

# Andrew F. Thompson

Professor of Environmental Science and Engineering  
Division of Geological and Planetary Sciences  
California Institute of Technology, Pasadena, CA 91125

## Research Interests

Circulation of the Southern Ocean and the Antarctic margins.  
Long-term evolution of the global overturning circulation.  
Mesoscale and submesoscale ocean dynamics.  
Physical-biological interactions in ocean boundary layers.  
Turbulence and variability generated by ocean-ice interactions.

## Professional Preparation

2006: Ph.D., Physical Oceanography, Scripps Institution of Oceanography, San Diego, CA  
2002: MPhil., Fluid Flow, University of Cambridge, UK  
2001: MMath., University of Cambridge, Cambridge UK  
2000: B.A., Engineering Sciences, Dartmouth College, Hanover, NH

## Appointments

2017-present: Professor of Environmental Science & Engineering, California Institute of Technology  
2011-2017: Assistant Professor, California Institute of Technology  
2010-2011: NERC Advanced Research Fellow, British Antarctic Survey  
2007-2010: NERC Postdoctoral Fellow, University of Cambridge  
2006-2007: Senior Research Associate, University of East Anglia  
2002-2006: Graduate Research Assistant, Scripps Institution of Oceanography  
2000-2002: Keasbey Memorial Fellow, Trinity College, University of Cambridge

## Honors

2014: Packard Fellowship for Science and Engineering  
2013: AGU Ocean Sciences Early Career Award  
2010: Natural Environment Research Council Advanced Fellowship  
2007: Natural Environment Research Council Postdoctoral Fellowship  
2006: Outstanding Student Paper Award, AGU Ocean Sciences Meeting  
2003: Woods Hole Oceanographic Institution Geophysical Fluid Dynamics Fellowship  
2002: National Defense Science and Engineering Graduate (NDSEG) Fellowship  
2000: Keasbey Memorial Scholarship

**Publications** († indicates student or postdoc)

Updated publication list available at: <http://web.gps.caltech.edu/~andrewt/publications.html>

Su, Z.†, J. Wang, P. Klein, A.F. Thompson & D. Menemenlis, 2017. Ocean submesoscales as a key component of the global heat budget. *Nature*, in review.

Azaneu, M.V.C., K.J. Heywood, B.Y. Queste & A.F. Thompson, 2017. Variability of the Antarctic Slope Front in the northwestern Weddell Sea. *J. Phys. Oceanogr.*, in review.

Rumyantseva, A., S. Henson, A. Martin, A.F. Thompson, G.M. Damerell, J. Kaiser & K.J. Heywood, 2016. The impact of atmospheric forcing on the North Atlantic phytoplankton spring bloom. *Limnol & Oceanogr.*, in review.

Manucharyan, G.E.† & A.F. Thompson, 2017. Submesoscale sea ice-ocean interactions in marginal ice zones. *J. Geophys. Res.*, in press.

Ruan, X.†, A.F. Thompson, M.M. Flexas & J. Sprintall, 2017. Bottom boundary layer contribution to the Southern Ocean overturning circulation. *Nat. Geosci.*, in press.

Thompson, A.F., Y. Chao, S. Chien, J. Kinsey and co-authors, 2017. Satellites to seafloor: Towards a fully autonomous ocean sampling. *Oceanography*, in press.

Buckingham, C.E., Z. Khaleel, A. Lazar, A.P. Martin, J.T. Allen, A.C. Naveira Garabato, A.F. Thompson & C. Vic, 2017. Testing Munk’s hypothesis for submesoscale eddy generation using observations in the North Atlantic. *J. Geophys. Res.*, in press.

Zhu, P.†, G.E. Manucharyan†, A.F. Thompson, J.C. Goodman & S.D. Vance, 2017. The influence of meridional ice transport on Europa’s ocean stratification and heat content. *Geophys. Res. Lett.*, **44**, 5969–5977.

Youngs, M.K.†, A.F. Thompson, A. Lazar† & K.J. Richards, 2017. ACC meanders, energy transfer and mixed barotropic-baroclinic instability. *J. Phys. Oceanogr.*, **47**, 1291–1305.

Manucharyan, G.E.†, A.F. Thompson & M.A. Spall, 2017. Eddy-memory mode of multi-decadal variability in residual-mean ocean circulations with applications to the Beaufort Gyre. *J. Phys. Oceanogr.*, **47**, 855–866.

Fenty, I., *et al.*, 2016. Oceans Melting Greenland: Early results from NASA’s ocean-ice mission in Greenland. *Oceanography*, **29**, 27–83.

Stewart, A.L. & A.F. Thompson, 2016. Eddy generation and jet formation on the Antarctic continental slope/ *J. Phys. Oceanogr.*, **46**, 3729–3750.

Erickson, Z.K.†, A.F. Thompson, N. Cassar & J. Sprintall, 2016. Advective generation of deep chlorophyll maxima (DCMs) in southern Drake Passage. *Geophys. Res. Lett.*, **43**, 20846–10855.

Ruan, X.† & A.F. Thompson, 2016. Bottom boundary potential vorticity injection from an oscillating flow: a PV pump. *J. Phys. Oceanogr.*, **46**, 3509–3526.

- Manucharyan, G.E.<sup>†</sup>, M.A. Spall & A.F. Thompson, 2016. A theory of the wind-driven Beaufort Gyre variability. *J. Phys. Oceanogr.*, **46**, 3263–3278.
- Viglione, G.A.<sup>†</sup> & A.F. Thompson, 2016. Lagrangian pathways of upwelling in the Southern Ocean. *J. Geophys. Res.*, **121**, 6295–6309.
- Thompson, A.F., A.L. Stewart & T. Bischoff<sup>†</sup>, 2016. A multi-basin residual-mean model for the global overturning circulation. *J. Phys. Oceanogr.*, **46**, 2583–2602.
- Chen, R., A.F. Thompson & G. Flierl, 2016. Time-dependent eddy-mean energy diagrams and their application to the ocean. *J. Phys. Oceanogr.*, **46**, 2827–2850.
- Cornillon, P.C., E. Firing, A.F. Thompson, *et al.*, 2016. Zonal Jets in Nature: Oceans. To appear in *Zonal Jets*. Ed., B. Galperin & P. Read. Cambridge University Press.
- Zhang, X.<sup>†</sup>, A.F. Thompson, M.M. Flexas, F. Roquet & H. Borneman, 2016. Circulation and meltwater distribution in the Bellingshausen Sea: from shelf break to coast. *Geophys. Res. Lett.*, **43**, 6402–6409.
- Damerell, G.M., K.J. Heywood, A.F. Thompson, U. Binetti & J. Kaiser, 2016. The vertical structure of upper ocean variability at the Porcupine Abyssal Plain during 2012–2013. *J. Geophys. Res.*, **121**, 3075–2089.
- Bishop, S.P.<sup>†</sup>, P.R. Gent, F.O. Bryan, A.F. Thompson, M.C. Long & R. Abernathey, 2016. Southern Ocean overturning compensation in an eddy-resolving climate simulation. *J. Phys. Oceanogr.*, **46**, 1575–1592.
- Thompson, A.F., A. Lazar<sup>†</sup>, C.E. Buckingham, A.C. Naveira Garabato, G.M. Damerell & K.J. Heywood, 2016. Open-ocean submesoscale motions: A full seasonal cycle of mixed layer instabilities from gliders. *J. Phys. Oceanogr.*, **46**, 1285–1307.
- Buckingham, C.E., A.C. Naveira Garabato, A.F. Thompson, L. Brannigan, A. Lazar<sup>†</sup>, D.P. Marshall, A.J.G. Nurser, G. Damerell, K.J. Heywood & S.E. Belcher, 2016. Seasonality of submesoscale flows in the ocean surface boundary layer. *Geophys. Res. Lett.*, **43**, 2118–2126.
- Su, Z.<sup>†</sup>, A.P. Ingersoll, A.L. Stewart & A.F. Thompson, 2016. Ocean convective available potential energy. Part I: Concept and calculation. *J. Phys. Oceanogr.*, **46**, 1081–1096.
- Su, Z.<sup>†</sup>, A.P. Ingersoll, A.L. Stewart & A.F. Thompson, 2016. Ocean convective available potential energy. Part II: Energetics of thermobaric convection and thermobaric cabbeling. *J. Phys. Oceanogr.*, **46**, 1097–1115.
- Hemsley, V.S., T.J. Smyth, A.P. Martin, E. Frajka-Williams, A.F. Thompson, G. Damerell & S.C. Painter, 2015. Improving oceanic primary production estimates using vertical irradiance and chlorophyll profiles from ocean gliders. *Env. Sci. Tech.*, **49**, 11612.
- Burke, A., A.L. Stewart<sup>†</sup>, J.F. Adkins, R. Ferrari, M.F. Jansen & A.F. Thompson, 2015. The glacial mid-depth radiocarbon bulge and its implications for the overturning circulation. *Paleoceanography*, **30**, 1021–1039.

- Youngs, M.K.<sup>†</sup>, A.F. Thompson, M.M. Flexas & K.J. Heywood, 2015. Weddell Sea export pathways from surface drifters. *J. Phys. Oceanogr.*, **45**, 1068–1085.
- Stewart, A.L.<sup>†</sup> & A.F. Thompson, 2015. The neutral density temporal residual mean overturning circulation. *Oc. Model.*, **90**, 44–56.
- Tsai, V.C., A.L. Stewart<sup>†</sup> & A.F. Thompson, 2015. Marine ice sheet profiles and stability under Coulomb basal conditions. *J. Glaciology*, **61**, 226.
- Biddle, L.C., J. Kaiser, K.H. Heywood, A.F. Thompson & A. Jenkins, 2015. Ocean glider observations of iceberg-enhanced biological productivity in the northwestern Weddell Sea. *Geophys. Res. Lett.*, **42**, 459–465.
- Stewart, A.L.<sup>†</sup> & A.F. Thompson, 2015. Eddy-mediated transport of warm Circumpolar Deep Water across the Antarctic shelf break. *Geophys. Res. Lett.*, **42**, 432–440.
- Schmidtko, S., K.J. Heywood, A.F. Thompson & S. Aoki, 2014. Multi-decadal warming of Antarctic waters. *Science*, **346**, 1227–1231.
- Thompson, A.F., K.J. Heywood, S. Schmidtko & A.L. Stewart<sup>†</sup>, 2014. Eddy transport as a key component of the Antarctic overturning circulation. *Nat. Geosci.*, **7**, 879–884.
- Bischoff, T.<sup>†</sup> & A.F. Thompson, 2014. Configuration of a Southern Ocean storm track. *J. Phys. Oceanogr.*, **44**, 3072–3078.
- Ferrari, R., M. Jansen, J. F. Adkins, A. Burke, A. L. Stewart<sup>†</sup> & A. F. Thompson, 2014. An ocean tale of two climates: Modern and Last Glacial Maximum. *Proc. Natl. Ac. Sci.*, **111**, 8753–8758.
- Heywood, K., S. Schmidtko, C. Heuze, J. Kaiser, T. Jickells, B. Queste, D. Stevens, M. Wadley, A. Thompson, S. Fielding, D. Guihen, E. Creed, J. Ridley, W. Smith, 2014. Importance of processes at the Antarctic continental slope for climate and carbon cycle. *Phil. Trans. Roy. Soc. A*, **372**, 20130047.
- Thompson, A.F. & A.C. Naveira Garabato, 2014. Equilibration of the Antarctic Circumpolar Current by standing meanders. *J. Phys. Oceanogr.*, **44**, 1811–1828.
- Su, Z.<sup>†</sup>, A. L. Stewart<sup>†</sup> & A. F. Thompson, 2014. An idealized model of Weddell Gyre export variability. *J. Phys. Oceanogr.*, **44**, 1671–1688.
- Stewart, A.L.<sup>†</sup>, R. Ferrari & A.F. Thompson, 2014. On the evolution of conceptual models of the ocean’s deep stratification and overturning. *J. Phys. Oceanogr.*, **44**, 891–899.
- Thompson, A.F. & M.K. Youngs<sup>†</sup>, 2013. Surface exchange between the Weddell and Scotia Seas. *Geophys. Res. Lett.*, **40**, 5920–5925.
- Stewart, A.L.<sup>†</sup> & A.F. Thompson, 2013. Connecting Antarctic cross-slope exchange with Southern Ocean overturning. *J. Phys. Oceanogr.*, **43**, 1453–1471.
- Stewart, A.L.<sup>†</sup> & A.F. Thompson, 2012. Sensitivity of the ocean’s deep overturning circulation to

- easterly Antarctic winds. *Geophys. Res. Lett.*, **39**, L18604.
- Boland, E.D.J.<sup>†</sup>, A.F. Thompson, P.H. Haynes & E. Shuckburgh, 2012. The formation of non-zonal jets over sloped topography. *J. Phys. Oceanogr.*, **42**, 1635–1651.
- Thompson, A. F. & Sallée, J. B., 2012. Jets and topography: Jet transitions and the implications for transport in the Antarctic Circumpolar Current. *J. Phys. Oceanogr.*, **42**, 956–972.
- Trasviña, A., Heywood, K. J., Renner, A. H. H., Thorpe, S. E., Thompson, A. F. & Zamudio, L., 2011. The impact of high frequency current variability on dispersion off the eastern Antarctic Peninsula. *J. Geophys. Res.*, **116**, C11024.
- Thompson, A. F. & Richards, K. J., 2011. Low frequency variability of Southern Ocean jets. *J. Geophys. Res.*, **116**, C09022.
- Thompson, A. F., Haynes, P. H., Wilson, C. & Richards, K. J., 2010. Rapid Southern Ocean front transition in an eddy-resolving ocean GCM. *Geophys. Res. Lett.*, **37**, L2360237.
- Thompson, A. F., 2010. Jet formation and evolution in baroclinic turbulence with simple topography. *J. Phys. Oceanogr.*, **40**, 257–278.
- Hughes, C. W., Thompson, A. F. & Wilson, C., 2010. Identification of jets and mixing barriers from sea level vorticity measurements using simple statistics. *Ocean Model.*, **32**, 44–57.
- Thompson, A. F. & Rahmstorf, S., 2009. Ocean Circulation. In *Surface Ocean-Lower Atmosphere Processes*, C. Le Quéré and E. S. Saltzman, eds. American Geophysical Union, Washington DC, 99–118.
- Thompson, A. F., Heywood, K. J., Thorpe, S. E., Renner, A. & Trasviña Castro, A., 2009. Surface circulation at the tip of the Antarctic Peninsula from drifters. *J. Phys. Oceanogr.*, **39**, 3–26.
- Thompson, A. F., 2008. The atmospheric ocean: eddies and jets in the Antarctic Circumpolar Current. *Phil. Trans. Roy. Soc. A*, **366**, 4529–4541.
- Thompson, A. F. & Heywood, K. J., 2008. Frontal structure and transport in the northwestern Weddell Sea. *Deep-Sea Res. I*, **55**, 1229–1251.
- Thompson, A. F. & Young, W. R., 2007. Baroclinic eddy heat fluxes: zonal flows and energy balance. *J. Atmos. Sci.*, **64**, 3214–3231.
- Thompson, A. F., Gille, S. T., MacKinnon, J. A. & Sprintall, J., 2007. Spatial and temporal patterns of small-scale mixing in Drake Passage. *J. Phys. Oceanogr.*, **37**, 572–592.
- Thompson, A. F. & Young, W. R., 2006. Scaling baroclinic eddy fluxes: vortices and energy balance. *J. Phys. Oceanogr.*, **36**, 720–738.
- Thompson, A. F. & Veronis, G., 2005. Diffusively-driven overturning of a stable density gradient. *J. Mar. Res.*, **63**, 291–313.
- Thompson, A. F., Huppert, H. E., Worster, M. G. & Aitta, A., 2003. Solidification and composi-

tional convection of a ternary alloy. *J. Fluid Mech.*, **497**, 167–199.

Thompson, A. F., Huppert, H. E. & Worster, M. G., 2003. Appendix: A global conservation model for diffusion-controlled solidification of a ternary alloy. *J. Fluid Mech.*, **483**, 191–197.

### Reports and Non-Refereed Publications

Thompson, A. F., & N. Cassar, 2015. Physical-biogeochemical coupling in the Southern Ocean, *Eos*, **96**, doi:10.1029/2015EO036829.

Thompson, A. F., *et al.*, 2015. ChinStrAP cruise report, R/V Laurence M. Gould, LMG 14-11, California Institute of Technology, Pasadena, CA, 71pp.

Thompson, A.F., J. C. Kinsey, M. Coleman & R. Castaño, 2015. *Satellites to the Seafloor: Autonomous Science to Form a Breakthrough in Quantifying the Global Ocean Carbon Budget*. Keck Institute for Space Studies, California Institute of Technology, Pasadena CA.

Thompson, A.F., J. Willis & A. Payne, 2016. *The Sleeping Giant: Measuring Ocean-Ice Interactions in Antarctica*. Keck Institute for Space Studies, California Institute of Technology, Pasadena, CA.

Thompson, A. F., 2007. ADELIE cruise report, RRS James Clark Ross cruise 158, *UEA Cruise Report Series No. 9*, University of East Anglia, Norwich, U.K., 86 pp.

Thompson, A. F., 2006. Eddy fluxes in baroclinic turbulence. Ph.D. dissertation. University of California, San Diego.

Thompson, A. F., 2003. Diffusively-driven overturning from a stable density gradient. Proceedings of the Geophysical Fluid Dynamics Program.

Thompson, A. F., 2002. Aspects of the solidification of a ternary alloy. Masters Thesis. University of Cambridge.

### Funded and Pending Grants

President’s and Director’s Fund: Phytoplankton Primary Productivity in the Southern Ocean: A Unique View through a PRISM. PI’s: Frankenberg (Caltech), Thompson (JPL), Co-I’s: Thompson (Caltech), Gierach (JPL). 2017-2018

NASA EXPORTS: Autonomous Investigation of Export Pathways from Hours to Seasons. PI: Lee (U. Washington), Co-I’s: D’Asaro, Perry (U. Washington), Nicholson (WHOI), Omand (U. Rhode Island), Thompson (Caltech), 2017-2020.

NSF-OCE: The Impact of Climate Change on the Physics and Biology of the Ocean on Scales Down to the Submesoscale. PI: Richards (U. Hawaii), Co-I’s: Bryan and Long (NCAR), Thompson (Caltech), 2017-2020.

NSF-OPP: Initiation of the Antarctic Slope Front in West Antarctica. PI: Thompson (Caltech), Co-I: Speer (Florida State U.). 2017-2020.

NASA Ocean Biology & Biogeochemistry: Modeling studies for EXPORTS in a dynamic ocean environment. PI: Mahadevan (WHOI), Co-I's: Thompson (Caltech), Martin (NOCS, UK), Nicholson (WHOI), Omand (URI). 2016-2018.

President's and Director's Fund: Antarctic sea ice extent and Southern Ocean circulation: Trends and connections. PI's: Thompson (Caltech), Kwok (JPL). 2016-2017.

Davidow Discovery Funds (Caltech): Dynamics of the Marginal Ice Zone. PI: Thompson. 2016-2017.

Keck Institute for Space Studies: Science-driven Autonomous and Heterogeneous Robotic Networks: A Vision for Future Ocean Observations. PI: Thompson (Caltech), Co-I's: Chien (JPL), Chao (Remote Sensing Solutions) and Kinsey (WHOI). 2015-2017.

NSF-OPP: Boundary current control of upwelling in southern Drake Passage, Supplement. PI: Thompson (Caltech), 2016-2017.

NASA Physical Oceanography: Towards improved estimates of upper ocean energetics: Science motivation for the simultaneous measurement of ocean surface vector winds and currents. PIs: Thompson (Caltech), Flexas, Rodriguez and Menemenlis (JPL). 2015-2018.

Packard Foundation Fellowship: Ocean robotics to explore physical-biogeochemical impacts on climate. PI: Thompson. 2014-2019.

NASA, Earth Venture Suborbital-2: Oceans Melting Greenland. PI: Willis (JPL), Co-Is: Thompson (Caltech), *et al.* 2015-2020.

GPS Discovery Fund (Caltech): Wave Gliders in the Southern Ocean. PI: Thompson. 2015-2016.

NSF-OPP: Boundary Current Control of Upwelling in Southern Drake Passage. PIs: Thompson (Caltech) and Sprintall (Scripps). 2013-2016.

President's and Director's Fund: Ocean-Ice Dynamics: Towards Improved Sea Level Rise Predictions. PIs: Thompson, Tsai (Caltech) and Boening, Larour (JPL). 2013-2015.

NSF-OCE: The Antarctic Circumpolar Current: A Fractured Transport Barrier. PIs: Thompson (Caltech) and Richards (UHawaii). 2012-2015.

NSF-OCE: Forcing and the North Atlantic Spring Bloom. PIs: Ferrari, Flierl (MIT, Lead Institution) and Thompson (Caltech). 2012-2015.

Davidow Discovery Funds (Caltech): Circulation Variability in the Weddell Sea. PI: Thompson.

NERC (UK): OSMOSIS: Ocean surface Mixing, Ocean Submesoscale Interaction Study. PIs: Belcher (Met Office), Naveira Garabato (NOC Southampton), Heywood (U. East Anglia), *et al.*, Thompson (Caltech, project partner, funding for glider deployment and collaboration).

NERC (UK): GENTOO: Gliders, Excellent New Tools for Observing the Ocean. PIs: Heywood (U. East Anglia, Lead Institution), Fielding, Murphy (British Antarctic Survey), Thompson, Dalziel (U. Cambridge). 2010-2014.

## Funded workshops

*Southern Ocean Dynamics and Biogeochemistry*, (February 2015)

Linde Center for Global Environmental Science, Pasadena, CA

Co-leads: Thompson (Caltech), Cassar (Duke U.)

<http://workshop.caltech.edu/socean/>

*Satellites to the Seafloor: Autonomous Science to Forge a Breakthrough in Quantifying the Global Ocean Carbon Budget*, (October 2013)

Keck Institute for Space Studies, Pasadena, CA

Co-leads: Thompson (Caltech), Kinsey (WHOI), Castano (JPL), Coleman (JPL).

<http://kiss.caltech.edu/programs.html#seafloor>

*The Sleeping Giant: Measuring Ocean Ice Interactions in Antarctica*, (September 2013)

Keck Institute for Space Studies, Pasadena, CA

Co-leads: Thompson (Caltech), Willis (JPL), Payne (U. Bristol).

[http://kiss.caltech.edu/programs.html#ocean\\_ice](http://kiss.caltech.edu/programs.html#ocean_ice)

## Scientific Cruises & Field Programs

**Initiation of the ASF**, R/V Nathaniel B. Palmer, December 2018-January 2019, (Chief Scientist)

Glider deployment and hydrographic survey in the Bellingshausen Sea

**Satellites to Seafloor**, R/V Shana Rae, August-October 2016 & April - July 2017

Coordinated ROMS numerical forecasts and glider/AUV submesoscale survey in Monterey Bay.

**ChinStrAP2**, R/V Laurence M. Gould, May 2016

Deployment of ocean gliders to study submesoscale variability across Drake Passage.

**ChinStrAP**, R/V Laurence M. Gould, December 2014 (Chief Scientist), April 2015

Deployment of two ocean gliders to sample across continental shelf and slope in Drake Passage.

**OSMOSIS D381**, RRS Discovery, September 2012

Full-year deployment of ocean gliders to measure hydrography, fluorescence, PAR in NE Atlantic.

**GENTOO JR255**, RRS James Clark Ross, January 2012

Deployment of ocean gliders in the Weddell Sea, hydrography over continental shelf/slope.

**ADELIE JR158**, RRS James Clark Ross, February 2007

Deployed surface drifters and carried out a hydrographic section in the Weddell Sea.

**SIO High Resolution XBT/XCTD Newtork** R/V Laurence M. Gould, March 2005

Collected a temperature and salinity section across Drake Passage.

**Global Ocean Ecosystem Dynamics (GLOBEC)** R/V Oceanus, August 1999

Mooring recovery over George's Bank, Gulf of Maine (WHOI Summer Student Fellow)



## **Teaching and Mentoring**

### **Postdoctoral Scholars**

Emily Newsom, NOAA Climate & Global Change Fellow, 2016 - present  
Zhan Su, NASA Postdoctoral Program Fellow, 2016 - present  
Georgy Manucharayan, Stanbeck Fellow, 2015 - present  
Stuart Bishop, 2014 - 2015 (now Asst. Professor, N. Carolina St. University)  
Ayah Lazar, 2013 - 2015 (now Scientist, National Institute of Oceanography, Israel)  
Andrew Stewart, 2011 - 2014 (now Asst. Professor, UCLA)

### **Graduate students**

Xiaozhou Ruan, Caltech, 2013 - present  
Giuliana Viglione, Caltech, 2013 - present  
Zach Erickson, Caltech, 2013 - present  
Tobias Bischoff, Caltech, (T. Schneider principal adviser), 2011 - 2016  
Zhan Su, Caltech, (co-advised with A. Ingersoll), 2011 - 2016  
Alan Jamieson, U. Cambridge, (co-advised with S. Dalziel), 2011 - 2015  
Emma Boland, U. Cambridge, (co-advised with P. Haynes, E. Shuckburgh), 2009 - 2011

### **Thesis advisory committee (graduate students)**

Tim Merlis, Jeff Thompson, Monica Martinez (EAS), Joel Scheingross, Ajay Limaye, Jennifer Walker, Jinqiang Chen, Toby Bischoff, Sophie Hines, Sally Zhang, Brent Minchew, Da Yang, Cheng Li, Ho-Hsuan Wei, John Naviaux, Austin Chadwick, Lia Siegelman (U. Brest), Marina Azaneu (U. East Anglia)

### **Undergraduate students**

Max Kotz, U. Cambridge, SURF student, 2017  
Robert Sanchez, Caltech, Senior thesis, 2016-2017 (now Grad. student at Scripps)  
Peiyun Zhu, U. Michigan, SURF student, 2016  
Madeleine Youngs, Caltech, Undergrad & SURF student, 2011 - 2015 (now Grad. student at MIT)  
Yann Quilcaille, Caltech, Masters internship, 2012  
Samuel Bouvier, U. Cambridge, Masters internship, 2009

### **Courses**

Earth's Oceans, ESE 102, Fall 2017  
Polar Oceanography, Caltech, ESE 137, Spring 2015, 2017 (Graduate course)  
Ocean Turbulence and Waves, Caltech, ESE 138, Spring 2014 (Graduate course)  
Physical Oceanography, Caltech, ESE 131, Winter 2013, 2014, 2015, 2016, 2017 (Graduate course)  
Submesoscale Dynamics, ESE 135, Spring 2013 (Graduate reading course)  
Southern Ocean Dynamics, Caltech, ESE 137, Spring 2012 (Graduate course)  
Mathematics IA, Natural Sciences Tripos, Supervisor, U. Cambridge, 2009 - 2011  
Dynamical Systems, Part III of the Math Tripos, Supervisor, U. Cambridge, 2007 - 2008

### **Graduate and Postdoctoral Advisors**

Karen Heywood, University of East Anglia, Postdoctoral Advisor  
William Young, Scripps Institution of Oceanography, Ph.D. Advisor  
Herbert Huppert and Grae Worster, Masters Advisor

## Activities, Outreach and Service

### Reviewer for:

National Science Foundation (NSF), NASA, Natural Environment Research Council (NERC), Australian Antarctic Program, Natural Sciences & Engineering Research Council (Canada), Australia National University, University of Tasmania, Marsden Foundation (New Zealand)

Science, Nature, Nature Geoscience, Nature Climate Change, Nature Scientific Reports, Journal of Fluid Mechanics, Journal of Physical Oceanography, Journal of the Atmospheric Sciences, Journal of Climate, Geophysical Research Letters, Journal of Geophysical Research-Oceans, Paleooceanography, Global Biogeochemical Cycles, Deep-Sea Research, Ocean Modelling, Climate Dynamics, Antarctic Science, Philosophical Transactions of the Royal Society A, Ocean Science, Journal of Atmospheric and Oceanic Technology, Oceanography, Physica D, Springer

### Panelist

NASA IDS Moving Ocean, 2017  
NSF Antarctic Ocean & Atmospheric Sciences, 2014  
NASA Ocean Surface Topography Science Team, 2012  
NSF Physical Oceanography, 2012

### Convener and Organizer

Meeting chair: 21st Conference on Atmospheric and Oceanic Fluid Dynamics, 2017  
Ice-ocean interactions and circulation around the Antarctic margins, AGU Ocean Sciences 2016  
Organizing committee: 20th Conference on Atmospheric and Oceanic Fluid Dynamics, 2015  
The Southern Ocean: Where ocean, ice and atmosphere meet, IUGG 2015  
Antarctic marginal seas and shelf/slope processes, SCAR 2014  
The Southern Ocean freshwater cycle, AGU Ocean Sciences 2014  
Advances in flow-topography interactions, AGU Ocean Sciences 2012  
Cambridge Oceanography Group, 2007 - 2011  
International Polar Year Young Scientist Workshop, Challenger Society Meeting, 2008

### Member

NASA EXPORTS Science Definition Team, 2015-2016  
US Integrated Ocean Observing System Glider Task Team, 2015 - 2017  
Atmosphere Ocean Fluid Dynamics Committee, American Meteorological Society, 2011-present  
American Geophysical Union, 2006 - present  
Challenger Society for Marine Science, 2007 - present  
American Meteorological Society, 2008 - present

### Academic Committees and Service

ESE education option representative, 2012 - present  
EAS Division Advisory Committee, 2015 - present  
GPS Strategic Staffing Committee, 2016 - 2017  
California Alliance Advisory Committee, 2015 - 2017  
Caltech Committee on Exchange Programs and Study Abroad, 2012 - present

## Presentations

### Select Conferences

*First author abstracts only*

AGU 2017 Meeting, New Orleans, LA. December 2017. **invited talk.**

21st Conference on Atmospheric and Oceanic Fluid Dynamics, Portland, OR. *Southern Ocean mechanism for climate transients through the last glacial period*, June 2017. **poster.**

NCAR Southern Ocean Workshop, Boulder, CO. *The steady and transient dynamics of a three-dimensional overturning circulation*, April 2017, **invited talk.**

AGU 2016 Meeting, San Francisco, CA. *Mesoscale and submesoscale variability in Drake Passage, Southern Ocean: observations from ocean gliders*, December, 2016, **poster.**

University of Washington, Program on Climate Change, 2016 Summer Institute, Friday Harbor Laboratory, WA. *Taking the Circumpolar out of the Antarctic Circumpolar Current*, September 2016, **invited talk.**

48th International Colloquium on Ocean Dynamics: Submesoscale Processes: Mechanisms, Implications and new Frontiers, Liege, Belgium. *Submesoscale seasonality: structures functions from ocean gliders*, May 2016, **talk.**

Ocean Sciences 2016, New Orleans, LA. *A multi-basin residual-mean model for the global overturning circulation*, February 2016, **talk.**

Our Common Future Under Climate Change, Paris, France. *The Southern Ocean in a Changing Climate*, July 2015, **invited talk.**

IUGG XXVI, Prague, Czech Republic. *Seasonal variability of submesoscale motions from ocean gliders*, July 2015, **talk.**

20th Conference on Atmospheric and Oceanic Fluid Dynamics, Minneapolis, MN. *Open-ocean submesoscale motions: Seasonal variations in mixed layer instabilities*, June 2015, **talk.**

Theoretical Advances in Planetary Flows and Climate Dynamics, Les Houches, France. *Eddies and Weddies: Overturning at the Antarctic margins*, March 2015, **invited talk.**

Southern Ocean Dynamics and Biogeochemistry, Pasadena, CA. *Mesoscale and submesoscale variability at Antarctic boundaries*, February 2015, **talk.**

iPAM Geophysical and Astrophysical Turbulence Workshop, Los Angeles, CA. *Seasonal variations in open ocean submesoscale motions from ocean gliders*. October 2014, **poster,**

SCAR Open Science Conference, Auckland, NZ. *Eddy-driven overturning at the Antarctic shelf break*, August 2014, **talk.**

SCAR Open Science Conference, Auckland, NZ. *Weddell gyre variability and surface winds: simple models and surface drifter data*. August 2014, **poster.**

Ocean Sciences 2014, Honolulu, HI. *Glider observations at the Antarctic shelf break: potential vorticity and cross-shelf transport*, February 2014 **talk.**

AGU 2013 Meeting, San Francisco, CA. *Glider observations of the Antarctic Slope Front in the Weddell Sea: Dynamic pathways for cross-slope exchange*, December 2013, **poster**.

19th Conference on Atmospheric and Oceanic Fluid Dynamics, Newport, RI. *Curvature and meanders of the Antarctic Circumpolar Current*. June 2013, **talk**.

Southern Ocean Dynamics, Cambridge, MA. *Southern Ocean storm tracks*. January 2013, **talk**.

SCAR Open Science Conference, Portland, OR. *Export pathways between the Weddell and the Scotia Sea from surface drifters*. July 2012, **talk**.

SCAR Open Science Conference, Portland, OR. *The zonally asymmetric ACC*. July 2012, **talk**.

Ocean Sciences 2012, Salt Lake City, UT. *Jet transitions near topography: Impacts on transport in the Antarctic Circumpolar Current*. February 2012, **talk**.

AGU 2011 Meeting, San Francisco, CA. *Low frequency variability of Southern Ocean jets*. December, 2011, **invited talk**.

IUGG XXV, Melbourne, Australia. *Lagrangian transport near front transitions: Altimetry and idealised models*. June, 2011, **talk**.

IUGG XXV, Melbourne, Australia. *Rapid Southern Ocean front transitions in an eddy-resolving ocean GCM*. June, 2011, **poster**.

Wave-Flow Interactions Network, 4th Meeting, Cambridge, UK. *Jets and topography: Jet transitions and impacts on mixing*. April, 2011, **talk**.

Challenger Society Meeting, Southampton, UK. *Surface and subsurface signatures of fronts in the Southern Ocean*. September, 2010, **talk**.

CLIVAR Southern Ocean Panel Meeting. *Jet-topography interactions in the Southern Ocean*. June, 2010, **invited talk**.

International Polar Year Oslo Science Conference, Oslo, Norway. *The structure and distribution of potential vorticity in the Antarctic Circumpolar Current*. June, 2010, **talk**.

Ocean Sciences 2010, Portland, OR. *Jet-Topography interactions in the Southern Ocean*. February, 2010, **talk**.

Ocean Modelling Group Meeting, Oxford, UK. *Southern Ocean jets*. September, 2009, **talk**.

17th Conference on Atmospheric and Oceanic Fluid Dynamics, Stowe, VT. *Mixing across unsteady jets*. June, 2009, **talk**.

EGU General Assembly, Vienna, Austria. *Vacillating jets: baroclinic turbulence and topography*. April, 2009, **talk**.

Rotating Stratified Turbulence and Turbulence in the Atmosphere and Oceans, Newton Institute, Cambridge, UK. *Jet formation and transport in baroclinic turbulence with simple topography*. December, 2008, **talk**.

Structures and Waves in Anisotropic Turbulence Workshop, Warwick, UK. *Scaling baroclinic eddy fluxes: vortices and jets*. November, 2008, **talk**.

Challenger Society Meeting, Bangor, UK. *Jet formation and transport over simple topography*. September, 2008, **poster**.

Nonlinear Processes in Atmospheric and Oceanic Flows Workshop, Castro Urdiales, Spain. *Baroclinic eddy fluxes in quasi-geostrophic turbulence with simple topography*. July, 2008, **talk**.

Ocean Sciences 2008, Orland, FL. *Surface drifters and topography at the tip of the Antarctic Peninsula*. February, 2008, **invited talk**.

IUGG XXIV, Perugia, Italy. *Topographically-steered jets at the tip of the Antarctic Peninsula*. July, 2007, **talk**.

Physical Oceanography Dissertation Symposium IV, Honolulu, HI. *Baroclinic eddy fluxes: vortices and  $\beta$ -plane jets*. October, 2006, **talk**.

Ocean Sciences 2006, Honolulu, HI. *Spatial and temporal patterns of small-scale mixing in Drake Passage*. February, 2006, **talk**.

58th Annual Meeting of the Division of Fluid Dynamics, Chicago, IL. *Stratification of a closed region containing two buoyancy sources*. November, 2005, **talk**.

15th Conference on Atmospheric and Oceanic Fluid Dynamics, Cambridge, MA. *Scaling baroclinic eddy fluxes: vortices and energy balance*. June, 2005, **talk**.

Global Circulation of the Atmosphere, Caltech, Pasadena, CA. *Scaling baroclinic eddy fluxes*. November, 2004, **poster**.

International Congress of Theoretical and Applied Mechanics, Warsaw, Poland. *Solidification and compositional convection of a ternary alloy*. August, 2004, **solicited talk**.

### Invited seminars

Geophysical Fluid Dynamics Program, Woods Hole Oceanographic Institution, 2017  
 Department of Geosciences, University of Chicago, 2017  
 Oceans and Cryosphere Seminar Series, Jet Propulsion Laboratory, 2017  
 Applied Ocean Science Seminar Series, Scripps Institution of Oceanography, 2017  
 Division of Geological and Planetary Sciences, Caltech, 2017  
 Center for Environmental & Applied Fluid Mechanics, Johns Hopkins University, 2016  
 Department of Atmospheric and Oceanic Sciences, UCLA, 2016  
 Atmosphere & Ocean Science Colloquium, Courant Institute, New York University, 2016  
 Physical Oceanography Seminar, National Oceanography Centre, Southampton, UK, 2016  
 Fluid Mechanics Research Seminar, Engineering and Applied Science, Caltech, 2016  
 Geology Department, Brown University, Providence, 2016  
 Geophysical Fluid Dynamics Program, Woods Hole Oceanographic Institution, 2016  
 MBARI Seminar Series, Monterey Bay Research Aquarium Institute, Monterey, 2016  
 Graduate School of Oceanography, Kingston, Rhode Island, 2015  
 Southern Ocean Carbon and Climate Observations and Modeling Webinar Series, 2015  
 Florida State University, Tallahassee, 2015  
 Center for Interdisciplinary Research in Fluids, U. California, Santa Barbara, 2015  
 Earth and Ocean Science Seminar Series, University of Waikato, New Zealand, 2014

Physical Oceanography Seminar Series, Woods Hole Oceanographic Institution, 2014  
Applied Mathematics and Statistics, U. California, Santa Cruz, 2014  
Ocean, Atmosphere and Climate Seminar Series, U. East Anglia, Norwich, UK, 2014  
British Antarctic Survey, Cambridge, 2014  
Department of Atmospheric and Oceanic Sciences, UCLA, 2014  
Mechanical and Aerospace Engineering, U. California, San Diego, 2014  
DIMES meeting, Scripps Institution of Oceanography, 2013  
Geophysical Fluid Dynamics Program, Woods Hole Oceanographic Institution, 2013  
British Antarctic Survey, Cambridge, 2013  
Stanford Earth Sciences Seminar Series, 2013  
Stanford Fluid Dynamics Seminar Series, 2013  
International Meeting of Students of Physical Oceanography, Scripps, 2012  
Hertz Foundation Summer Workshop, 2012  
Southern Ocean Forum, Jet Propulsion Laboratory, 2012  
Geoclub Seminar, California Institute of Technology, 2012  
Mechanical and Aerospace Engineering Seminar, Arizona State University, 2011  
Earth Systems Science Seminar, University of California, Irvine, 2011  
Applied Mathematics Seminar, University of East Anglia, 2011  
Geophysical and Nonlinear Fluid Dynamics Seminar, University of Oxford, 2011  
Astrophysical Fluid Dynamics Seminar, University of Cambridge, 2011  
Oceans and Cryosphere Seminar Series, Jet Propulsion Laboratory, 2011  
Climate Seminar Series, Harvard University, USA, 2010  
Environmental Science & Engineering Seminar Series, California Institute of Technology, 2010  
Physical Oceanography Seminar Series, Woods Hole Oceanographic Institution, 2010  
Oceanography Seminar, Scripps Institution of Oceanography, 2010  
Program in Atmosphere, Oceans and Climate Seminar Series, MIT, 2009  
Ocean Science Seminar Series, University of Liverpool, 2009  
Physical Oceanography & Climate Seminar Series, NOC, Southampton, 2009  
Dynamics of Rotating Fluid, University College London, 2009  
Climate, Atmospheric Sciences and Physical Oceanography Seminar Series, Scripps, 2008  
Fluid Mechanics Seminar, DAMTP, University of Cambridge, 2008  
Dept. of Space and Atmospheric Physics, Imperial College, 2008  
Proudman Oceanography Laboratory, Liverpool, 2008  
Institute of Theoretical Geophysics, University of Cambridge, 2007  
Applied Mathematics Seminar Series, University College London, 2007  
Applied Modelling and Computation Group Seminar Series, Imperial College, 2007  
British Antarctic Survey, Cambridge, 2007  
Physical Oceanography & Climate Seminar Series, NOC, Southampton, 2007  
Department of Meteorology, University of Reading, 2007  
Atmosphere, Ocean and Climate Seminar Series, University of East Anglia, 2006  
Department of Oceanography, CICESE, Ensenada, Mexico, 2005  
Institute of Theoretical Geophysics, University of Cambridge, 2003