

# Wenda Zhang

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## Education

### Doctor of Philosophy: Marine Science

Stony Brook University

Advisor: Prof. Christopher L. P. Wolfe

2017 - 2022

Stony Brook, NY, U.S.

### Bachelor of Science: Marine Science

Ocean University of China

2013 - 2017

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

Host: Dr. Stephen M. Griffies

August 2022-present

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

Advisor: Prof. Christopher L. P. Wolfe

2018-2022

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

Supervisor: Prof. Xueen Chen

2016 - 2017

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](https://doi.org/10.3390/fluids5010002)

## Invited Presentations

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### “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

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- “An 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

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### Conference Session Primary Chair

2024 Ocean Sciences Meeting, Session PL41A & PL53A: Multiscale Eddy Dynamics and Tracer Transport: Bridging Observations, Theory, and Modeling

*New Orleans, LA*

February 2024

### Conference Session Co-Chair

2025 Xiamen Symposium on Marine Environmental Sciences, Session 35: Eddy variability in the ocean and atmosphere: dynamics, parameterization and prediction

*Xiamen, China*

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

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### Teaching Assistant

Oceanography (MAR 104)  
Physics for Environmental Studies (ENS 119)

*Stony Brook University*

Fall 2017 and Fall 2018

Spring 2018 and Spring 2021

## Awards and Honors

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

## Volunteer Services

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### NJ Ocean Fun Days

Volunteer

*Island Beach State Park*

May 2023

### Workshop for Boys and Girls Club

Volunteer

*Mercer County, NJ*

March 2023

### Qingdao Red Cross Society

Volunteer

*Qingdao, China*

June-July 2013

## Programming Skills

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**Programming** Python, Matlab

**Computer Language** Fortran