Jacob Steinberg

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Research Experience & Employment

research interests: mesoscale turbulence, energy cascades, deep ocean dynamics, remote sensing, sea level, ocean warming, autonomous platforms (ideal sampling strategies)

Woods Hole Oceanographic Institution — Woods Hole, MA
Postdoctoral Investigator — May 2020 – present

- Analyze and synthesize observations of eddy kinetic and potential energy in a scale-aware consistent manner to improve mesoscale eddy representation and parameterization in global climate models. This work considers large scale temperature and salinity structure as related to eddy formation and mixing. A main focus is the joint analysis of observational and model data. (Ocean Transport and Eddy Energy Climate Process Team w/ Sylvia Cole)
- Investigate global and regional patterns in sea level change and identify physical drivers of observed trends using both model (ECCO) and observational data (SSH, GRACE, Argo, tide gauge). Interested in the oceanic response to heat content changes. (Oct. 2021 - present; NASA-OSTST w/ Christopher Piecuch)

University of Washington — Seattle, WA
Graduate Research Assistant — September 2013–March 2020

- Focus: ocean eddy radial-vertical structure, eddy evolution, eddy decay, geostrophic turbulence, energy cascades, and surface expression of interior motions. Development, deployment, piloting, and extensive use of Seaglider and Deepglider autonomous underwater vehicles.

University of Delaware — Lewes, DE
Research Experience for Undergraduates — Summer 2012

- "Laboratory Investigation of Sea Spray as Produced by Wind and Breaking Waves"

N.O.A.A. — Silver Spring, MD
Data Analyst/Intern for East Coast eutrophication study — 2011-2013

Education

University of Washington — Seattle, WA
Ph.D. in Physical Oceanography, Advisor: Charles Eriksen — 2013–2020

- Thesis: "Eddy Vertical Structure and Variability: vortex evolution and the geography of geostrophic turbulence"

University of Washington — Seattle, WA
M.S. in Applied Mathematics — 2016

University of Washington — Seattle, WA
M.S. in Physical Oceanography — 2016

University of Maryland — College Park, MD
B.S. in Civil and Environmental Engineering, Magna Cum Laude (minor: project management) — 2009–2013

Publications

G. Marques, N. Loose, E. Yankovsky, **Steinberg, J.M.**, C.-Y. Chang, N. Bhamidipati, A. Adcroft, B. Fox-Kemper, S. Griffies, R. Hallberg, M. Jansen, H. Khatri, and L. Zanna, "NeverWorld2: An idealized model hierarchy to investigate ocean mesoscale eddies across resolutions", *pre-print: EGUsphere*, 2022. DOI: https://doi.org/10.5194/egusphere-2022-186.

Steinberg, J.M., S. Cole, K. Drushka, and R. Abernathey, "Seasonality of the Mesoscale Inverse Cascade as Inferred from Global Scale-Dependent Eddy Energy Observations", *Journal of Physical Oceanography*, 2022. DOI: https://doi.org/10.1175/JPO-D-21-0269.1.

Steinberg, J.M. and C. Eriksen, "Eddy Vertical Structure and Variability: Deepglider Observations in the North Atlantic", *Journal of Physical Oceanography*, vol. 52, pp. 1091–1110, 2022. DOI: https://doi.org/10.1175/JPO-D-21-0068.1.

N. Loose, R. Abernathey, I. Grooms, J. Busecke, A. Guillaumin, E. Yankovsky, G. Marques, **Steinberg, J.M.**, A. Ross, H. Khatri, S. Bachman, L. Zanna, and P. Martin, "GCM-Filters: A Python Package for Diffusion-based Spatial Filtering of Gridded Data", *Journal of Open Source Software*, 2022. DOI: 10.21105/joss.03947.

I. Grooms, N. Loose, R. Abernathey, **Steinberg, J.M.**, S. Bachman, G. Marques, A. Guillaumin, E. Yankovsky, and L. Zanna, "Diffusion-based smoothers for spatial filtering of gridded geophysical data", *Journal of Advances in Modeling Earth Systems*, 2021. DOI: https://doi.org/10.1029/2021MS002552.

Steinberg, J.M. and C. Eriksen, "Glider Sampling Simulations in High-Resolution Ocean Models", *Journal of Atmospheric and Oceanic Technology*, vol. 37, pp. 975–992, 2020. DOI: https://doi.org/10.1175/JTECH-D-19-0200.1.

Steinberg, J.M. and C. Eriksen, "Observed Evolution of a California Undercurrent Eddy", *Journal of Physical Oceanography*, vol. 49, pp. 649–674, 2019. DOI: https://doi.org/10.1175/JPO-D-18-0033.1.

N. Pelland, J. Bennett, **Steinberg, J.M.**, and C. Eriksen, "Automated Glider Tracking of a California Undercurrent Eddy Using the Extended Kalman Filter", *Journal of Atmospheric and Oceanic Technology*, vol. 35, pp. 2241–2264, 2018. DOI: https://doi.org/10.1175/JTECH-D-18-0126.1.

Prior Work

Bricker, S.B. and Grizzle, R. and Trowbridge, P. and Rose, J.M. and Ferreira, J.G. and Wellman, K. and Zhu, C. and Galimany, E. and Saurel, C. and Landeck-Miller, R. and Wands, J. and Rheault, R. and **Steinberg, J.M.** and Jacob, A. and Davenport, E.D. and Ayvazian, S. and Chintala, M. and Tedesco, M.A.. "Bioextractive Removal of Nitrogen by Oysters in Great Bay Piscataqua River Estuary, New Hampshire, USA". *Estuaries and Coasts*, 43:23, 2020.

Bricker, S.B. and Ferreira, J.G. and Zhu, C. and Rose, J.M. and Galimany, E. and Wikfors, G. and Saurel, C. and Landeck-Miller, R. and Wands, J. and Trowbridge, P. and Grizzle, R. and Wellman, K. and Rheault, R. and **Steinberg, J.M.** and Jacob, A. and Davenport, E.D. and Ayvazian, S. and Chintala, M. and Tedesco, M.A.. "Role of Shellfish Aquaculture in the Reduction of Eutrophication in an Urban Estuary" *Environmental Science and Technology*, 52:173-183, 2018.

Fieldwork

Seaglider and Deepglider Operations — UW
Graduate Research Assistant — 2013–2020

- Participated in the preparation, deployment, piloting, and recovery of Seaglider and Deepglider autonomous underwater vehicles. Completed over a dozen small boat operations on university, chartered, and private vessels at the starts and ends of multi-month missions in the Northeastern Pacific and North Atlantic.

Ocean Inquiry Project — Seattle, WA
Field instructor - Diver — 2014–2019

- Led education-based one-day research cruises on Puget Sound focused on mini CTD operations, net tows, and water samples.

Teaching

- **Teaching Assistant** at the University Washington — Winter 2018-2019, 2019-2020
  Geophysical Fluid Dynamics (OCN 512)

  Lectured as well as organized and carried out experiments in the UW GFD lab.
- **Teaching Assistant** at the University Washington — Fall 2017
  Physics Across Oceanography: Fluid Mechanics and Waves (OCN 285)
- **Teaching Assistant** at the University Washington — Fall 2015
  Introduction to Fluid Mechanics (OCN 511)

Professional Activities

- Ocean Sciences Meeting: Session Chair — Feb. 2022

- Member of the OceanGliders community — 2021–present
  Focused on the development and publication of glider best practice procedures (specifically depth average current considerations)
- Postdoctoral Association: At-Large Member — 2020–2021
  Elected member of the WHOI postdoctoral association responsible for organizing and engaging with the WHOI postdoc community. Including organizing seminars, workshops, panels, and happy-hours.
- UW College of the Environment: Student Advisory Committee Member — 2017–2018
  Oceanography graduate student representative in the council serving as liaison between students and faculty/administration
- Reviewer for the Journal of Physical Oceanography (JPO)
- Reviewer for the Journal of Geophysical Research: Oceans (JGR: Oceans)
- Reviewer for the Journal of Advances in Modeling of Earth Systems (JAMES)
- Reviewer for the Journal of Marine Systems

Conferences & Presentations

- Institute of Science and Technology Austria — Vienna, May 2022
  Invited Talk: Ocean Energetics: Interesting and Outstanding Problems in Observational Physical Oceanography
- EGU22 — Vienna, May 2022
  Talk: Seasonality of the Mesoscale Inverse Cascade
- Climate Process Team Annual Meeting: Ocean Transport and Eddy Energy — Boulder, Apr. 2022
  Talk: A Lanscape of Eddy Vertical Structure
- Ocean Sciences Meeting — Feb. 2022
  Talk: Observed Seasonality of the Mesoscale Inverse Cascade in the Global Ocean
- Aspen Center for Physics: Transport and Mixing of Tracers in Geophysics and Astrophysics — June 2021
  Meeting Participant
- NOAA Monster Jam Seminar: Invited Talk — May 2021
  Talk: Using Deepglider AUVs to explore the structure of large ocean eddies and the role they play in the redistribution of energy and tracers
- UCLA: Biogeochemistry Group: Invited Talk — Mar. 2021
  Talk: Eddy Vertical Structure and Variability: Deepglider Observations of Geostrophic Turbulence in the North Atlantic
- NCAR-CESM: Ocn. Model Working Group / CPT: Ocn. Transport and Eddy Energy Annual Meeting — Feb. 2021
  Talk: Scale Aware Eddy Kinetic Energy from Along-Track Sea Surface Height Measurements
- Woods Hole Oceanographic Institution: Department Seminar — Woods Hole, Jul. 2020
  Talk: Eddy Vertical Structure and Variability: Deepglider Observations of Geostrophic Turbulence in the North Atlantic
- Ocean Sciences Meeting — San Diego, Feb. 2020
  Talk: Observations of Eddy Vertical Structure Variability in the North Atlantic and Energy Partitioning Across Vertical Modes

- Bermuda Institute of Ocean Sciences — Bermuda, Aug. 2019
  Talk: Geostrophic Turbulence and Eddy Vertical Structure
- Oregon State University — Corvalis, Jun. 2019
  Invited Talk: Geostrophic Turbulence and Eddy Vertical Structure
- University of Washington — Seattle, Jun. 2019
  Talk: Geostrophic Turbulence and Eddy Vertical Structure
- US CLIVAR Workshop: Sources and Sinks of Mesoscale Eddy Energy — Tallahassee, Mar. 2019
  Poster: Interpreting Geostrophic Turbulence from Eddy Vertical Structure and Variability
- Ocean Sciences Meeting — Portland, Feb. 2018
  Poster: Geostrophic Turbulence Observed in Eddy Vertical Structure
- GHER: Liege Colloquium — Liege, Belgium, Jun. 2016
  Poster: The Evolution of a California Undercurrent Submesoscale Eddy (Cuddy)
- Ocean Sciences Meeting — New Orleans, Feb. 2016
  Poster: The Evolution of a California Undercurrent Submesoscale Eddy (Cuddy)

Outreach & Volunteering

- WHOI: PO Website Development — 2021 –
  Committee member helping update, improve, and maintain the department website
- Letters to a Pre-Scientist — 2020 –2021
  Pen-pal/mentor for letter-writing non-profit with the goal of exposing middle school STEM students to new career pathways
- MIT: EAPS Mentoring Program — 2020 –2021
  Mentor to graduate students in the Joint MIT-WHOI Program
- Orca Bowl: Science Judge — 2014–2019
  High School STEM quiz-bowl competition
- Pacific Science Center: Polar Science Weekend — 2014–2019
  Annual expo showing ocean exploring instruments to the public
- Hazel Wolf Elementary — 2016–2019
  STEM career 'advisor' to middle school students

Awards

- Liege Colloquium: Jacques Nihoul Poster Award (2016)

References

Charles C. Eriksen, eriksen@uw.edu

Sylvia T. Cole, scole@whoi.edu

Christopher Piecuch, cpiecuch@whoi.edu