KENNETH HUGHES

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PROFILE

A process-oriented physical oceanographer combining observations with numerical modelling

EDUCATION AND POSITIONS

Senior Lecturer	University of Waikato	July 2024–present
Assistant Professor (Senior Research)	Oregon State University, USA	Jul 2022–June 2024
Postdoctoral Research Scientist	Oregon State University, USA	Jul 2018–Jun 2022
PhD in Physical Oceanography	University of Victoria, Canada	2018
MSc in Physics	University of Otago, New Zealand	2013
BSc (Hons) in Physics	University of Otago, New Zealand	2011

SUBMITTED/IN PREP MANUSCRIPTS

Predicting ocean turbulence across orders of magnitude using neural networks trained on multiyear observations
S. Iyer, **K. G. Hughes** and J. N. Moum
Artif. Intell. Earth Syst. — submitted Sep 2024

PEER-REVIEWED PUBLICATIONS

Imaging thermocline microstructure in 2D with swaths traced by wave-pumped χpods
K. G. Hughes and J. N. Moum (2025)
J. Geophys. Res. Oceans, 130, e2024JC022134, doi:10.1029/2024JC022134

Relative roles of plume and coastal forcing on exchange flow variability of a glacial fjord
R. M. Sanchez, F. Straneo, **K. G. Hughes**, P. L. Barbour, and E. L. Shroyer (2024)
J. Geophys. Res. Oceans, 129, e2023JC020492, doi:10.1029/2023JC020492

Fjord circulation induced by melting icebergs
K. G. Hughes (2024)
The Cryosphere, 18, 1315–1332, doi:10.5194/tc-18-1315-2024

A turbulence data reduction scheme for autonomous and expendable profiling floats
K. G. Hughes, J. N. Moum, and D. L. Rudnick (2023)
Ocean Sci., 19, 193–207, doi:10.5194/os-19-193-2023

Prolonged thermocline warming by near-inertial internal waves in the wakes of tropical cyclones
N. Gutiérrez Brizuela, M. H. Alford, S.-P. Xie, J. Sprintall, and four others including **K. G. Hughes** (2023)
Proc. Natl. Acad. Sci., 120, e2301664120, doi: 10.1073/pnas.2301664120

Wind dependencies of deep cycle turbulence in the equatorial cold tongues
J. N. Moum, W. D. Smyth, **K. G. Hughes**, D. Cherian, and four others (2023)
J. Phys. Oceanogr. , 53, 1979–1995, doi:10.1175/JPO-D-22-0203.1

Turbulent diapycnal fluxes as a pilot essential ocean variable
A. Le Boyer, N. Couto, M. H. Alford, H. F. Drake, and thirteen others including **K. G. Hughes** (2023)
Front. Mar. Sci., 10, 1241023, doi:10.3389/fmars.2023.1241023

Flippin' χSOLO, an upper ocean turbulence-profiling float
J. N. Moum, D. L. Rudnick, E. L. Shroyer, **K. G. Hughes**, and eight others (2023)
J. Atmos. Oceanic Tech., 40, 629–644, doi:10.1175/JTECH-D-22-0067.1

Pathways, form drag, and turbulence in simulations of an ocean flowing through an ice mélange
K. G. Hughes (2022)
J. Geophys. Res. Oceans, 127, e2021JC018228, doi:10.1029/2021JC018228

Deep cycle turbulence in Atlantic and Pacific cold tongues

J. N. Moum, **K. G. Hughes,** E. L Shroyer, W. D. Smyth and five others (2022)

Geophys. Res. Lett., 49, e2021GL097345, doi:10.1029/2021GL097345

Stratified shear instabilities in diurnal warm layers

K. G. Hughes, J. N. Moum, E. L. Shroyer, and W. D. Smyth (2021)

J. Phys. Oceanogr., 51, 2583–2598, doi:10.1175/JPO-D-20-0300.1

Heat transport through diurnal warm layers

K. G. Hughes, J. N. Moum, and E. L. Shroyer (2020)

J. Phys. Oceanogr., 50, 2885–2905, doi:10.1175/JPO-D-20-0079.1

Evolution of the velocity structure in the diurnal warm layer

K. G. Hughes, J. N. Moum, and E. L. Shroyer (2020)

J. Phys. Oceanogr., 50, 615–631, doi:10.1175/JPO-D-19-0207.1

Tidal conversion and dissipation at steep topography in a channel poleward of the critical latitude

K. G. Hughes and J. M. Klymak (2019)

J. Phys. Oceanogr., 49, 1269–1291, doi: 10.1175/JPO-D-18-0132.1

Tidally modulated internal hydraulic flow and energetics in the central Canadian Arctic Archipelago

K. G. Hughes, J. M. Klymak, W. J. Williams and H. Melling (2018)

J. Geophys. Res., 123, 5210–5229, doi:10.1029/2018JC013770

Brine convection, temperature fluctuations and permeability in winter Antarctic land-fast sea ice

P. Wongpan, **K. G. Hughes**, P. J. Langhorne and I. J. Smith (2018)

J. Geophys. Res., 123, 216–230, doi:10.1002/2017JC012999

Water mass modification and mixing rates in a 1/12° simulation of the Canadian Arctic Archipelago

K. G. Hughes, J. M. Klymak, X. Hu and P. G. Myers (2017)

J. Geophys. Res., 122, 803–820, doi:10.1002/2016JC012235

Measurements of Ice Shelf Water beneath the front of the Ross Ice Shelf using gliders

M. J. S. Nelson, B. Y. Queste, I. J. Smith, G. H. Leonard, B. G. M. Webber and **K. G. Hughes** (2017)

Ann. Glaciol., 58, 41–50, doi:10.1017/aog.2017.34

Observed platelet ice distributions in Antarctic sea ice: an index for ocean–ice shelf heat flux

P. J. Langhorne, **K. G. Hughes**, A. J. Gough, I. J. Smith and nine others (2015)

Geophys. Res. Lett., 42, 5442–5451, doi:10.1002/2015GL064508

Extension of an Ice Shelf Water plume model beneath sea ice with application in McMurdo Sound, Antarctica

K. G. Hughes, P. J. Langhorne, G. H. Leonard and C. L. Stevens (2014)

J. Geophys. Res., 119, 8662–8687, doi:10.1002/2013JC009411

Towards a process model for predicting potential anchor ice formation sites in coastal Antarctic waters

G. H. Leonard, S. M. Mager, A. G. Pauling, **K. G. Hughes** and I. J. Smith (2014)

J. Spat. Sci., 59, 297–312, doi:10.1080/14498596.2014.913271

Estimates of the refreezing rate in an ice-shelf borehole

K. G. Hughes, P. J. Langhorne and M. J. M. Williams (2013)

J. Glaciol., 59, 938–948, doi:10.3189/2013JoG12J117

THESES AND OTHER PUBLICATIONS

Different Approaches to Onboard Reduction of Turbulence Data: Pros and Cons

K. G. Hughes and J. N. Moum (2023)

In *Microstructure Sensing from Autonomous Platforms, Report of the Office of Naval Research Sponsored Workshop*, 6–7, http://hdl.handle.net/1773/51007

Crystal orientation in ice frozen from fresh and brackish water

S. Grothe, **K. G. Hughes**, and P. J. Langhorne (2014)

In *Proceedings of the 22nd IAHR International Symposium on Ice,* 743–750, doi:10.13140/RG.2.1.4390.3206

Tidal flows, sill dynamics, and mixing in the Canadian Arctic Archipelago

PhD Thesis: https://dspace.library.uvic.ca//handle/1828/10367

Propagation of an ice shelf water plume beneath sea ice in McMurdo Sound, Antarctica

Master's Thesis: http://hdl.handle.net/10523/4325

On the rate of refreezing in a bore hole in an ice shelf

Honours Dissertation

FUNDING AND PI/CO-PI ROLES

Moored oceanic turbulence measurements in ASTraL

K. G. Hughes and J. N. Moum

Office of Naval Research. Status: Funded. Mar 2023–Feb 2028. Total: $910k

Cold tongue mixing

J. N. Moum, **K. G. Hughes**, D. A. Cherian, E. L. Shroyer, and D. M. Gibson

National Science Foundation. Status: Funded. Mar 2021–Feb 2026. Total: $2.1M

Float array for submesoscales and turbulence in ARCTERX

J. N. Moum, **K. G. Hughes,** T. M. S. Johnston, and D. L. Rudnick

Office of Naval Research. Status: Funded. Apr 2021–Mar 2026. Total: $970k

Eyes at the front: a megasite project at Helheim Glacier

Adopted PI role in May 2021. Project end: Mar 2024

TEACHING AND OTHER PAST EMPLOYMENT

Lecturer – second year oceanography — University of Waikato — 2024

Lecturer for second half of course

Teaching assistant — University of Victoria — 2014, 2016, 2017

Independently lead weekly first-year labs and mark lab tests and exams (instructed five times)

Substitute lecturer — Universities of Otago and Victoria — 2014, 2016, 2017

Lecture second-, third-, and fourth-year oceanography, time series analysis, and environmental physics courses

Research assistant — University of Otago — Aug 2013–May 2014

Collect and reduce data and prepare figures and reports.

Lab demonstrator — University of Otago — 2012, 2014

Demonstrate practical science methods and explain various software for second-year physics course

MENTORING/ADVISING

ARC-Learn mentoring: Co-mentor to several students from 2021 to 2024 (ARC-learn is a program providing opportunities to undergraduates from a range of backgrounds to participate in 1.5 year research projects with Arctic themes)

REU mentoring: Mentor in summer 2023 (In the *Research Experiences for Undergraduates* program, students work one on one with mentors on a 9-week, full-time research project)

PhD committee member: Sid Kerhalkar, UMass Dartmouth (2020–present)

Co-advising: Oriane Hugly, 5-month Master's internship at OSU (2024)

Informal mentoring: Michael Shahin (PhD student, U. Kansas)

SOFTWARE

Extensive experience: Python, Matlab, Linux, Numerical ocean modelling (MITgcm), LaTeX, and Inkscape

Other: Mathematica, Bash, Fortran, Git, and NetCDF tools

Observational Datasets: Brooke Ocean Moving Vessel Profiler, Seabird and RBR CTD Profilers, RDI ADCPs, Simrad Echosounder, and various turbulence sensors developed by the Oregon State University Ocean Mixing Group

SERVICE, OUTREACH, AND TRAINING

Blog about presenting science: brushingupscience.com

Chair of weekly physical oceanography and atmospheric science seminars at Oregon State University (Sep 2019–Oct 2021)

Reviewer for ~40 papers/proposals for outlets including Journal of Geophysical Research, Journal of Physical Oceanography, Geophysical Research Letters, Scientific Reports, Journal of Glaciology, Journal of Climate, Ocean Modelling, The Cryosphere, Journal of Oceanology and Limnology, Frontiers in Marine Science, Continental Shelf Research, Geoscientific Model Development, and the National Science Foundation

Named in AGU's 2019 list of outstanding reviewers

Participant in OSU's Social Justice Education Initiative tier 1 and 2 workshops

Member of CEOAS's outreach Community of Practice (2022–2024)

Session moderator at 2024 Ocean Sciences Meeting

FIELD WORK EXPERIENCE

Western Pacific

Making measurements using specialized turbulence profilers/platforms — Aug–Oct 2018, Sep 2019, May 2023, Feb 2025

Oregon Coast

Week-long cruise testing new free-rising turbulence profilers — May 2019

Canadian Arctic Archipelago

Two weeks as a scientist aboard a Canadian Coastguard ship — Sep 2015

McMurdo Sound, Antarctica

Measuring sea ice thickness and ocean properties — Nov 2011

PRESENTATIONS

Joint Commission on Ice–Ocean Interactions Workshop	Virtual	Oct 2024
NZ Physical Oceanography Workshop, Wellington	Oral	Sep 2024
Ocean Sciences Meeting, New Orleans	Oral	Feb 2024
Microstructure Sensing from Autonomous Platforms Workshop, Lake Arrowhead	Oral	May 2022
Banse Seminar Series, University of Washington	Oral	Dec 2021
Physical Oceanography Seminar Series, University of Alaska Fairbanks	Virtual	Apr 2021
Physics of Oceans and Atmosphere Seminar, Oregon State University	Virtual	Apr 2020
Ocean Sciences Meeting, San Diego	Poster	Feb 2020
Ocean Sciences Meeting, Portland	Poster	Feb 2018
Physics of Oceans and Atmosphere Seminar, Oregon State University	Oral	Dec 2017
Canadian Meteorological and Oceanographic Society Congress, Toronto	Oral	Jun 2017
Munk Centennial Symposium, San Diego	Poster	May 2017
American Geophysical Union Fall Meeting, San Francisco	Oral	Dec 2016
ArcticNet Annual Science Meeting, Winnipeg	Oral	Dec 2016
Department Student Workshop, University of Victoria	Oral	Nov 2016
Canadian Meteorological and Oceanographic Society Congress, Whistler	Oral	May 2015
New Zealand Sea Ice Symposium, Otago	Oral	Feb 2014
Gordon Research Seminar on Polar Marine Science, Ventura	Oral	Mar 2013
Gordon Reseach Conference on Polar Marine Science, Ventura	Poster	Mar 2013
Antarctica New Zealand, Annual Antarctic Conference, Christchurch	Oral	Oct 2012
New Zealand Sea Ice Symposium, Otago	Oral	Feb 2012
Snow and Ice Research Group Annual Workshop, Twizel	Oral	Feb 2012