Jacob Steinberg

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Research Experience & Employment

interests: open ocean to coastal sea level connectivity, mesoscale turbulence, eddy vertical structure, scale dependent energy cascades, deep-ocean dynamics, remote sensing, sea level, ocean heat uptake, gliders

N.O.A.A. Geophysical Fluid Dynamics Laboratory — Princeton, NJ
Research Physical Scientist — Apr. 2023 – present

- Member of the Ocean and Cryosphere Division focused on improving understanding of physical drivers of coastal sea level variability and its representation in ocean/climate models.

Woods Hole Oceanographic Institution — Woods Hole, MA
Postdoctoral Investigator — May 2020 – Apr. 2023

- Analyzed and synthesized diverse set of observations of eddy kinetic and potential energy in a scale-aware, consistent manner to improve mesoscale eddy parameterizations in global climate models. Considered large scale density structure as related to eddy formation and mixing. A main focus was the joint analysis of observational and model data. (Ocean Transport and Eddy Energy Climate Process Team w/ S. Cole)
- Investigated regional patterns of sea level variability. Focused on physical/dynamical relationships among ocean warming, coastal sea level, and ocean bottom pressure trends. Analyses employed model output (ECCO) and observational data (altimetry, gravimetry, profiling floats, tide gauges). Specifically interested in the oceanic response to heat content changes. (Oct. 2021 - Apr. 2023; NASA-OSTST w/ C. Piecuch)

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

- Focus: ocean mesoscale 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: sea spray research at wind-wave tank facility — Summer 2012

N.O.A.A. — Silver Spring, MD
Data Analyst for bio-extractive removal of nitrogen 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

Steinberg, J.M., Krasting, J., & Griffies, S. (n.d.). A Link Between U.S. East Coast Sea Level and North Atlantic Subtropical Ocean Heat Content. *submitted to the Journal of Geophysical Research: Oceans*.

Steinberg, J.M., Piecuch, C., Hamlington, B., Thompson, P., & Coats, S. (2024). Influence of Deep Ocean Warming on Coastal Sea Level Trends in the Gulf of Mexico. *Journal of Geophysical Research: Oceans*. https://doi.org/https://doi.org/10.1029/2023JC019681

Toole, J., Musgrave, R., Fine, E., **Steinberg, J.M.**, & Krishfield, R. (2023). On the Vertical Structure of Deep Ocean Subinertial Variability. *Journal of Physical Oceanography*. https://doi.org/https://doi.org/10.1175/JPO-D-23-0011.1

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

Marques, G., Loose, N., Yankovsky, E., **Steinberg, J.M.**, Chang, C.-Y., Bhamidipati, N., Adcroft, A., Fox-Kemper, B., Griffies, S., Hallberg, R., Jansen, M., Khatri, H., & Zanna, L. (2022). NeverWorld2: An idealized model hierarchy to investigate ocean mesoscale eddies across resolutions. *Geoscientific Model Development*, *15*. https://doi.org/https://doi.org/10.5194/gmd-15-6567-2022

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

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

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

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

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

Pelland, N., Bennett, J., **Steinberg, J.M.**, & Eriksen, C. (2018). Automated Glider Tracking of a California Undercurrent Eddy Using the Extended Kalman Filter. *Journal of Atmospheric and Oceanic Technology*, *35*, 2241–2264. https://doi.org/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. Carried out small boat operations on university and chartered vessels at the starts and ends of multi-month missions in the Northeastern Pacific and western North Atlantic.

Ocean Inquiry Project Seattle, WA
field and classroom instructor and diver 2014–2019

– Led education-focused research cruises on Puget Sound carrying out CTD casts, net tows, and water sampling.

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 demonstrations 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

- U.S. CLIVAR - Phenomena, Observations, and Synthesis Panel Member 2024-2028
- Ocean Sciences Meeting: Session Organizer/Chair Feb. 2024
  RH001 Advances in Understanding, Monitoring, and Simulating Sea Level
- NOAA GFDL: Diversity, Equity, Inclusion, and Accessibility Committee member 2023-2024
- National Academies: Gulf Research Program Fellowship Reviewer June 2023
- NASA Physical Oceanography: ROSES PO-22 Proposal Review Panel Member Sept. 2022
- Ocean Sciences Meeting: Session Organizer/Chair Feb. 2022
  PL06 Mesoscale Eddy Energy and Ocean Transport
- Member of the OceanGliders community 2021–2022
  Contributed to glider best practice procedure document (specifically depth average current considerations)
- Postdoctoral Association: At-Large Member 2020–2021
  Elected member of the WHOI postdoctoral association. Organized and engaged with WHOI postdoc community.
- UW College of the Environment: Student Advisory Committee Member 2017–2018
  Oceanography graduate student representative in the council.
- have peer reviewed for the: Journal of Physical Oceanography, Journal of Geophysical Research: Oceans, Geophysical Research Letters, Journal of Advances in Modeling of Earth Systems, Journal of Climate, Quarterly Journal of the Royal Meteorological Society, Continental Shelf Research, Advances in Space Research, Limnology and Oceanography, Earth's Future, Journal of Marine Systems

Outreach & Volunteering

- NOAA GFDL: Summer Hollings Scholar Mentor 2023,2024
  Co-mentor to undergraduate research scholars.
- University of Washington: Student Seaglider Center 2022 –2023
  Advisor and mentor to undergraduates participating in a hands-on course to build, deploy, and pilot Seaglider autonomous underwater vehicles.
- WHOI: PO Website Development 2021 –2023
  Committee member helping update, improve, and maintain the department website
- Letters to a Pre-Scientist 2020 –2021
  Pen-pal/mentor for 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

Recent Conferences & Presentations

- Understanding Gulf Ocean Systems Seminar Series (NAS Gulf Research Program) Apr. 2024
  Invited Talk: Influence of Deep-Ocean Warming of Coastal Sea Level Rise in the Gulf of Mexico
- Ocean Sciences Meeting New Orleans, Feb. 2024
  Talk: A Mechanistic Link between U.S. East Coast Sea Level and Offshore Ocean Heat Content
- American Meteorological Society Annual Meeting Baltimore, Jan. 2024
  Talk: A Mechanistic Link between U.S. East Coast Sea Level and Offshore Ocean Heat Content
- GFDL Lunchtime Seminar Princeton, Nov. 2023
  Talk: Regional Patterns and Drivers of Sea Level Change
- Climate Process Team Annual Meeting: Ocean Transport and Eddy Energy Woods Hole, May 2023
  Talk: A Landscape of Eddy Vertical Structure - controls on the vertical distribution of mesoscale eddy kinetic energy
- University of Washington: Physical Oceanography Seminar Seattle, Feb. 2023
  Talk: Influence of Deep-Ocean Warming of Coastal Sea Level Rise in the Gulf of Mexico
- ECCO Annual Meeting Pasadena, Jan. 2023
  Short Talk: Influence of Deep-Ocean Warming of Coastal Sea Level Rise in the Gulf of Mexico
- Caltech Special Seminar Pasadena, Jan. 2023
  Talk: A Landscape of Eddy Vertical Structure
- Ocean Surface Topography Science Team Meeting Venice, Oct. 2022
  Short Talk: Influence of Deep-Ocean Warming of Coastal Sea Level Rise in the Gulf of Mexico
- GRACE Science Team Meeting Oct. 2022
  Short Talk: Influence of Deep-Ocean Warming of Coastal Sea Level Rise in the Gulf of Mexico
- NCAR Boulder, Aug. 2022
  Talk: Exploring Mesoscale Eddy Vertical Structure Regimes in the Global Ocean
- 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 Landscape 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 July 2020
  Talk: Eddy Vertical Structure and Variability: Deepglider Observations of Geostrophic Turbulence in the North Atlantic