Cheng Zhang

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RESEARCH INTERESTS

Coastal Processes
Coastal Hazards
Numerical Modeling
Ocean Science
Machine Learning
Data Assimilation

EDUCATION

2015 - 2020 **Ph.D.** (advised by Dr. James Kirby)**:** Coastal Engineering, University of Delaware, United States
Dissertation: A two-layer non-hydrostatic landslide model for tsunami generation on irregular bathymetry

2008 - 2011 **M.S.:** Design and Manufacture of Naval Architecture and Ocean Structure, South China University of Technology, China
Thesis: Numerical simulation of free-surface viscous flow with submerged moving structures

2004 - 2008 **B.S.:** Naval Architecture and Ocean Engineering, South China University of Technology, China

RESEARCH EXPERIENCES

2025 - present **Assistant Professor,** Civil and Environmental Engineering, Rowan University

- To develop cutting-edge, AI-enhanced deterministic and probabilistic tools to assess and mitigate risks from nature hazards in coastal communities.

2021 - 2024 **Postdoctoral Research Associate,** Program in Atmospheric and Oceanic Sciences, Princeton University

- To develop and implement the machine-learned parameterizations of various processes in MOM6, and to evaluate those implementations in the context of GFDL's OM4 and CM4.

2020 - 2021 **Postdoctoral Scholar**, College of Earth, Ocean, and Atmospheric Sciences, Oregon State University

- **Estimating the underlying bathymetry and the associated ocean states by using a combination of numerical models and collected data (funded by ONR).** Utilizing a data assimilative system consisting of ROMS and remote sensing and in-situ data to estimate ocean state at James River, VA.

2015 - 2020 **Research Assistant**, Center for Applied Coastal Research, University of Delaware

- **Development, experimental validation and case studies for the next generation of landslide tsunami models for coastal hazard mitigation (funded by NSF).** Developing a two-layer coupled model for water column and landslide motion to invest submarine landslides and resulting tsunami generation over irregular bathymetry.

2008 - 2011 **Research and Teaching Assistant**, South China University of Technology, China

- Developed a two-phase air-water model based on immersed boundary (IB) method and volume of fluid (VOF) method with adaptive mesh refinement (AMR) technique, to investigate wave-structure interaction problems with surface-piercing structures.

TECHNICAL SKILLS

Programming Languages: FORTRAN, C/C++, Python.

High performance computing: distributed memory parallel programming (OpenMPI) and massive parallel programming on GPU (CUDA FORTRAN).

Science & Engineering software packages: NHWAVE, FUNWAVE, MOM6, SCHISM, ROMS, SWAN, SHiELD, MATLAB, PyTorch.

JOURNAL PUBLICATIONS

Submitted:

1. Gultekin, C., Subel, A., **Zhang, C.**, Leibovich, M., Perezhogin, P., Adcroft, A., Fernandez-Granda, C. and Zanna L., An Analysis of Deep Learning Parameterizations for Ocean Subgrid Eddy Forcing (Submitted to *Environmental Data Science*).

Published:

2. **Zhang, C**., Perezhogin, P., Adcroft, A. and Zanna, L., Addressing out-of-sample issues in multi-layer convolutional neural-network parameterization of mesoscale eddies applied near coastlines. *Journal of Advances in Modeling Earth Systems*, 17(5), e2024MS004819,2025.
3. Chang Y., Shi H., Luo Y., Qiu S., Wang W., Wang D., Qiu C. and **Zhang, C.**, Study on high-speed ship waves propagation in the Pearl River Estuary by the numerical simulation. *Ocean Engineering*, 317, 120062, 2025.
4. Balwada, D., Abernathey, R., Acharya, S., Adcroft, A., Brener, J., Balaji, V., ... **Zhang, C.** and Zanna, L., Learning Machine Learning with Lorenz-96. *Journal of Open Source Education*, 7(82), 241, 2024.
5. Perezhogin, P., **Zhang, C.**, Adcroft, A., Fernandez-Granda, C. and Zanna, L., A stable implementation of a data‐driven scale‐aware mesoscale parameterization. *Journal of Advances in Modeling Earth Systems*, 16(10), e2023MS004104, 2024.
6. **Zhang, C.**, Perezhogin, P., Gultekin, C., Adcroft, A., Fernandez-Granda, C. and Zanna, L., Implementation and evaluation of a machine learned mesoscale eddy parameterization into a numerical ocean circulation model. *Journal of Advances in Modeling Earth Systems*, 15(10), e2023MS003697, 2023.
7. Luo, Y., Shi, H., Zhang, Z., **Zhang, C.**, Zhou, W., Pan, G. and Wang, W., Wave field predictions using a multi-layer perceptron and decision tree model based on physical principles: A case study at the Pearl River Estuary. *Ocean Engineering*, 277, 114246, 2023.
8. Luo, Y., **Zhang, C.**, Liu, J., Xing, H., Zhou, F, Wang, D., Long, X., Wang, S., Li, M. and Shi F., Identifying ship-wakes in a shallow estuary using machine learning. *Ocean Engineering*, 246, 110456, 2022.
9. Kirby, J. T., Grilli, S.T., Horrillo, J., Liu, P.L.F., Nicolsky, D., Abadie, S., Ataie-Ashtiani, B., Castro, M.J., Escalante, C., Fine, I., González-Vida, J.M., Løvholt, F., Lynett, P., Ma, G., Macias, J., Ortega, S., Shi, F., Yavari-Ramshe, S. and **Zhang, C.**, Validation and intercomparison of models for landslide tsunami generation. *Ocean modelling*, 101943, 2022.
10. Grilli, S.T., **Zhang, C**., Kirby, J.T., Grilli, A.R., Tappin, D.R., Watt, S.F.L., Hunt, J.E., Novellino, A., Engwell, S., Nurshal, M.E.M., Abdurrachman, M., Cassidy, M., Madden-Nadeau, A.L. and Day, S., Modeling of the Dec. 22nd 2018 Anak Krakatau volcano lateral collapse and tsunami based on recent field surveys: comparison with observed tsunami impact. *Marine Geology*, 106566, 2021.
11. **Zhang, C.**, Kirby, J. T., Shi, F., Ma, G. and Grilli, S. T., A two-layer non-hydrostatic landslide model for tsunami generation on irregular bathymetry. 1. Theoretical basis. *Ocean modelling*, 101749, 2021.
12. **Zhang, C.**, Kirby, J. T., Shi, F., Ma, G. and Grilli, S. T., A two-layer non-hydrostatic landslide model for tsunami generation on irregular bathymetry. 2. Numerical discretization and validation. *Ocean modelling*, 101769, 2021.
13. Grilli, S. T., Tappin, D. R., Carey, S., Watt, S. F., Ward, S. N., Grilli, A. R., Engwell, S. L., **Zhang, C.**, Kirby, J. T., Schambach, L. and Muin, M., Modelling of the tsunami from the December 22, 2018 lateral collapse of Anak Krakatau volcano in the Sunda Straits, Indonesia. *Scientific reports*, 9, 2019.

14. Zhou, Y., Ma, N., Shi, X. and **Zhang, C.**, Direct calculation method of roll damping based on three dimensional CFD approach, *Journal of Hydrodynamics, Ser. B*, 27 no.2 176-186, 2015.
15. **Zhang, C.**, Lin, N., Tang, Y. and Zhao, C., A sharp interface immersed boundary/VOF model coupled with wave generating and absorbing options for wave–structure interaction, *Computers & fluids*, 89, 214-231, 2014.
16. Chen X., **Zhang, C.**, Tang, Y., Zhao, C. and Lin, W., An immersed boundary method with an approximate projection on non-staggered grids to solve unsteady fluid flow with a submerged moving rigid object, *Proceedings of the Institution of Mechanical Engineers, Part M: Journal of Engineering for the Maritime Environment*, 228 no. 3, 272-283, 2014.
17. **Zhang, C.**, Zhang, W., Lin, N., Tang, Y., Zhao, C., Gu, J., Lin, W., Chen X. and Qiu, A., A two-phase flow model coupling with volume of fluid and immersed boundary methods for free surface and moving structure problems, *Ocean Engineering*, 74, 107-124, 2013.
18. Zhang, W., Tang, Y., Zhao, C. and **Zhang, C.**, A two-phase flow model with VOF for free surface flow problems, *Applied Mechanics and Materials*, 232, 279-283, 2012.

CONFERENCE

1. **Zhang, C.**, Reichl, B. G., Harris, L., Mouallem, J., Steinberg, J., Gao, K., Chen, J. H., Chen, J., Impact of Langmuir Turbulence on Air-Sea Interaction in Coupled High-Wind Simulations (Talk). *AMS Annual Meeting*. New Orleans, LA, Jan. 12-16, 2025.
2. **Zhang, C.**, Reichl, B. G., Harris, L., Mouallem, J., Steinberg, J., Gao, K., Chen, J. H., Chen, J., Impact of Sea-State Dependent Langmuir Turbulence on Coupled Simulations of High-Wind Conditions (Poster). *AGU Fall Meeting*. Washington DC, Dec. 9-13, 2024.
3. **Zhang, C.**, Perezhogin, P., Gultekin, C., Adcroft, A., Fernandez-Granda, C. and Zanna, L., Stochastic-Deep Learning Parameterization of Subgrid Ocean Processes in the MOM6 Ocean Model (Talk). *AGU Fall Meeting*. Chicago, Dec. 12-16, 2022.
4. **Zhang, C.**, Kirby, J. T., Grilli, S. T., Shi, F. and Ma, Numerical modelling of tsunami generated by submarine landslides on irregular bathymetry (Poster). *Ocean Science Meeting*. San Diego, CA, Feb. 16-21, 2020.
5. Grilli, S. T., Schambach, L., **Zhang, C.**, Kirby, J. T., Grilli, A. R., Tappin, D. R., Carey, S., Watt, S., Day, S. J., Engwell, S. L., Ward, S. N. and Muin, M., Modeling of the slide and tsunami generation from the 12/22/18 lateral collapse of Anak Krakatau volcano (Sunda Straits, Indonesia): comparison with recent field surveys of slide deposits and tsunami impact. *AGU Fall Meeting*. San Francisco, CA, Dec. 9-13, 2019.
6. **Zhang, C.**, Kirby, J. T., Grilli, S. T., Shi, F. and Ma, G., Numerical modeling of the tsunami generated by the collapse of Anak Krakatau volcano in the Sunda Straits of Indonesia on Dec. 22, 2018, with a two-layer non-hydrostatic wave-slide model (Talk). *THESIS*, Newark, DE, Sep. 17-19, 2019.
7. **Zhang, C.**, Kirby, J. T., Grilli, S. T., Shi, F. and Ma, G., Numerical modeling of submarine mass failure by a two-layer non-hydrostatic wave-slide model (Poster). *AGU Fall Meeting*. Washington DC, Dec. 10-14, 2018.
8. **Zhang, C.**, Kirby, J. T., Grilli, S. T., Shi, F. and Ma, G., A two-layer non-hydrostatic landslide model for tsunami generation on irregular bathymetry (Talk), *ICCE*. Baltimore, MD, July 30 – Aug. 6, 2018.
9. Ma, G., **Zhang, C.**, Kirby, J.T., Shi, F. and Grilli, S.T., Simulating tsunami wave generation using a two-layer non-hydrostatic landslide model, *15th Annual Meeting of Asia Oceania Geosciences Society*. Honolulu, Hawaii, Jun. 03-08, 2018

TECHNIQUE REPORTS

1. Kirby, J.T., Grilli, S.T., **Zhang, C.**, Horrillo, J., Nicolsky, D., Liu, P.L.-F., The NTHMP Landslide Tsunami Benchmark Workshop, Galveston, January 9–11, 2017. Research Report No. CACR-18-01, Center for Applied Coastal Research, Department of Civil and Environmental Engineering, University of Delaware, 2018.
2. **Zhang, C.**, Kirby, J. T., Ma, G., Shi, F., Grilli, S. T. and Shelby, M., NTHMP landslide benchmark results for NHWAVE, Version 3.0, Research Report No. CACR-17-05, Center for Applied Coastal Research, Department of Civil and Environmental Engineering, University of Delaware, 2017.
3. **Zhang, C.**, Tehranirad, M., Kirby, J. T., Derakhti, M., Nemati, F., Grilli, S. T., Ma, G. and Shi, F., Tsunami benchmark results for the non-hydrostatic wave model NHWAVE, Version 3.0, Research Report No. CACR-17-03, Center for Applied Coastal Research, Department of Civil and Environmental Engineering, University of Delaware, 2017.

PROFESSIONAL ACTIVITIES

Reviewer for Ocean Modelling; Journal of Fluid Mechanics; Journal of Computational Physics; Natural Hazards; Journal of Waterway, Port, Coastal, and Ocean Engineering; Journal of Advances in Modeling Earth Systems; Applied Mathematical Modelling; Natural Hazards and Earth System Sciences; Engineering Applications of Computational Fluid Mechanics; Water Wave; Journal of Mountain Science; Journal of Marine Science and Engineering; Journal of Water Resources Planning and Management; Water; Physics of Fluids; Marine Georesources & Geotechnology; Ocean and Coastal Research, Dynamics of Atmospheres and Oceans; Journal of Geophysical Research: Machine Learning and Computation

Recent talk AMS meeting (2025), CEE Graduate Seminar at Rutgers University (2024), Job talk at Rowan University (2024), AGU meeting (2022), M²LInES Annual meeting (2022), Princeton University Ocean Division Seminar (2021), NOAA Coastal Ocean Modeling Science Seminar (2021)

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