Dr. Christopher Horvat christopher.horvat@auckland.ac.nz
Senior Lecturer, University of Auckland personal website: www.chrv.at
Assistant Professor (Research), Brown University group website: www.polar-oceans.com
research: google scholar

CURRENT EMPLOYMENT

University of Auckland, Auckland, NZ
Department of Physics
Glavish-Buckley Senior Lecturer in Climate Physics (2022-present).
Co-Director, Climate Systems Laboratory (2022-present).

Brown University, Providence, RI, USA.
Department of Earth, Environmental, and Planetary Sciences
Visiting Assistant Professor (Research) (2022-present).

PREVIOUS EMPLOYMENT

Brown University, Providence, RI, USA.
Assistant Professor of Environment and Society (Research) (2020-2022)
*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.

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

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

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

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. 2022-2025. $175,000 to Brown.

University of Auckland. PI. **C. Horvat.** Investigating Tropical Cyclone Impacts on People and Ecology in the South Pacific. NZD$20,000 to Auckland.

Pending Competitive Grants

Google Climate Innovations. PI. B. Fox-Kemper, K. Bergen, E. De Lorenzo, **C. Horvat**, M. Martinez Wilhelmus, OCEAN Resources: Ocean Climate Emulation for Adaptation and Natural Resources. $5m to Brown.

Nasa Proposals with ICESat-2. Co-I. *M. Hell* and **C. Horvat**. Observing the marginal ice zone with ICESat-2: Improving estimates of sea ice freeboard and storm impacts. $440,000 to Brown.

Nasa Proposals with ICESat-2. Co-I. E. Buckley, M. Martinez-Wilhelmus, and **C. Horvat**. Re-examining the Arctic Sea Ice Cover: New Applications of ICESat-2 Observations. $480,000 to Brown.

Nasa Proposals with ICESat-2. Co-I. K. Bisson, R. Tilling, and **C. Horvat**. Observing the marginal ice zone with ICESat-2: Improving estimates of sea ice freeboard and storm impacts. Advancing ICESat-2 retrievals of phytoplankton in polar ice. $600,000.

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

<u>*Post-doctoral Researchers*</u>

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

Erica Rosenblum (Brown University) 2021-present. Postdoc.
Sam Brenner (Brown University) 2022-present. Postdoc.
Rafael Santana (Auckland University) 2022-present. Postdoc.
Michelle McCrystall (Auckland University) 2022-present. Postdoc.
Guillaume Boutin (Nansen Center) 2021-present. Postdoc. [28]
Paul Hall (Brown University) 2021-present. Research Software Engineer.

Graduate Students
Anna Lo Piccolo (Brown University). 2019-present. Masters Thesis + PhD. [31]
Yanan Wang (University of Huddersfield, UK). 2019-present. External PhD Advisor. [29]

Undergraduate Researchers
Poom Yoosiri (Brown University) 2022-present. Undergraduate Research. [35]
K'vaan Valabh (University of Auckland) 2022-present. Undergraduate Research.

Previous:
Undergraduate Researchers
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]
Lydia Stone (Harvey Mudd College) 2021-2022. Undergraduate Research.

PUBLICATIONS [Supervision italicized]

32. **C. Horvat**, S. Seabrook, A. Cristi, L. Matthes, K. Bisson. Phytoplankton Blooms Under Antarctic Sea Ice. *F. Mar. Sci.* 2022. doi: 10.3389/fmars.2022.942799
31. *M. Hell*, **C. Horvat**. Directional Surface Wave Spectra And Sea Ice Structure from ICEsat-2 Altimeter. *The Cryosphere Discuss*. doi: 10.5194/egusphere-2022-842
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**, L. Brodeau. 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: 0.1029/2020GL087629
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*.

38. **C. Horvat**, B. Fox-Kemper. The Polar Tempest. In prep. .
37. **C. Horvat**, C. Bitz, C. Polashenski. Sea Ice Thinning and Surface Transformation Drive Solar Heating of the Arctic Ocean. *In review.*
36. **C. Horvat**, E. Buckley, *P. Yoosiri, M. Stewart*. Laser Altimetry Reveals Biases in Passive Microwave Sea Ice Concentration Records. *In prep.*.
35. **C. Horvat**, E. Blanchard-Wrigglesworth, D.Dumont. Defining the Marginal Ice Zone. *In prep*.
34. E. Blanchard-Wrigglesworth, M. Webster, L. Boisvert, C. Parker, **C. Horvat**. Record Arctic cyclone of January 2022: characteristics, impacts, and predictability. *In Review*.
33. P. Russell, **C. Horvat**. Extreme South Pacific Phytoplankton Blooms Induced by Tropical Cyclones. Geophys Res. Lett. *In review*.
32. *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 Harshest 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. Co-Director of Auckland Climate Physics Laboratory.
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)