

**Dr. Christopher Horvat**  
Senior Lecturer, University of Auckland  
Assistant Professor (Research), Brown University

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## CURRENTLY

**University of Auckland**, Auckland, NZ  
Senior Lecturer, Department of Physics (2022-present).  
**Brown University**, Providence, RI, USA.  
Assistant Professor (Research) of Environment and Society (2021-present).

## PREVIOUS AND OTHER EMPLOYMENT

**Brown University**, Providence, RI, USA.  
*Voss Postdoctoral Fellow* (2019-2020)  
*NOAA Climate and Global Change Postdoctoral Fellow* (2017-2019)  
**Harvard University** and **NIWA**, Wellington, NZ. *Frank Knox Memorial Fellow* (2017-2018)  
*Enduring Ice* (film). Scientific lead, principal subject. [Link](#). (2016-present)

## 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.

## TEACHING EXPERIENCE

*As a lecturer:*  
**PHYS 120** (Auckland University): Advancing Physics (2022) + lab coordination.  
**ENVPHYS 200** (Auckland University): Earth Observations and Models (2022).

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

## 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)

## RESEARCH SUPPORT (Amounts in \$USD unless specified)

### Active Awarded Grants + Support

*Schmidt Futures Foundation*. PI. A. Alberello, V. Dansereau, **C. Horvat**, E. Olason, P. Rampal. The Scale Aware Sea Ice Project. \$10.4m (\$3.1m to CH work package). 2020-2026.

*NASA Proposals with ICESat-2*. PI. **C. Horvat** and E. Blanchard-Wrigglesworth. Waves in sea-ice: detection, attenuation and floe size impacts with ICESat-2. \$355k (\$175k to Brown). 2020-2022.

*NSF Arctic Program*. co-I. B. Pearson, **C. Horvat**. Surface Wave-energized Mixing, Sea Ice and the Arctic Ocean. 2022-2024. \$175,000 to Brown.

### Pending Competitive Grants

*Royal Society of New Zealand Rutherford Discovery Fellowship*. PI. **C. Horvat**. Polar oceanography in a warming world. NZD\$800k to University of Auckland.

### Past Awarded Grants

*MOSAIc International Arctic Drift Experiment*. Partner. **C. Horvat** with Hwang and Ren, Floe-scale observation and quantification of Arctic sea ice breakup and floe size during the autumn-to-summer transition (MOSAIcFSD). \$0 to Brown.

*NSF Navigating the New Arctic*. Collaborator. J. Ryan, A. Lynch, L. Smith, B. Dale. Co-production of shorefast ice knowledge in Uummannaq Bay, Greenland. \$830,000 to Brown. 2019-2022.

## SUPERVISION + Group (publications in brackets)

### Current

Anna Lo Piccolo (Brown University). 2019-present. Masters Thesis + PhD. [31]

Yanan Wang (University of Huddersfield, UK). 2019-present. External PhD Advisor. [29]

Momme Hell (Brown University) 2021-present. Postdoc. [38]

Guillaume Boutin (Nansen Center) 2021-present. Postdoc. [28]

Erica Rosenblum (Brown University) 2021-present. Postdoc.

Rafael Santana (Auckland University) 2022-present. Postdoc.

Sam Brenner (Brown University) 2022-present. Postdoc.

Paul Hall (Brown University) 2021-present. Research Software Engineer.

Poom Yoosiri (Brown University) 2022-present. Undergraduate Research.

Madelyn Stewart (Yale University) 2022-present. Undergraduate Research.

Lydia Stone (Harvey Mudd College) 2021-present. Undergraduate Research.

### Previous:

Jacinta Clay (Brown University, now Princeton University). 2018-2019. Senior Thesis.

Jarrett Valenti (Roger Williams University, now Ford). Undergraduate Research. 2019.

Radha Mastandrea (MIT, now Cambridge). Undergraduate Research. 2016 [6]

Carlyn Chrabaszcz (Brown University). Undergraduate Research. 2019.

Ding Ding Wei (Brown University) 2021-2022. Undergraduate Research. [29]

Lucas Washburn (Brown University) 2020-2022. Undergraduate Research. [30]

## PUBLICATIONS

30. **C. Horvat**. Floes, the Marginal Ice Zone, and Coupled Wave-Sea-Ice Feedbacks. Proceedings of the Royal Society A. 2022. doi: 10.1098/rsta.2021.0252
29. Y. Wang, P. Hwang, A. Bateson, Y. Aksenov, **C. Horvat**. Summer sea ice floe size distribution in the Arctic: High-resolution optical satellite imagery and model evaluation. *The Cryosphere Discuss.* 2022. doi: 10.5194/tc-2022-130
28. G. Boutin, T. Williams, **C. Horvat**. Modelling of the wave-affected sea ice region using a coupled model: evaluation using ICESat-2 and potential impact on sea ice dynamics. Proceedings of the Royal Society A. 2022.
27. M. Ardyna [et al., incl **C. Horvat**]. Wildfire aerosol deposition amplifies Arctic sea-ice loss and phytoplankton production. *Nat. Comms Earth and Env.* 2022.
26. J. Brouwer, A. Fraser, D. Murphy, P. Wongpan, A. Alberello, A. Kohout, **C. Horvat**, S. Wotherspoon, R. Massom, J. Cartwright, G. Williams. Altimetric observation of wave attenuation through the Antarctic marginal ice zone using ICESat-2. *The Cryosphere*, 2022.
25. **C. Horvat**, L. Roach. WIFF1.0: A hybrid machine learning parameterization of Wave-Induced sea-ice Floe Fracture. *Geophys. Mod. Dev.* 2022.
24. **C. Horvat**. Marginal ice zone fraction benchmarks sea ice and climate model skill. *Nature Communications*. 2021. doi: 10.1038/s41467-021-22004-7
23. M. Meylan, **C. Horvat**, C. Bitz. A Floe Size Dependent Scattering Model in Two and Three dimensions for Wave Attenuation by Ice Floes. *Ocean Modeling*. 2021.
22. A. Petty [et a., incl **C. Horvat**]. Assessment of ICESat-2 sea ice surface classification with Sentinel-2 imagery: implications for freeboard and new estimates of lead and floe geometry. *Earth and Space Science*. 2021.
21. M. Ardyna [et al., incl **C. Horvat**]. Under-ice phytoplankton blooms: shedding light on the 'invisible' part of Arctic primary production. *Fron. Mar. Sci.* 2020.
20. **C. Horvat**, E Blanchard-Wrigglesworth, A. Petty. Observing Waves in Sea Ice with ICESAT-2. *Geophys Res. Lett.* 2020. doi: 10.1029/2020GL087629
19. K. Golden [et al., incl. **C. Horvat**]. Modeling Sea Ice. *Notices of the American Mathematical Society*. 2020.
18. E. Chassignet [et al., incl. **C. Horvat**]. Impact of horizontal resolution on global ocean-sea-ice model simulations based on the experimental protocols of the Ocean Model Intercomparison Project phase 2. *Geoscientific Model Development*. 2020. doi:10.5194/gmd-2019-374
17. S. Cooley, J. Ryan, L. Smith, **C. Horvat**, B. Pearson, et al., Coldest communities face greatest reductions in Arctic shorefast ice. *Nature Clim. Change*. 2020.
16. **C. Horvat**, D. Flocco, D. Rees Jones, L. Roach, and K. Golden. The effect of melt pond geometry on the distribution of solar energy under first-year sea ice. *Geophys. Res. Lett.* 2020. doi:10.1029/2019GL085956
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 Model Comparison. *The Cryosphere*. 2019. doi: 10.5194/tc-2019-134
14. L. Roach, C. Bitz, **C. Horvat**, S. Dean. Advances in modelling interactions between sea ice and ocean surface waves. *J. Adv. Mod. Earth Sys.* 2019.
13. E. Kyzivat, L. Smith, L. Pitcher, J. Fayne, S. Cooley, [et al., incl. **C. Horvat**]. A high-resolution airborne color-infrared camera water mask for the NASA ABoVE campaign. *Remote Sensing*. 2019. Doi: 10.3390/rs11182163
12. J-E. Lee, B. Fox-Kemper, **C. Horvat**, Y. Ming. The response of the East Asian monsoon to the precessional cycle: A new study using the Geophysical Fluid Dynamics Laboratory model. *Geophys. Res. Lett.* 2019. Doi: 10.1029/2019GL082661
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.* 2019. Doi: 10.1029/2018MS001395
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.

In review (please contact for manuscript). *Supervisees italicized and underlined.*

39. E. Blanchard-Wrigglesworth, M. Webster, L. Boisvert, C. Parker, **C. Horvat**. Record Arctic cyclone of January 2022: characteristics, 2 impacts, and predictability. *In Review*.
38. *M. Hell*, **C. Horvat**. Directional Surface Wave Spectra And Sea Ice Structure from ICESat-2 Altimeter.
37. **C. Horvat**, B. Fox-Kemper. The Polar Tempest. In prep. .
36. **C. Horvat**, C. Bitz, C. Polashenski. Sea Ice Thinning and Surface Transformation Drive Solar Heating of the Arctic Ocean. *In review*.
35. **C. Horvat**, E. Buckley, *P. Yoosiri*, *M. Stewart*. Laser Altimetry Reveals Biases in Passive Microwave Sea Ice Concentration Records. *In prep.*.
34. **C. Horvat**, E. Blanchard-Wrigglesworth, D. Dumont. Defining the Marginal Ice Zone. *In prep.*
33. **C. Horvat**, S. Seabrook, A. Cristi, L. Matthes, K. Bisson. Phytoplankton Blooms Under Antarctic Sea Ice. *Nature Comms. Env.* In review.
32. P. Russell, **C. Horvat**. Extreme South Pacific Phytoplankton Blooms Induced by Tropical Cyclones. *Geophys Res. Lett.* *In review*.
31. *A lo Piccolo*, **C. Horvat**, B. Fox-Kemper. Energetics of Brine Driven Eddies at Winter Sea Ice Leads. *In prep for The Cryosphere*.

## SELECTED REPORTING

### About research:

*Tracking Arctic Sea Ice in Nares Strait.* Canadian Geographic.

*Solving the Mystery of the Arctic's Green Ice.* Phys.org.

*Thinning Arctic Sea Ice lets in light, prompts algae-bloom study.* Reuters.

*'Enduring Ice' Expedition Will Kayak Through the Harshes of Arctic Environments.* Seeker.

**About the Westbrook ice disk collaboration:** Washington Post, Gizmodo

**About science:** New York Times, NPR

## PROFESSIONAL SERVICE

Editor, *Geophys. Mod. Devel.*

Service on: Brown DEEPS Diversity Inclusivity Action Committee (DIAC), Auckland Dept. of Physics Equity Committee.

Reviewer: Cryosphere, Ann. Glaciology, Journal of Geophysical Research, Elementa, Frontiers, Ocean Modeling, Journal of Advances in Modeling Earth Systems, Journal of Physical Oceanography, etc.

Proposals: National Science Foundation, NASA Cryosphere.

Committees: NASA ROSES Physical Oceanography.

**As a committee member/team member:**

NASA IceSat-2 science team (2020-present).

IARPC Sea Ice Collaboration Team (2019-present).

IARPC Physical Oceanography Self-Formed Team (2019-present).

NASA cryosphere Surface Deformation and Change working group (2020-pres).

Executive Committee, Arctic in Rapid Transition (2016-2018).

Council, Assoc. Of Polar Early Career Sciences (APECS) (2016-2017)

Council, APECS U.S. Branch (2016-2017)

Associate Editor, Contributor, EGU Cryosphere Blog (2016-2018)

Expert, Applied Math and Climate Change, Science in the News (2015-present)