017
42 day cruise aboard R/V Sikuliaq in Beaufort and Chukchi Seas <i>Sea State DRI, funded by Office of Naval Research.</i>	Sept-Nov 2015
10 day cruise aboard R/V Norseman II in Beaufort Sea <i>Marginal Ice Zone (MIZ) DRI, funded by Office of Naval Research.</i>	Sept 2014

FUNDING

NSF Arctic Natural Science <i>M. Smith, J. Thomson</i>	2022-2024 \$286k total
EAGER: Persistent measurements of surface waves in landfast ice using fiber optic telecommunication cables	
NSF Arctic System Science <i>M. Steele, M. Smith, B. Light, M. Orelllana, A. Jahn, D. Bailey</i>	2022-2025 \$2,652k to UW
Sea ice-ocean exchange of Arctic microplastics: linking small scales to the large-scale system	

NSF Arctic System Science*D. Perovich, C. Polashenski, M. Smith, B. Light, M. Holland, M. Webster*

2022-2024

\$535k to UW

Collaborative Research: Spatiotemporal variability of solar radiation partitioning in the sea ice system: improving climate models using observations from the MOSAiC field campaign

APL IR&D (Internal funding)*M. Smith, D. Krout, J. Thomson, D. Winebrenner, I. Rigor*

2021-2022

\$50k

Persistent measurements of surface waves under landfast ice using fiber optic telecommunication cables

JOURNAL ARTICLES

1. **Smith, M.**, M. M. Holland, A. A. Petty, B. Light, D. A. Bailey. (*in review*). Effects of increasing the category resolution of the sea ice thickness distribution in a coupled climate model on Arctic and Antarctic sea ice. *Submitted to Journal of Geophysical Research-Oceans*.
2. **Smith, M.**, L. von Albedyll, I. Raphael, B. Lange, I. Matero, E. Salganik, M. Webster, B. Light, and M. Granskog. (2022). Quantifying the summer meltwater lens: fine-scale observations of under-ice melt ponds and false bottoms. *Elementa Science of the Anthropocene*. doi.org/10.1525/elementa.2022.000103
3. Clemens-Sewall, D., **M. Smith**, M. Holland, C. Polashenski, D. Perovich. (2022). Snow redistribution onto young sea ice: observations and implications for climate models. *Elementa Science of the Anthropocene*. doi.org/10.1525/elementa.2021.00115
4. Thomson, J., **M. Smith**, K. Drushka, and C. Lee. (2022). Air-ice-ocean interactions and the delay of fall freeze-up. *The Oceanography Society*. doi.org/10.5670/oceanog.2022.124
5. Cooper, V., L. A. Roach, J. Thomson, S. D. Brenner, **M. Smith**, M. Meylan, C. M. Bitz. (*in review*). Wind waves in sea ice of the western Arctic and a global coupled wave-ice model. *Phil. Trans. A*
6. Light, B., **M. Smith**, D. Perovich, M. Webster, M. Holland, I. Raphael, F. Linhardt, A. Macfarlane, and others. (2022). Arctic sea ice albedo: spectral composition, spatial heterogeneity, and temporal evolution observed during the MOSAiC drift. *Elementa Science of the Anthropocene*. doi.org/10.1525/elementa.2021.000103
7. Wang, Y., P. C. Taylor, F. G. Rose, D. A. Rutan, M. D. Shupe, M. A. Webster, **M. Smith**. (2022). Toward a more realistic representation of surface albedo in NASA CERES-derived surface radiative fluxes: A comparison with the MOSAiC field campaign: Comparison of CERES and MOSAiC surface radiation fluxes. *Elementa: Science of the Anthropocene*. doi.org/10.1525/elementa.2022.00013
8. Ferris, L., C. A. Clayson, D. Gong, S. Merrifield, E. Shroyer, **M. Smith**, L. St. Laurent. (2022). Shear turbulence in the high-wind Southern Ocean using direct measurements. *Journal of Physical Oceanography*. doi.org/10.1175/JPO-D-21-0015.1
9. Webster, M., [and 12 other, including **M. Smith**]. (2022). Spatiotemporal evolution of melt ponds in the Arctic: MOSAiC observations and model results. *Elementa Science of the Anthropocene*. doi.org/10.1525/elementa.2021.000072
10. **Smith, M.**, B. Light, A. Macfarlane, D. Perovich, M. Holland, M. Shupe. (2022). Sensitivity of the Arctic Sea Ice Cover to the Summer Surface Scattering Layer. *Geophysical Research Letters*. doi.org/10.1029/2022GL098349
11. Nicolaus, M.[and 102 others, including **M. Smith**]. (2022). Overview of the MOSAiC expedition-Snow and Sea Ice. *Elementa Science of the Anthropocene*. doi.org/10.1525/elementa.2021.000046

12. Kay, J.[and 14 others, including **M. Smith**]. (2022). Less surface sea ice melt in the CESM2 improves Arctic sea ice simulation with minimal non-polar climate impacts. *Journal of Advances in Modeling Earth Systems*. DOI:10.1029/2021MS002679
13. Holland, M. M., D. Clemens-Sewall, L. Landrum, B. Light, D. Perovich, C. Polashenski, **M. Smith**, and M. Webster. (2021). The influence of snow on sea ice as assessed from simulations of CESM2. *The Cryosphere*. doi.org/10.5194/tc-2021-174
14. Perovich, D., **M. Smith**, B. Light, and M. Webster. (2021). Meltwater Sources and Sinks for Arctic Sea Ice in Summer. *The Cryosphere*. doi.org/10.5194/tc-15-4517-2021
15. MacKinnon, J., [and 28 others, including **M. Smith**]. (2021). A warm jet in a cold ocean. *Nature Communications*. doi:10.1038/s41467-021-22505-5
16. **Smith, M.**, M. Holland, and B. Light. (2022). Arctic sea ice sensitivity to lateral melting representation in a coupled climate model. *The Cryosphere*. doi.org/10.5194/tc-2021-67
17. Thomson, J., Lund, B., Hargrove, J., **Smith, M.**, Horstmann, J., and J. A. MacKinnon. (2021). Wave-driven flow along a compact marginal ice zone. *Geophysical Research Letters* doi.org/10.1029/2020GL090735
18. Thompson, L., **M. Smith,** S. Stammerjohn, S. Ackley, J. Thomson, and B. Loose. (2020). Frazil ice growth and ice production during katabatic wind events in the Ross Sea, Antarctica. *The Cryosphere* doi.org /10.5194/tc-2019-213
19. **Smith, M.**, and J. Thomson. (2019). Pancake ice kinematics and dynamics using shipboard stereo video. *Annals of Glaciology*. doi.org/10.1017/aog.2019.3
20. Kohout, A. L., **Smith, M.**, Roach, L. A., Williams, G., Montiel, F., Williams, M. J. (2020). Observations of exponential wave attenuation in Antarctic sea ice during the PIPERS campaign. *Annals of Glaciology*, 1-14.
21. Ackley, S. F., Stammerjohn, S., Maksym, T., **Smith, M.**, Cassano, J., Guest, P., ... DePace, L. (2020). Sea-ice production and air/ice/ocean/biogeochemistry interactions in the Ross Sea during the PIPERS 2017 autumn field campaign. *Annals of Glaciology*, 1-15. doi.org/10.1017/aog.2020.31
22. **Smith, M.**, and J. Thomson. (2019). Ocean surface turbulence observed in newly-formed sea ice. *Journal of Geophysical Research-Oceans*. doi:10.1029/2018JC014405
23. Voermans, J., A. Babanin, J. Thomson, **M. Smith,** and H. Shen. (2019). Wave attenuation by sea ice turbulence. *Geophysical Research Letters*.
24. **Smith, M.**, S. Stammerjohn, O. Persson, L. Rainville, G. Liu, W. Perrie, W., R. Robertson, J. Jackson, and J. Thomson. (2018). Episodic reversal of autumn ice advance caused by release of ocean heat in the Beaufort Sea. *Journal of Geophysical Research-Oceans*. doi:10.1002/2018JC013764
25. Roach, L., **M. Smith**, and S. Dean. (2018). Quantifying growth of pancake sea ice floes using images from drifting buoys. *Journal of Geophysical Research-Oceans*. doi:10.1002/2017JC013693
26. Collins, C., M. Doble, B. Lund, and **M. Smith**. (2018). Observations of Surface Wave Dispersion in the Marginal Ice Zone. *Journal of Geophysical Research-Oceans*. doi:10.1029/2018JC013788
27. Stopa, J.E., F. Ardhuin, J. Thomson, **M. Smith**, A. Kohout, M. Doble, and P. Wadhams. (2018). Wave attenuation through an Arctic Marginal Ice Zone on October 12, 2015. Part 1: measurement of wave spectra and ice features from Sentinel 1A. *Journal of Geophysical Research-Oceans*. doi:10.1029/2018JC013791

28. Lund, B., H. Graber, **M. Smith**, M. J. Doble, O. Persson, J. Thomson, and P. Wadhams. (2018). Arctic sea ice drift measured by shipboard marine radar. *Journal of Geophysical Research-Oceans*. doi:10.1029/2018JC013769
29. Thomson, J., [and 32 others, including **M. Smith**]. (2018). Overview of the Arctic Sea State and Boundary Layer Physics Program. *Journal of Geophysical Research-Oceans*. doi:10.1002/2018JC013766
30. Cheng, S., [and 12 others, including **M. Smith**]. (2017). Calibrating a Viscoelastic Sea Ice Model for Wave Propagation in the Arctic Fall Marginal Ice Zone. *Journal of Geophysical Research-Oceans*. doi:10.1002/2017JC013275
31. Collins III, C.O., [and 12 others, including **M. Smith**]. (2017). Doppler Correction of Wave Frequency-Spectra Measured by Underway Vessels. *Journal of Atmospheric and Oceanic Technology*. doi:10.1175/JTECH-D-16-0138.s1
32. **Smith, M.**, and Thomson, J. (2016). Scaling observations of surface waves in the Beaufort Sea. *Elementa Science of the Anthropocene* 4: 000097. doi: 10.12952/journal.elementa.000097
33. Ardhuin, F, J. Stopa, B. Chapron, F. Collard, **M. Smith**, J. Thomson, M. Doble, B. Blomquist, O. Persson, C. O. Collins III, and P. Wadhams. (2016). Measuring ocean waves in sea ice using SAR imagery: A quasi-deterministic approach evaluated with Sentinel-1 and in situ data. *Remote Sensing of the Environment* 189. doi:10.1016/j.rse.2016.11.024

SEMINAR PRESENTATIONS

- *February 2022*. University of Maryland, AOSC. Sea ice melt in the changing Arctic: Insights from the MOSAiC expedition.
- *June 2021*. IARPC Joint Collaboration Team June Meeting: Air-Sea Exchange of Energy. Sea ice at the interface: Changes in atmosphere-ocean exchange of momentum and heat in the Arctic marginal ice zone (MIZ) and pack ice.
- *May 2021*. WHOI Applied Ocean Physics & Engineering Seminar. Interactions of upper ocean and sea ice in the Arctic Ocean: Small-scale processes and their large-scale implications. (virtual).
- *April 2021*. NASA GISS Sea Level Seminar Series. On pancakes and polynyas: The role of waves in sea ice formation. (virtual).
- *April 2021*. Yale Earth & Planetary Sciences Department, Air, Ocean, and Climate Dynamics Seminar Series. Coupled changes in the upper ocean sea ice in the Arctic Ocean. (virtual).
- *March 2021*. Los Alamos National Lab, Climate, Ocean, Sea Ice and Ice Sheet Modeling Seminar. Postcards from an Arctic drift station: observations and targets for model improvement. (virtual).
- *Feb 2021*. University of Alaska Fairbanks, Physical Oceanography seminar. Surface waves and near-surface stratification in sea ice. (virtual).
- *Oct 2018*. University of Gothenburg, Department of Marine Science seminar. The role of waves in autumn sea ice advance. Gothenburg, Sweden.
- *Oct 2018*. Ifremer, Laboratoire d’Oceanographie Physique et Spatiale seminar. The role of waves in autumn sea ice advance. Brest, France.
- *May 2016*. Applied Physics Lab seminar. Surface waves in the Beaufort Sea. Seattle, Washington.

FIRST-AUTHORED CONFERENCE PRESENTATIONS

- *2022, oral*. Smith, M., B. Light, A. Macfarlane, D. Perovich, M. Holland, M. Shupe. Sensitivity of the Arctic Sea Ice Cover to the Summer Surface Scattering Layer. The MOSAiC Conference.

- *2022, oral (virtual)*. Smith, M., J. Thomson, L. Hosekova, D. Mascarenas, E. Eidam, E. Rogers. Using observations of waves to understand the connection between declining landfast sea ice and eroding coastlines in the Alaskan Arctic. Ocean Sciences Meeting (online).
- *2021, oral*. Smith, M., M. Holland, B. Light, and A. Petty. Impact of the sea ice thickness distribution resolution in a coupled climate model. AGU Fall Meeting (hybrid).
- *2021, oral (virtual)*. Smith, M., L. von Albedyll, I. Raphael, I. Matero, and B. Lange. Freshwater under the MOSAiC floe: Implications of under-ice melt ponds for mass balance. vEGU21 - EGU General Assembly (online).
- *2020, oral (virtual)*. Smith, M., M. Holland, and B. Light. Arctic sea ice sensitivity to lateral melting representation in a coupled climate model . AGU Fall Meeting (online).
- *2020, oral (virtual)*. Albedo evolution of melting Arctic sea ice: Observations from MOSAiC. Symposium on "Environmental control of algal bloom phenology in a pan-Arctic perspective".
- *2020 (Delayed to 2021 due to Covid-19)*. The role of waves in the autumn Arctic. Physical Oceanography Dissertation Symposium, Lihu'e, Hawaii.
- *2019, oral (Invited)*. Smith, M. and J. Thomson. Small-scale feedbacks between waves and sea ice in the evolving marginal ice zone. AGU Fall Meeting, San Francisco
- *2019, oral*. Smith, M. and J. Thomson. Pancake ice dynamics and kinematics from stereo video. IGS Symposium on Sea Ice, Winnipeg, Canada
- *2018, oral*. Smith, M. and J. Thomson. Pancake ice dynamics using shipboard stereo imagery. AGU Fall Meeting, Washington D.C.
- *2018, oral*. Smith, M. and J. Thomson. Event-driven release of upper ocean heat in the autumn Canadian Arctic Ocean. Forum for Arctic Modeling and Observational Synthesis (FAMOS), Bergen, Norway.
- *2018, oral*. Smith, M. and J. Thomson. Waves, turbulence, and thin sea ice at the autumn air-ice-ocean interface. POLAR2018, Davos, Switzerland.
- *2018, poster*. Smith, M.M., and J. Thomson. Surface turbulence production and suppression at the air-ice-ocean interface. Ocean Sciences Meeting, Portland.
- *2017, oral*. Smith, M.M., S. Stammerjohn, O. Persson, L. Rainville, G. Liu, W. Perrie, and J. Thomson. Observations of storm-driven mixing in the autumn Arctic Ocean. IGS Symposium on Polar Ice, Polar Climate, Polar Change, Boulder.
- *2017, oral*. Smith, M., and J. Thomson. Surface turbulence in the presence of pancake ice in the autumn Arctic Ocean. AMS Annual Meeting, Seattle.
- *2016, poster*. Smith, M., and J. Thomson. Observations of wave-enhanced mixing in the autumn Arctic Ocean. AGU Fall Meeting, San Francisco.
- *2016, poster*. Smith, M., and J. Thomson. Observations of fetch-limited waves in the emerging Arctic Ocean. WISE Meeting (Waves In Shallow-water Environments), Venice, Italy.
- *2016, oral*. Smith, M., and J. Thomson. Scaling observations of distanced-limited waves in the seasonally ice-covered Beaufort Sea. Ocean Sciences Meeting, New Orleans.
- *2014, poster*. Smith, M., and J. Thomson, W.E. Rogers. Large-Scale Patterns of Waves in Partial Ice Cover in the Arctic Ocean. AGU Fall Meeting, San Francisco.
- *2014, poster*. Smith, M.M., B. Raubenheimer, and S. Elgar. Ocean Sciences Meeting, Honolulu.

AWARDS

International Arctic Science Committee (IASC) Early-Career Travel Funding	2022
College of the Environment Postdoc Travel Funding	2021
NCAR/CISL University Large Allocation Request	2020-2021
2nd Place Oral Presentation by a Student, IGS Symposium on Sea Ice	2019
Nece Award for Outstanding PhD, UW Department of Civil & Environmental Engineering	2019
Marie Sklodowska-Curie Actions Seal of Excellence	2019
Andy Studebaker Travel Award (UW CEE) to attend AGU Fall Meeting in Washington D.C.	2018
NSF Travel Award to attend the SCAR Open Science Conference in Davos, Switzerland	2018
APECS Travel Award to attend the POLAR meeting in Davos, Switzerland	2018
Best Oral Presentation by a Student, IGS Symposium on Polar Ice	2017
IGS Symposium Student Travel Award	2017
Valle Fellowship, UW Department of Civil & Environmental Engineering	2014-2015
Sarah and James Bowdoin Scholar	2014
Honors in Earth & Oceanographic Science, Bowdoin College	2014
WHOI Summer Student Fellow Travel Award to attend Ocean Sciences in Honolulu	2013
American Geophysical Union Student Travel Award to attend Ocean Sciences in Honolulu	2013

OUTREACH

National Ocean Sciences Bowl (NOSB) Career Mentor	May 2021
Monthly outreach activities with a 5th grade class, Maywood Hills Elementary School, Bothell, Washington	Nov 2019-May 2020
Pacific Science Center Science Communication Fellow	2019-present
Polar Science Weekend Volunteer and Table Lead	2014-present
Board of Directors of ‘Engage: Communicating Science Effectively’	2017-2019
Making Connections Math & Science Tutor	2016-2018
Seattle Girls’ School Mentor	2016-2018
UW Engineering Discovery Days Volunteer	2015-2019

PUBLIC PRESENTATIONS

Community Talk for Camden Conference, hosted by the Rockland Library: “A Year in the Ice: Insights into the changing Arctic Ocean from the MOSAiC expedition”	2021
Ready Set Transfer Academy Seminar, South Seattle College: ‘Polar Oceanography’	Nov. 2017
UW Science Now Series, Seattle Town Hall: ‘Understanding the Changing Arctic Ocean’	Mar. 2017

Scholars' Studio @the Commons, UW: 'Waves of Change'	May 2016
National Ocean Sciences Bowl (NOSB) Webinar presentation: 'Earth's Frozen Oceans: Properties and Importance of Sea Ice'	2021

SERVICE

INSTITUTIONAL

APL Seminar Series Planning Committee	2022
APL Mentoring Program Advisory Committee	2021
Member of APL Diversity, Equity, and Inclusion Group	2021
Departmental Steward & Bargaining Committee Member for UAW4121 - University of Washington Academic Student Employee & Postdoc Union	2017-present
Undergraduate Research Advisor: University of Washington, 3 students	2017-2020

SCIENTIFIC COMMUNITY

Ocean Sciences Meeting Mentor	2022
Reviewer for NSF Proposals	2021-present
Expert Reviewer for IPCC WGII Sixth Assessment Report	2021
Primary Session Convener at vEGU Annual Meeting	2021
AGU Outstanding Student Paper Award (OSPA) Judge	2020
Member of the Steering Committee for MPOWIR (Mentoring Physical Oceanography Women to Increase Retention)	2020-present
Peer Reviewer: Ocean Modelling, Remote Sensing, Journal of Glaciology	2019-present
CryoMentor at AGU Fall Meeting	2019
Seattle Society for Women in Marine Science (SWMS) Steering Committee	2017-2021

CERTIFICATIONS

AAUS Scientific SCUBA diver	2015-2019
NPFVOA Safety Equipment and Survival Procedures	2014