Dr. Christopher Horvat christopher_horvat@brown.edu

Department of Earth, Environmental, and Planetary Sciences
Institute at Brown for Environment and Society
Providence, Rhode Island, USA.

phone:+1-401-225-5879
website: www.chrv.at
research: google scholar

Education

Ph.D in Applied Mathematics, **Harvard University**, 2017.
S.M. in Applied Mathematics, **Harvard University**, 2013.
B.S. in Mathematics, B.S. in Physics, **University of Pittsburgh**, 2011.

Employment History

Institute at Brown for Environment and Society, Brown University, Providence, RI
NOAA *Climate and Global Change Postdoctoral Fellow* (2017-present)
Voss Postdoctoral Fellow (2017-present)

National Institute of Water and Atmospheric Research, Wellington, NZ
Frank Knox Memorial Fellow (2017-2018)

Albedo (film). ***Enduring Ice*** (expeditions). Scientific lead, principal subject. Link. (2016-present).

Teaching Experience

As *a Teaching Fellow*:
AM 201 (Harvard University): Applied Mathematical Modelling (fall 2012, fall 2016)
EPS 134 (Harvard University): Intro to Physical Oceanography (spring 2014, spring 2016)
EPS 231 (Harvard University): Climate Dynamics (spring 2015).

Selected Reporting:

Tracking Arctic Sea Ice in Nares Strait. Canadian Geographic. Link.
Solving the Mystery of the Arctic's Green Ice. Phys.org. Link.
Melting Away. Colloquoy. Link.
Thinning Arctic Sea Ice lets in light, prompts algae-bloom study. Reuters. Link.
'*Enduring Ice' Expedition Will Kayak Through the Harshest of Arctic Environments*. Seeker. Link.

Awards, Honors

At *Brown University*

NOAA Climate and Global Change Postdoctoral Fellowship, (2017-2019).
Voss Postdoctoral Fellowship, (2019-2021).
Royal Canadian Geographic Society Expedition of the Year, (2017).

At *Harvard University*:

Knox Memorial Fellowship, (2017-2018)
COMNAP/SCAR Antarctic Research Fellowship (2017)
Graduate Climate Conference SCRIM Fellowship, (2016)
Butler Conservation Fund Frenchboro Residency, (2016)
National Defense Science and Engineering Graduate (NDSEG) Fellowship, (2013-2016)
HUCE Graduate Consortium Fellowship (2014-2016)
Smith Fellowship in Applied Mathematics (2011-2013)

At *University of Pittsburgh*:

Culver Prize in Mathematics (2010)
Blumberg Award in Mathematics (2010)

Publications

11. A. Roberts, E. Hunke, S. Kamal, W. Lipscomb, **C. Horvat**, and W. Maslowski. A Variational Model for Sea Ice Ridging in Earth System Models, Part I: Theory. *J. Adv. Model Earth Sys.* 2018.
10. **C. Horvat** and E. Tziperman. Understanding melting due to ocean eddy heat fluxes at the edge of sea-ice floes. *Geophys. Res. Lett.* 2018. doi:10.1029/2018GL079363.
9. L. Roach, **C. Horvat**, S. Dean, and C. Bitz. An emergent sea ice floe size distribution in a global coupled ocean-sea ice model. *J. Geophys. Res. Oceans.* 2018. doi:10.1029/2017JC013692
8. C. Cuevas, N. Maffezzoli, J. Corella, A. Spolaro, P. Vallelonga, [et al., incl. **C. Horvat**]. Rapid increase in atmospheric iodine levels in the North Atlantic since the mid-20th century. *Nature Communications*, 2018. doi:10.1038/s41467-018-03756-1
7. **C. Horvat**, D. Rees Jones, S. Iams, D. Schroeder, D. Flocco, D. Feltham. Prediction and timing of sub-ice phytoplankton blooms in the Arctic Ocean. *Science Advances*, 2017. doi:10.1126/sciadv.1601191
6. **C. Horvat** and E. Tziperman. The evolution of scaling laws in the sea ice floe size and thickness distribution. *J. Geophys. Res. Oceans*. 2017, doi:10.1002/2016JC012573
5. B. Hwang, J. Wilkinson, E. Maksym, H.C. Graber, A. Schweiger, **C. Horvat**, et al.. Winter-to-summer transition of Arctic sea ice breakup and floe size distribution in the Beaufort Sea. *Elem Sci Anth*, 2017. doi:http://doi.org/10.1525/elementa.232
4. **C. Horvat,** E. Tziperman, and J.M. Campin. Effects of the floe size distribution on ocean eddies and sea ice melting. *Geophys. Res. Lett.* 2016, doi:10.1002/2016GL069742.
3. **C. Horvat** and E. Tziperman. A prognostic model of the sea-ice floe size and thickness distribution, The Cryosphere. 2015, doi:10.5194/tc-9-2119-2015..
2. M. Tronzo, J. Barber, **C. Horvat**, et al. A three-dimensional mathematical and computational model of necrotizing enterocolitis. J. of Theor. Biology. 2013, doi:10.1016/j.jtbi.2012.11.018.
1. **C. Horvat** and M. Stoffregen. A solution to the lonely runner conjecture for almost all points. arXiv:1103.1662, 2011.

First-Author Publications in Review (please contact for manuscript)

16. **C. Horvat**, B. Fox-Kemper. Parameterizing Brine Driven Eddy Mixing at Sea Ice Leads.
15. **C. Horvat**, L. Roach, R. Tilling, B. Fox-Kemper, C. Bitz, K. Hill, C. Guider. Sea Ice Floe Size Reconstructed From Satellite Altimetry: Theory, Climatology, and Comparison with Models.
14. **C. Horvat**. Brief Communication: A change in the role of Arctic clouds.
13. **C. Horvat**, D. Flocco, D. Rees Jones, L. Roach, and K. Golden. The partitioning of solar energy under ponded sea ice.
12. **C. Horvat**, C. Bitz, and C. Polashenski. Sea Ice Thinning Controls the Arctic Sea Ice Albedo Feedback.

Current Research Support

PI, *CPAESS and the* NOAA *Climate and Global Change Fellowship Program*, Modeling sea ice from the floe-scale up. 2017-2019. $150,600.

PI, *Institute at Brown for Environment and Society Voss Fellowship*, Ice floes and ocean floes: heat in the polar oceans from the floe scale to the climate scale. 2019-2021. $105,800.

Project Partner, *MOSAiC International Arctic Drift Experiment*, Floe-scale observation and quantification of Arctic sea ice breakup and floe size during the autumn-to-summer transition (MOSAiCFSD) 2019-2021. PI, Phil Hwang.

Collaborator, NSF *Navigating the New Arctic*, Co-production of shorefast ice knowledge in Uummannaq Bay, Greenland. 2019-2021. $830,000 to Brown ($80,000 to support C. Horvat expedition work). Lead PI: Johnny Ryan. Co-PIs: Amanda Lynch, Laurence Smith.

Pending Research Grants

Office of Naval Research Multidisciplinary University Research Initiative: Subseasonal-to-seasonal prediction of Arctic sea ice from floe-to-basin scale using a hybrid approach based on continuum, discrete element, and statistical methods. $7,500,000 ($843,000 to Brown). *Pending* (2019-2024). Lead PI: Cecilia Bitz. Co-PIs Christopher Horvat, Bruno Tremblay, Pierre Lermusiaux, Adrian Raftery, Christopher Bretherton.

Office of Naval Research Arctic and Global Prediction Program: Remotely sensed sea ice metrics to validate and improve sea ice models. *Pending*. 2019-2021. $405,982 to Brown. Lead PI: Laurence Smith, Co-PIs Christopher Horvat, Johnny Ryan.

Expired Research Grants

Department of Defense, National Defense Science and Engineering Graduate (NDSEG) Fellowship. (2013-2016). $93,000.

Professional Service

As a reviewer: (average ~10 papers, 2 proposals, 1 committee per year).
Journals: Cryosphere, Journal of Geophysical Research, Elementa, Ocean Modeling, Journal of Advances in Modeling Earth Systems, Journal of Physical Oceanography. Proposals: National Science Foundation, NASA Cryosphere.
Committees: NASA ROSES.

As a committee member:
Executive Committee, Arctic in Rapid Transition (2016-present).
Council, Assoc. Of Polar Early Career Sciences (APECS) (2016-2017)
Council, APECS U.S. Branch (2016-2017)
Associate Editor, Contributor, EGU Cryosphere Blog (2016-present)
Expert, Applied Math and Climate Change, Science in the News (2015-present)

Seminars/Contributed Talks/Conference Proceedings

(2018)

Seminars/contributed/community talks:
Sea Ice Modelling and the Floe Size Distribution. The Future of Earth System Modeling: Polar Climate, Pasadena, CA.
Sea ice from the floe scale up. University of Tasmania, Hobart, Australia.
The new Arctic: a Chris story. Brown University Lunch Bunch, Providence, RI.
Sea ice, floes, and the New Arctic from the floe scale up. Caltech Geoclub seminar, Pasadena, CA.

Conference Proceedings:
C. Horvat, D. Flocco, D. Rees Jones. *The distribution of solar energy under ponded sea ice.* AGU Fall Meeting. Abstract no: C21D-0472
C. Horvat, E. Tziperman. SIAM Conference on Nonlinear Waves and Coherent Structures, Philadelphia, PA. *The Evolution of Scaling Laws in the Sea Ice Floe Size Distribution.*

L. Roach, C. Horvat, C. Bitz, S. Dean. *Improving the Representation of Coupled Wave-Ice-Ocean-Atmosphere Interactions via Simulation of the Floe Size Distribution.* AGU Fall Meeting. Abstract no: C34B-02
L. Roach, M. Smith, C. Horvat, S. Dean, C. Bitz. *Integrating In-Situ Observations with Process-Based Modelling of the Sea Ice Floe Size Distribution.* AGU Fall Meeting. Abstract no: C33F-1635
C. Bitz, L. Roach, A. Ordonez, C. Horvat, S. Dean, B. Fox-Kemper, M. Meylan. Coupled Wave-Ice Interactions in the Marginal Ice Zone in Simulations with a Floe-Size Distribution. AGU Fall Meeting. Abstract no: C33B-01.

(2017)

Seminars/contributed/community talks:
Floe size and thickness distributions. Isaac Newton Institute, Cambridge, UK.
The frequency and extent of sub-ice phytoplankton blooms in the Arctic Ocean. NOAA Climate Seminar.
Theory, modeling, and impact of the floe size distribution of sea ice. Australia National University, Canberra, AU.
Theory, modeling, and impact of the floe size distribution of sea ice. Otago University, Dunedin, NZ.
The Sea Ice Floe Size Distribution. National Institute of Water and Atmospheric Research, Wellington, NZ.
The Evolution of Scaling Laws in the Sea Ice Floe Size Distribution. University of Washington, Seattle, WA.

(2016)

Seminars/contributed/community talks:
The Sea Ice Floe Size Distribution. Oxford University, Oxford, UK.
Feedbacks of the floe size and thickness distribution. UK National Oceanography Centre, Southampton, UK.
Sub-ice phytoplankton blooms in the Arctic Ocean. Polar Prediction Workshop, Lamont-Doherty Earth Observatory.
Interaction of Sea Ice Floe Size, Ocean Eddies, and Ice Melting. Forum for Arctic Modeling and Synthesis, Woods Hole, USA;
Increase in the frequency and spread of sub-ice phytoplankton blooms in the Arctic Ocean. Graduate Climate Conference, Seattle, WA;

Conference Proceedings:
C. Horvat, *Effects of the sea ice floe size distribution on ocean eddies and sea ice melting.* EGU Spring Meeting, Abstract no: EPSC2016-630.
Evolution, response to forcing, and feedbacks of the floe size and thickness distribution.
C. Horvat, E. Tziperman. AGU Fall Meeting.

(2015)

Seminars/contributed/community talks:
Mathematics of Sea Ice Workshop, Vancouver, BC, Canada. *Thermodynamic and dynamic influence of the floe size distribution of sea ice*

Conference Proceedings:
C. Horvat, E. Tziperman. *Effects of the Sea Ice Floe Size Distribution on Polar Ocean Properties and Air-Sea Exchange.* AGU Fall Meeting.