# Wenda Zhang

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## Education

**Doctor of Philosophy: Marine Science** *2017 - 2022*
Stony Brook University Stony Brook, NY, U.S.
Advisor: Prof. Christopher L. P. Wolfe

**Bachelor of Science: Marine Science** *2013 - 2017*
Ocean University of China Qingdao, China

## Research Interests

Ocean mesoscale eddies, and their impact on mixing, large-scale ocean circulations and climate; parameterization of mesoscale processes in ocean climate models, geophysical fluid dynamics; Lagrangian transport and mixing; idealized models.

## Appointments

**Postdoctoral Research Associate** *2022-present*
Host: Dr. Stephen M. Griffies Princeton University

- Studying the vertical structure of mesoscale and submesoscale ocean eddies in idealized models, and developing parameterizations of this structure for use in global climate and prediction models.
- Implementing and improving the mesoscale kinetic energy backscatter parameterization in climate simulations of GFDL Modular Ocean Model (MOM6).

**Research Assistant** *2018-2022*
Advisor: Prof. Christopher L. P. Wolfe Stony Brook University

- Quantified potential vorticity (PV) transport due to coherent eddies and identified the relation between the PV diffusivity and dispersion of coherent eddies in a two-layer quasigeostrophic model.
- Analyzed the vertical structure of the mesoscale tracer diffusivity in an idealized ocean configuration of the MITgcm.

**Undergraduate Researcher** *2016 - 2017*
Supervisor: Prof. Xueen Chen Ocean University of China

- Diagnosed the energy transfer between mesoscale eddies and mean flows through barotropic and baroclinic pathways in the South China Sea based on the Global Hybrid Coordinate Ocean Model (HYCOM) hindcasts.

## Publications

**In Progress**

- **Zhang, W.**, Y. Kuo, S. Silvestri, A. Adcroft, R.W. Hallberg, S.M. Griffies, 2025: A WENO finite-volume scheme for the evolution of potential vorticity in isopycnal ocean models. *Submitted* to *Journal of Advances in Modeling Earth Systems* DOI: https://essopenarchive.org/doi/full/10.22541/essoar.175380391.18723979.
- Wang, S., **Zhang W.**, Kido S., Sasaki H., Guo X., 2025: Understanding energy cascade in the Northwest Pacific using a submesoscale permitting OGCM. *Submitted* to *SCIENCE CHINA Earth Sciences*.
- Feng, Z., Zhang Z., Zhang J., **Zhang W.**, Yuan M., Jing Z., Zhao W., Tian J., 2025: Implementation of a new parameterization of submesoscale vertical flux in an eddy-resolving model in the North Pacific. *Submitted* to *Ocean Modelling*.
- Pudig, M., **Zhang W.**, Smith K.S., Zanna L., 2025: Parameterizing isopycnal mixing via kinetic energy backscatter in an eddy-permitting ocean model. *In preparation* for *Journal of Advances in Modeling Earth Systems*.
- Zhang, Z., Chang J., Zhang X., and **Zhang W.**, 2025: Mixed transitional layer instability: A mechanism for deep-penetrating submesoscale processes in the subtropical upper ocean. *Under revision* in *Journal of Physical Oceanography*
- **Zhang, W.**, A. Adcroft, E. Yankovsky, S.M. Griffies, R.W. Hallberg, 2024: A scale-dependent vertical structure for mesoscale energy backscatter parameterizations. *In preparation* for *Journal of Advances in Modeling Earth Systems*

**Peer Reviewed**

- Griffies, S. M., Adcroft, A., Beadling, R. L., Bushuk, M., Chang, C. Y., Drake, H. F., ..., **Zhang, W.**, Zhao, M. (2024). The GFDL-CM4X climate model hierarchy, Part I: model description and thermal properties. *Journal of Advances in Modeling Earth Systems*

- Griffies, S. M., Adcroft, A., Beadling, R. L., Bushuk, M., Chang, C. Y., Drake, H. F., ..., **Zhang, W.**, Zhao, M. (2024). The GFDL-CM4X climate model hierarchy, Part II: case studies. *Journal of Advances in Modeling Earth Systems*
- Lobo, M., Griffies, S.M. and **Zhang, W.**, 2024. Vertical structure of baroclinic instability in a three-layer quasi-geostrophic model over a sloping bottom. *Journal of Physical Oceanography*
- **Zhang, W.**, S.M. Griffies, R.W. Hallberg, Y. Kuo, and C.L.P. Wolfe, 2024: The role of surface potential vorticity in the vertical structure of mesoscale eddies in wind-driven ocean circulations. *Journal of Physical Oceanography*, DOI: https://doi.org/10.1175/JPO-D-23-0203.1
- **Zhang, W.**, C.L.P Wolfe, 2024: Inferring tracer diffusivity from coherent mesoscale eddies. *Journal of Advances in Modeling Earth Systems*, 16, e2023MS004004. https://doi.org/10.1029/2023MS004004
- **Zhang, W.**, C.L.P. Wolfe, 2022: On the vertical structure of oceanic mesoscale tracer diffusivities. *Journal of Advances in Modeling Earth Systems*, 14, e2021MS002891. https://doi. org/10.1029/2021MS002891
- **Zhang, W.**, C.L.P. Wolfe, R. Abernathey, 2020: Role of surface-layer coherent eddies in potential vorticity transport in quasi-geostrophic turbulence driven by eastward shear. *Fluids*, 5(1), p.2, doi: 10.3390/fluids5010002

## Invited Presentations

**"Scale- and flow-aware subgrid closure for mesoscale eddies in ocean climate models"**
University of Tokyo and Japan Agency for Marine-Earth Science and Technology (JAMSTEC) January 2025

**"The role of surface potential vorticity in the vertical structure of mesoscale eddies"**
NOAA Coastal Ocean Modeling Seminars, online July 2024

## Conference Presentations

- "A implicit representation of subgrid potential vorticity mixing in isopycnal ocean models", Climate Process Team: Ocean Transport and Eddy Energy Annual Meeting, New York City, NY, August 2025 (**oral presentation**)
- "Sensitivity of the kinetic energy backscatter parameterization to its vertical structure in eddy-permitting ocean simulations", CLIVAR Ocean Model Development Panel and COMMODORE Workshop, Boulder, CO, September 2024 (**poster presentation**)
- "Sensitivity of the kinetic energy backscatter parameterization to its vertical structure in eddy-permitting ocean simulations", Climate Process Team: Ocean Transport and Eddy Energy Annual Meeting, Providence, RI, August 2024 (**oral presentation**)
- "The role of surface potential vorticity in the vertical structure of mesoscale eddies in wind-driven ocean circulations", 24th Conference on Atmospheric and Oceanic Fluid Dynamics, Burlington, VT, June 2024 (**oral presentation**)
- "A scale-dependent vertical structure for energy backscatter parameterizations", EGU conference, Vienna, Austria, April 2024 (**oral presentation**)
- "The role of surface potential vorticity in the vertical structure of mesoscale eddies", Ocean Sciences Meeting, New Orleans, LA, February 2024 (**oral presentation**)
- "A scale-dependent vertical structure for mesoscale energy backscatter parameterizations", CESM Ocean Model Working Group Meeting, Virtual, February 2024 (**oral presentation**)
- "Scale-dependent vertical structure of eddy kinetic energy in an adiabatic ocean model", Climate Process Team: Ocean Transport and Eddy Energy Annual Meeting, Woods Hole, MA, May 2023 (**oral presentation**)
- "Scale-dependent vertical structure of eddy kinetic energy in an idealized isopycnal ocean model", CESM Ocean Model Working Group Meeting, Virtual, February 2023 (**oral presentation**)
- "Inferring tracer diffusivity from coherent mesoscale eddies", 23rd Conference on Atmospheric and Oceanic Fluid Dynamics, Breckenridge, CO, June 2022 (**poster**)
- "On the vertical structure of oceanic mesoscale tracer diffusivities", Climate Process Team: Ocean Transport and Eddy Energy Annual Meeting, Boulder, CO, April 2022 (**oral presentation**)
- "What determines the vertical structure of mesoscale tracer diffusivity?", Ocean Sciences Meeting, Virtual, March 2022 (**oral presentation**)
- "Vertical structure of tracer diffusivity in an idealized basin circulation model", CESM Ocean Model Working Group Meeting, Virtual, February 2021 (**oral presentation**)
- "Diffusive versus nondiffusive properties of coherent ocean eddies", Ocean Sciences Meeting, San Diego, CA, February 2020 (**eLightning presentation**)
- "Role of coherent eddies in potential vorticity transport in two-layer quasigeostrophic turbulence", 22nd Conference on Atmospheric and Oceanic Fluid Dynamics, Portland, ME, June 2019 (**oral presentation**)

## Professional Services

**Conference Session Primary Chair** — *New Orleans, LA*
2024 Ocean Sciences Meeting, Session PL41A & PL53A: Multiscale Eddy Dynamics and Tracer Transport: Bridging Observations, Theory, and Modeling — February 2024

**Conference Session Co-Chair** — *Xiamen, China*
2025 Xiamen Symposium on Marine Environmental Sciences, Session 35: Eddy variability in the ocean and atmosphere: dynamics, parameterization and prediction — January 2025

**Journal Reviewer**
Reviewer for Journal of Physical Oceanography, Journal of Advances in Modeling Earth Systems, Journal of Geophysical Research - Oceans, Climate Dynamics — 2022 - Present

## Teaching Experience

**Teaching Assistant** — *Stony Brook University*
Oceanography (MAR 104) — Fall 2017 and Fall 2018
Physics for Environmental Studies (ENS 119) — Spring 2018 and Spring 2021

## Awards and Honors

2020 **Maze-Landeau Travel Award**, Stony Brook University
2019 **Distinguished Travel Award**, Stony Brook University
2019 **IACS Travel Award**, Stony Brook University
2016 **The Outstanding Student Award**, Ocean University of China
2016 **The Scholarship Award for Participation in Social Activities**, Ocean University of China
2015 **The First-Class Scholarship Award for Excellence in Academic Work**, Ocean University of China
2015 **Second Prize in Physics Competition of Chinese College Students (non-physics major)**, Chinese Physical Society
2014 **First Prize in Mathematics Competition of Chinese College Students (non-mathematics major)**, Chinese Mathematical Society

## Volunteer Services

**NJ Ocean Fun Days** — *Island Beach State Park*
Volunteer — May 2023

**Workshop for Boys and Girls Club** — *Mercer County, NJ*
Volunteer — March 2023

**Qingdao Red Cross Society** — *Qingdao, China*
Volunteer — June-July 2013

## Programming Skills

**Programming** Python, Matlab
**Computer Language** Fortran