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, 2022.7 –
Department of Earth & Environment, Boston University

Postdoctoral Associate, 2019.3 – 2022.6
Massachusetts Institute of Technology,
Host: Raffaele Ferrari

Graduate Teaching/Research Assistant, 2013.9 – 2019.2
California Institute of Technology

Education

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

B.S., Ocean University of China, Qingdao, China 2009 - 2013
Major: Marine Meteorology

Honors and Awards

- *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

Funded Proposals

- *NCAR/CISL University Large-scale Allocation Grant (3.7 M Core-hours), 2019-2022*

Publication

- **Ruan, X.**, & R. Ferrari, (2022). Tidal mixing and diapycnal transport over steep topography. *in prep*
- 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, et al. including **X. Ruan**, (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 climate and earth system science (EE107) – instructor, Boston University, 2023
- 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

- 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

- 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, Journal of Atmospheric and Oceanic Technology, Fluids, Communications Earth & Environment