

Xiaozhou Ruan

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Research Interests

Geophysical Fluid Dynamics, Ocean Mixing, Boundary Layer Turbulence, Coastal Oceanography, Southern Ocean Dynamics, Abyssal Ocean Circulation.

Employment

Assistant Professor, Department of Earth & Environment, Boston University	2022.7 –
Postdoctoral Associate, Massachusetts Institute of Technology,	2019.3 – 2022.6
Graduate Teaching/Research Assistant, California Institute of Technology	2013.9 – 2019.2

Education

Ph.D., California Institute of Technology, Pasadena, CA, US Major: Environmental Science and Engineering Dissertation Title: Oceanic Bottom Boundary Layers and Abyssal Ocean Circulation Minor: Applied and Computational Mathematics	2013 - 2019
B.S., Ocean University of China, Qingdao, China Major: Marine Meteorology	2009 - 2013

Honors and Awards

- *Junior faculty fellow*, Rafik B. Hariri Institute for Computing and Computational Science & Engineering, Boston University, 2023
- *Editors' Citation for Excellence in Refereeing for Geophysical Research Letters*, AGU, 2019
- *Richard Bruce Chapman Memorial Award*, California Institute of Technology, 2019
- *Chinese Government Award for Outstanding Self-Financed Students Abroad*, China Scholarship Council, 2018
- *Travel support for Southern Ocean Workshop*, NCAR Advanced Study Program, 2017
- *Travel grant for CLIVAR Open Science Conference*, US-CLIVAR, 2016
- *The 'Next Generation' Travel Award*, The Oceanography Society, 2016

- *Best Poster Student Presentation Award*, 20th Conference on Atmospheric and Oceanic Fluid Dynamics, American Meteorological Society, 2015
- *Foster and Coco Stanback Travel Grant*, California Institute of Technology, 2014
- *Foster and Coco Stanback Graduate Fellowship in Global Environmental Science*, California Institute of Technology, 2013-2014
- *National Scholarship*, Ministry of Education of the P.R. China, 2009-2010, 2011-2012
- *The First Prize Scholarship for Excellent Academic Performance*, Ocean University of China, 2009-2010, 2010-2011, 2011-2012
- *Outstanding student award*, Ocean University of China, 2009-2010, 2010-2011, 2011-2012

Publication (*Names in bold font indicate current and former group members*)

- **Li, D., H. Wei & X. Ruan**, (2024). The importance of eddy stirring in wind-driven coastal upwelling. under review
- Naveira Garabato, A.C., C.P. Spingys, B. Fernández-Castro, N. Couto, H.F. Drake, A. Forryan, Y. Ma, H. Mercier, M. Messias, **X. Ruan**, H. Van Haren, G. Voet, B.L. Wynne-Cattanach, R. Ferrari, M.H. Alford & K. Polzin, (2024). Convective turbulent mixing drives rapid upwelling along the ocean's bottom boundary. under review
- Kong, T., J. Farmer, **X. Ruan**, H. Ren, T. Lee, T. Lin, D. Sigman, Y. Ming & X. Wang, (2024). Ocean iron fertilization by sea-level enhanced mid-ocean ridge volcanism. under review
- **Ruan, X.**, Y. Si & R. Ferrari, (2024). Diapycnal upwelling driven by tidally-induced mixing over steep topography. under review
- Chen, Y., R. Chen, G. Wang, **X. Ruan**, W. Li, Q. Geng & J. Wang, (2024). Submesoscale vertical heat transport at the Kuroshio Extension: Characteristics and mechanisms. *J. Geophys. Res.*, 129, e2023JC020612
- Wynne-Cattanach, B.L., N. Couto, H.F. Drake, R. Ferrari, A. Le Boyer, H. Mercier, M. Messias, **X. Ruan**, C.P. Spingys, H. Van Haren, G. Voet, K. Polzin, A.C. Naveira Garabato & M.H. Alford, (2024). Observational evidence of diapycnal upwelling within a sloping submarine canyon. *Nature*, 630, 884-890
- **Li, D. & X. Ruan**, (2024). On the Pathways of Wind-Driven Coastal Upwelling: Nonlinear Momentum Flux and Baroclinic Instability. *J. Phys. Oceanogr.*, 54, 63-79
- Drake, H., **X. Ruan** & R. Ferrari, (2022). Diapycnal displacement, diffusion, and distortion of tracers in the ocean. *J. Phys. Oceanogr.*, 52, 3221-3240
- Drake, H., **X. Ruan**, J. Callies, K. Ogden, A. Thurnherr and R. Ferrari (2022). Dynamics of eddying abyssal mixing layers over sloping rough topography. *J. Phys. Oceanogr.*, 52, 3199-3219
- **Ruan, X.**, (2022). Note on the bulk estimate of the energy dissipation rate in the oceanic bottom boundary layer. *Fluids*, 7(2), 82
- **Ruan, X.**, J. Wenegrat & J. Gula, (2021). Slippery bottom boundary layers: the loss of energy from the general circulation by bottom drag. *Geophys. Res. Lett.*, 48, e2021GL094434
- L.M. Schulze Chretien, A.F. Thompson, M.M. Flexas, K. Speer, N. Swaim, R. Oelerich, **X. Ruan**, R. Schubert & C. LoBuglio, (2021). The Shelf Circulation of the Bellingshausen Sea. *J. Geophys. Res.*, 126, e2020JC016871

- **Ruan, X.**, K. Speer, A.F. Thompson, L.M. Chretien Schulze & D. Shoosmith, (2021). Ice-Shelf Meltwater Overturning in the Bellingshausen Sea. *J. Geophys. Res.*, 126, e2020JC016957
- **Ruan, X.**, A.F. Thompson & J.R. Taylor, (2021). The evolution and arrest of a turbulent stratified oceanic bottom boundary layer over a slope: Upslope regime and PV dynamics. *J. Phys. Oceanogr.*, 51, 1077-1089
- **Ruan, X.**, & R. Ferrari, (2021). Diagnosing diapycnal mixing from passive tracers. *J. Phys. Oceanogr.*, 51, 757-767
- **Ruan, X.**, & J. Callies, (2020). Mixing-driven mean flows and submesoscale eddies over mid-ocean ridge flanks and fracture zone canyons. *J. Phys. Oceanogr.*, 50, 175–195
- **Ruan, X.**, A.F. Thompson & J.R. Taylor, (2019). The evolution and arrest of a turbulent stratified oceanic bottom boundary layer over a slope: Downslope regime. *J. Phys. Oceanogr.*, 49, 469-487
- Tsai, V.C. & **X. Ruan**, (2018). A simple Physics-Based Improvement to the Positive Degree Day Model, *J. Glaciol.*, 1-8. doi:10.1017/jog.2018.55
- **Ruan, X.**, A.F. Thompson, M.M. Flexas & J. Sprintall, (2017). Contribution of topographically generated submesoscale turbulence to Southern Ocean overturning. *Nat. Geosci.*, 10, 840-845.
- **Ruan, X.**, & A.F. Thompson, (2016). Bottom boundary potential vorticity injection from an oscillating flow: a PV pump. *J. Phys. Oceanogr.*, 46, 3509-3526

Teaching Experience

- Introduction to Physical Oceanography (EE360) – instructor, Boston University, 2024
- Introduction to Climate and Earth System Science (EE107) – instructor, Boston University, 2023, 2024
- Physical Oceanography (ESE131) – Teaching Assistant, Caltech, 2016, 2017, 2018
- Earth's Ocean (ESE102) – Guest Lecturer, Caltech, 2017
- Ocean turbulence from space (Ge196) – Guest Lecturer, Caltech, 2016
- Topics in Atmosphere and Ocean Dynamics (ESE135) – Teaching Assistant, Guest Lecturer, Caltech, 2016

Scientific Cruises

- **Initiation of the ASF**, R/V Nathaniel B. Palmer, December 2018-January 2019, Glider deployment and hydrographic survey in the Bellingshausen Sea.
- **Satellites to Seafloor**, R/V Shana Rae, August 2016, Coordinated ROMS numerical forecasts and glider/AUV submesoscale survey in Monterey Bay.
- **ChinStrAP**, R/V Laurence M. Gould, December 2014, Deployment of two ocean gliders and hydrographic survey to sample across continental shelf and slope in Drake Passage.

Invited Seminars

- PO department seminar, WHOI, May 2024
- Geophysical Sciences department seminar, University of Chicago, April 2024
- C&E Lunch Bunch seminar, Brown University, March 2024
- Sack Lunch Seminar, Massachusetts Institute of Technology, May 2023

- CEAFM (Center for Environmental & Applied Fluid Mechanics) seminar, Johns Hopkins University, Apr 2023
- OCES Department Seminar, Hong Kong University of Science and Technology, Oct 2022
- Department Seminar, Boston University, Feb 2022
- Physical Oceanography Lunch Seminar, University of Washington, Jan 2021
- Peking University Department of Atmospheric and Oceanic Sciences seminar, Nov 2020
- Physical Oceanography Seminar series, GSO of University of Rhode Island, Nov 2019
- AOCD seminars, Yale University, Oct 2019
- AOS department seminar (AOS271), UCLA, Nov 2018
- ESE & Society Seminar, Caltech, Oct 2017
- ESE & Society Seminar, Caltech, Oct 2015
- GPS Yuk Lunch Seminar, Caltech, Sep 2014

Conference Presentations

- Gordon Research Conference on Ocean Mixing, South Hadley, MA. Diapycnal mixing from passive tracer evolution and distribution. June 2024 **talk**
- Ocean Sciences 2024, New Orleans, LA. What controls the vertical tracer exchange pathways in wind-driven coastal upwelling? Feb 2024 **talk**
- International Symposium on Polar Ocean and Global Change (online), Qingdao, China. Ice-Shelf Meltwater Overturning in the Bellingshausen Sea. May 2023 **talk**
- 23rd Conference on Atmospheric and Oceanic Fluid Dynamics, Breckenridge, CO. Diapycnal upslope flows over rough ocean topography. June 2022 **talk**
- Gordon Research Conference on Ocean Mixing, South Hadley, MA. Diapycnal upwelling driven by tidally-induced mixing over steep topography. June 2022 **poster**
- Ocean Sciences 2022 (online). Tidally-driven mixing and water mass transformation over steep topography. February 2022 **talk**
- Ocean Sciences 2020, San Diego, CA. Diagnosing diapycnal dispersion from tracer evolution and distribution. February 2020 **talk**
- BBL turbulence and the Ocean Overturning Circulation workshop, Cambridge, MA. The evolution and arrest of a turbulent stratified oceanic bottom boundary layer over a slope. Dec 2018 **talk**
- Gordon Research Conference on Ocean Mixing, Andover, NH. The evolution and arrest of a turbulent stratified oceanic bottom boundary layer over a slope. June 2018 **poster**
- Ocean Sciences 2018, Portland, OR. Contribution of topographically generated submesoscale turbulence to Southern Ocean overturning. Feb 2018 **talk**
- 21st Conference on Atmospheric and Oceanic Fluid Dynamics, Portland, OR. Ekman arrest in a turbulent bottom boundary layer. June 2017 **poster**
- NCAR Southern Ocean Workshop, Boulder, CO. Topographic closure of the overturning circulation in the Southern Ocean. April, 2017 **talk**
- CLIVAR Open Science Conference 2016, Qingdao, China. Frontal structure and transport in southern Drake Passage from ocean gliders. September 2016 **talk**
- Ocean Sciences 2016, New Orleans, LA. Frontal structure and transport in southern Drake Passage from ocean gliders. February 2016 **talk**
- 20th Conference on Atmospheric and Oceanic Fluid Dynamics, Minneapolis, MN. Boundary Control of Potential Vorticity Injection with oscillating flows. June 2015 **poster**

Journal Reviewer

Science Advances, Journal of Physical Oceanography, Geophysical Research Letter, Journal of Geophysical Research—Oceans, Ocean Modelling, Monthly Notices of the Royal Astronomical Society, Journal of Atmospheric and Oceanic Technology, Fluids, Communications Earth & Environment