

GRAEME MACGILCHRIST

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Atmospheric and Oceanic Science,
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Current employment

Postdoctoral Research Scholar Princeton University & NOAA-GFDL, Princeton, NJ, U.S.A. 2018 – present
Advisors: Prof. Jorge Sarmiento and Dr. Stephen Griffies
Research focus: Dynamics of the Southern Ocean and its impact on tracer transport.

Education

DPhil Physical Oceanography University of Oxford, U.K. 2013 – 2017
Thesis: Lagrangian perspectives on ocean ventilation
Supervisors: Prof. David Marshall and Dr. Helen Johnson

MSc Oceanography (with Distinction) University of Southampton, U.K. 2011 – 2012
Dissertation: Quantifying carbon sequestration in the Arctic Ocean (84%)
Supervisor: Prof. Alberto Naveira Garabato

MMath Mathematics (Hons, 1st Class) Newcastle University, U.K. 2006 – 2010
Broad degree incorporating applied maths, pure maths and statistics
Dissertation: Magnetic fields in accretion discs (78%)

Publications [Google Scholar] and manuscripts

In preparation

Yan et al., (in prep) Rapid onset of labour productivity reduction due to heat stress in the 21st century, intended submission to *Nature Communications*.

MacGilchrist et al., (in prep) Decadal variability of the Southern Ocean overturning circulation, intended submission to *AGU Advances*.

Tesdal et al., (in prep) Watermass transformation on and off the Antarctic shelf under glacial melt conditions, intended submission to *Journal of Climate*.

Published

MacGilchrist, G.A. et al. (2021) Demons in the North Atlantic: Variability of deep ocean ventilation, *Geophysical Research Letters*, 48(9): e2020GL092340.

MacGilchrist, G.A. et al. (2020) Locations and mechanisms of ocean ventilation in the high-latitude North Atlantic in an eddy-permitting ocean model, *Journal of Climate*, 33(23): 10113–10131.

MacGilchrist, G.A. et al. (2019) Reframing the carbon cycle of the subpolar Southern Ocean, *Science Advances*, 5(8): eaav6410.

van Sebille, E. et al. (2018) Lagrangian ocean analysis: Fundamentals and practices, *Ocean Modelling*, 121: 49–75.

Naveira Garabato, A.C., MacGilchrist, G.A et al. (2017) High latitude ocean ventilation and its role in Earth's climate transitions, *Philosophical Transactions of the Royal Society A*, 375: 20160324.

MacGilchrist, G.A. et al. (2017) Characterizing the chaotic nature of ocean ventilation. *Journal of Geophysical Research: Oceans*, 122: 7577–7594.

MacGilchrist, G.A. et al. (2014) Effect of enhanced pCO₂ levels on the production of DOC and TEP in short term bioassay experiments. *Biogeosciences*, 11: 3695–3706.

MacGilchrist, G.A. et al. (2014) The Arctic Ocean carbon sink. *Deep Sea Research I*, 86: 39–55.

Awards and Scholarships

Postdoctoral	DoE/LLNL Subcontract No. 640108 (Prime Contract No. DE-AC52-07NA27344) “Diagnostics and Performance Metrics for Evaluating Ventilation Pathways and Interior Water Mass Properties in Ocean Models” Awarded: \$ 358,360 (3 years) Cooperative Institute for Modelling the Earth System, Princeton/NOAA-GFDL project award, “Evaluating the biological carbon pump in a watermass transformation framework” Awarded: \$ 175,272 (2 years)
Doctoral studies	Natural Environment Research Council PhD studentship CASE studentship, NERC (linked to U.K. Met Office) Oxford-Radcliffe-Graduate Scholar, University College Sykes scholarship for travel in mainland China
Masters studies	School fees bursary, University of Southampton Educational Support Fund, Society for Underwater Technology John Raymont Fund for highest aggregate mark in MSc Oceanography
Undergraduate studies	Excellence in 1 st three years, Newcastle University Individual awards for merit in 1 st and 2 nd years, Newcastle University

Teaching experience

Head lecturer Princeton University, U.S.A.	<i>Spring 2021</i>
Subject: GEO202 Oceans, Atmosphere, and Climate Foundational climate science course ranging from basic operation of Earth System to response to anthropogenic perturbation.	
Lecturer Prison Teaching Initiative, NJ, U.S.A.	<i>2019</i>
Undergrad-level lecturing and tutoring at the Federal Correctional Institute, Fort Dix Subject: MAT125 Elementary Statistics	
Tutor and demonstrator Princeton University, U.S.A., & University of Oxford, U.K.	<i>2013-present</i>
Subject areas: Chemical Oceanography, Physical Oceanography, Planet Earth, Southern Ocean, Geophysical Fluid Dynamics, Vector Calculus, Mathematics for Earth Science.	
Science outreach	<i>2011-present</i>
Lecturing and outreach events at Bronx Community College, NYC. Fluid dynamics demonstrations to students and general public, University of Oxford. Outreach talks on fluid dynamics and oceanography at Cheney School, Oxford, and King’s College School, London. Society for Underwater Technology Christmas Lecture at the National Maritime Museum, Greenwich, 2013. Tutoring with ‘Science Plus Oxford’, an initiative to introduce high school children to science and scientists.	
Academic tutor and sports coach Future Hope, Kolkata, India	<i>2006 & 2008</i>
Voluntary work with disadvantaged children and young adults. Responsibilities: Daily tutoring and sports coaching with groups of between 10 and 30 children, aged between 4 and 20.	

Supervision and mentorship

Graduate students

Clara Douglas (University of Southampton, U.K.) “Biological production and export in the subpolar Southern Ocean”. 2020-present

Research assistants

Ben Taylor (Princeton University, U.S.A.) “Carbon budgets in the biogeochemical Southern Ocean State Estimate”. Now a PhD student at Scripps Institution of Oceanography. 2019-2020

Undergraduate students

Princeton Environmental Institute summer intern program (6 students) 2019, 2020
GFDL/CIMES summer intern program (1 student)

Previous employment

Research assistant OSMOSIS project cruise JR090, RRS James Cook 2013

Responsibilities: Operation of tethered microstructure profiler.
CTD sample collection and salinometer measurements.

Researcher University of Southampton, U.K. 2012 – 2013

Responsibilities: Publication of MSc research, further work on ocean acidification.

Field Research Coordinator Madagascar Cultures and Nature, Ifotaka, Madagascar 2011

Responsibilities: Lead researcher in survey of invasive plant species near Ifotaka.
Coordination of U.K. students, as part of Operation Wallacea.

Project Assistant Burcote Wind, Edinburgh, U.K. 2010-2011

Responsibilities: Varied role within a wind-farm development company.

Selected Presentations

Decadal variability of the Southern Ocean overturning circulation Scripps BGC-Argo meeting (San Diego, 2021)
SOCCOM-AGU meeting (Princeton, 2021)

Evaluating the biological carbon pump in a WMT framework Ocean Sciences Meeting (San Diego, 2020, poster)
Princeton AOS formal seminar (Princeton, 2020)

Reframing the carbon cycle of the subpolar Southern Ocean ORCHESTRA-RoSES UK Annual Meeting (Cambridge, 2020)
Institute for Marine and Antarctic Science, UTas (Hobart, 2019)
Australian National University (Canberra, 2019)
Geology and Geoscience Seminar, Yale University (Newhaven, 2018)
AGU Fall Meeting (Washington, D.C., 2018)

Ocean ventilation in the high-latitude North Atlantic CASPO Seminar, Scripps Institution of Oceanography (San Diego, 2018)
Physical Oceanography seminar, Ifremer (Brest, 2017)
Ocean Modelling Group, Challenger Society (Newcastle, 2018; Exeter, 2017; Liverpool, 2016)

Characterising the chaotic nature of ocean ventilation Ocean Sciences Meeting (Portland, 2018; New Orleans, 2016, poster)
Ocean ventilation and deoxygenation, Royal Society (London, 2017, poster)
Nanjing University Institute of Science and Technology (Nanjing, 2016)
Ocean University of China (Qingdao, 2016)
Peking University (Beijing, 2016)
Rapid-USAMOC International Science Meeting (Bristol, 2015)
IUGG General Assembly (Prague, 2015)

Workshops and Summer Schools

Sources and Sinks of Mesoscale Eddy Energy	Florida State University, Tallahassee, U.S.A. CLIVAR-sponsored workshop, organized by Baylor Fox-Kemper	2019
ECCO Summer School	Friday Harbor Laboratories (UW), Friday Harbor, U.S.A. NASA-sponsored summer school on state estimation	2019
Water Mass Transformation Workshop	University of New South Wales, Sydney, Australia Invitational international workshop, organised by Sjoerd Groeskamp	2019
Advanced Climate Dynamics Course	Newfoundland, Canada Topic: Role of high latitudes in centennial to millennial scale climate variability.	2016
Future of Lagrangian Ocean Modelling Workshop	Imperial College, London, U.K. Invitational international workshop, organised by Erik van Sebille.	2015
Alpine Summer School	Val d'Aosta, Italy Topic: Dynamics, stochastics and predictability of the climate system.	2014
Fluid Dynamics and Sustainability of the Environment	Cambridge, U.K. Broad topics in fluid dynamics, with focus on GFD. Computational and laboratory-based practical components.	2014

Extra-curricular and skills

<i>Rugby</i>	International honours Scotland Under 18, 19 and 20, 2005-2007 Under 19 World Cup in Dubai, 2006 Tynedale R.F.C. Promotion to English National League 1, 2008 Northumberland County Cup Winner, 2008 – 2010 Oxford University R.F.C. Player in Varsity Match versus Cambridge, 2013-2016 Two full Blues.
<i>I.T. Literacy</i>	Proficient in Python, MATLAB, Linux, Fortran, and R. Comfortable with version control and committed to open source software development.
<i>Research tools</i>	Coding and analysing numerical simulations of a range of complexities. Experience working with NEMO, MITgcm (including adjoint and data assimilation), and MOM6 ocean models. Applying dynamical systems theory to oceanographic problems. Lagrangian analysis of numerical simulations and observations. Budget calculations from box inversions.
<i>Languages</i>	Native English speaker. Good spoken French, basic Gaelic.
<i>Music</i>	Guitar, trumpet, piano, mandolin, ukulele.

References

Prof. Jorge Sarmiento, Postdoc mentor, Princeton University (jls@princeton.edu)
Dr. Stephen Griffies, Postdoc mentor, Princeton University (stephen.griffies@noaa.gov)
Prof. David Marshall, PhD supervisor, University of Oxford (david.marshall@physics.ox.ac.uk)
Dr. Helen Johnson, PhD supervisor, University of Oxford (helen.johnson@earth.ox.ac.uk)
Prof. Alberto Naveira Garabato, MSc supervisor, University of Southampton (acng@noc.soton.ac.uk)