

Benjamin Tsai

Assistant Professor

Oregon State University

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Research Interests

Hydrodynamics

- Nearshore processes
- Turbulence modeling
- Wave breaking

Fluid-Soil Interaction

- Sediment transport
- Scour around structures/objects
- Coastal erosion

Geotechnics

- Fast granular flow
- Scour burial
- Pore water pressure

Education

University of Delaware

Newark, DE, USA

PhD, Civil and Environmental Engineering (Concentration: Coastal Engineering)

2017 - 2023

- Advisor: Dr. Tian-Jian Hsu
- Dissertation: *Coastal Hydrodynamics and its Interaction with Structure and Sediment*

National Cheng Kung University

Tainan, Taiwan

MS, Hydraulic and Ocean Engineering (Concentration: Ocean Engineering)

2012 - 2014

- Advisor: Dr.-Ing. Yu-Shu Kuo
- Thesis: *Wave-Induced Pore Pressure Changes in Sandy Seabed*

National Cheng Kung University

Tainan, Taiwan

BS, Hydraulic and Ocean Engineering

2008 - 2012

- Undergrad research advisor: Dr.-Ing. Yu-Shu Kuo

Professional Experience

Oregon State University, School of Civil and Construction Engineering

Corvallis, OR, USA

Assistant Professor

2025 - Present

United States Geological Survey, St. Petersburg Coastal and Marine Science Center

St. Petersburg, FL, USA

Research Oceanographer · Mendenhall Postdoctoral Fellow

2023 - 2025

University of Delaware, Department of Civil and Environmental Engineering

Newark, DE, USA

Graduate Research Assistant

2017 - 2023

National Yunlin University of Science and Technology, Research Center for Soil and Water Resources and Natural Disaster Prevention

Yunlin, Taiwan

Research Assistant

2016-2017

National Cheng Kung University, Department of Hydraulic and Ocean Engineering

Tainan, Taiwan

Research Assistant

2015-2016

National Cheng Kung University, Department of Hydraulic and Ocean Engineering

Tainan, Taiwan

Graduate Research Assistant

2012-2014

Honors and Awards

2023 **USGS Mendenhall Research Fellowship**, United States Geological Survey, USA.
Civil Engineering Graduate Research Award, University of Delaware, USA.

2022 **Government Scholarship to Study Abroad**, Ministry of Education, Taiwan.

Publications

* corresponding author; † advised student; ‡ advised postdoc

Journal Articles

- Tsai, B.*** and Lee, C (2026). A Generalized Framework for Flow Resistance in Canopies and Granular Beds. *Water Resources Research*, 62(4), e2025WR041950. <https://doi.org/10.1029/2025WR041950>
- Zhang, J.*, **Tsai, B.**, Rafati, Y., Hsu, T.-J., and Puleo, J. A (2025). Cross-shore Hydrodynamics and Morphodynamics Modeling of an Erosive Event using XBeach. *Coastal Engineering*, 196, 104662. <https://doi.org/10.1016/j.coastaleng.2024.104662>
- Tsai, B.***, Hsu, T.-J., Lee, S.-B., Pontiki, M., Puleo, J. A., and Wengrove, M. E. (2024). Large Eddy Simulation of Cross-Shore Hydrodynamics Under Random Waves in the Inner Surf and Swash Zones. *Journal of Geophysical Research: Oceans*, 129(9), e2024JC021194. <https://doi.org/10.1029/2024JC021194>
- Feagin, R. A.*, Innocenti, R. A., Bond, B., Wengrove, M., Huff, T. P., Lomonaco, P., **Tsai, B.**, Puleo, J., Pontiki, M., Figlus, J., Chavez, V., and Silva, R. (2023). Does vegetation accelerate coastal dune erosion during extreme events? *Science Advances*, 9(24), eadg7135. <https://doi.org/10.1126/sciadv.adg7135>
- Tsai, B.***, Mathieu, A., Montellà, E. P., Hsu, T.-J., and Chauchat, J. (2022). An Eulerian two-phase flow model investigation on scour onset and backfill of a 2D pipeline. *European Journal of Mechanics - B/Fluids*, 91, 10–26. <https://doi.org/10.1126/10.1016/j.euromechflu.2021.09.004>
- Innocenti, R. A.*, Feagin, R. A., Charbonneau, B. R., Figlus, J., Lomonaco, P., Wengrove, M., Puleo, J., Huff, T. P., Rafati, Y., Hsu, T.-J., Moragues, M. V., **Tsai, B.**, Boutton, T., Pontiki, M., and Smith, J. (2021). The effects of plant structure and flow properties on the physical response of coastal dune plants to wind and wave run-up. *Estuarine, Coastal and Shelf Science*, 261, 107556. <https://doi.org/10.1126/10.1016/j.ecss.2021.107556>

Peer-Reviewed Conference Papers

- Tsai, B.***, Mathieu, A., Hsu, T.-J., and Chauchat, J. (2023). An Eulerian two-phase model investigation on wave-induced scour around a vertical circular cylinder. *Proceedings of the 11th International Conference on Scour and Erosion*. <https://www.issmge.org/publications/publication/an-eulerian-two-phase-model-investigation-on-wave-induced-scour-around-a-vertical-circular-cylinder>

Presentations

Invited Talks

- August 2026. *High-Fidelity Modeling for Coastal and Marine Applications*. Seminar, Coastal and Hydraulics Laboratory, U.S. Army Engineer Research and Development Center, Vicksburg, MS, USA.
- July 2024. *Computational Fluid Dynamics (CFD) Modeling for Coastal and Marine Applications*. Seminar, Stantec Inc., Laurel, MD, USA.
- September 2023. *Numerical Investigation on Coastal Hydrodynamics and Its Interaction with Structure and Sediment*. Seminar, Department of Hydraulic and Ocean Engineering, National Cheng Kung University, Tainan, Taiwan.
- June 2023. *Coastal Hydrodynamics and Its Interaction with Structure and Sediment*. Seminar, St. Petersburg Coastal and Marine Science Center, U.S. Geological Survey, St. Petersburg, FL, USA.
- May 2023. *Large-Eddy Simulations for Two Nearshore Applications*. Seminar, US Naval Research Laboratory, John C. Stennis Space Center, MS, USA.
- May 2023. *A Numerical Investigation on Wave-induced Scour around a Cylinder*. The Second Hydraulic Modeling Collaboration Workshop at the Turner-Fairbank Highway Research Center, Federal Highway Administration, McLean, VA, USA.
- October 2022. *RANS vs LES: an Eulerian Two-Phase Model Investigation on Wave-induced Scour*. Hydraulic Modeling Collaboration Workshop at the Turner-Fairbank Highway Research Center, Federal Highway Administration, McLean, VA, USA.

Contributed Presentations

* presenting author; † advised student; ‡ advised postdoc

- Taylor, J.*†, **Tsai, B.** (2026, August). *Evaluation of Recently Developed Turbulence Closure Models under Breaking Waves in the Surf Zone*. Poster presented at the 12th Young Coastal Scientists and Engineers Conference – Americas, Vancouver, BC, Canada.

- Tsai, B.*** (2026, May). *Large Eddy Simulation of Wave-Backwash Interactions and the Effects on Morphological Chang*. Oral presentation presented at the 2026 NHERI Computational Symposium, Berkeley, CA, USA.
- Tsai, B.***, Buckley, M. L., and Palmsten, M. L. (2026, May). *Modeling Undertow Profile Using Large Eddy Simulation*. Oral presentation presented at the 39th International Conference on Coastal Engineering, Galveston, TX, USA.
- Kumar, N.* , Nouri, M., **Tsai, B.**, Manat, O., Mieras, R. S., Hsu, T.-J., and Puleo, J. A. (2026, May). *Studying the Effect of Wave-Swash Interaction on the Cross-Shore Beach Profile Evolution Using SedInterFoam*. Oral presentation presented at the 39th International Conference on Coastal Engineering, Galveston, TX, USA.
- Tsai, B.***, Buckley, M. L., and Palmsten, M. L. (2024, December). *Numerical simulations of wave-induced currents using a multi-layer non-hydrostatic model*. Oral presentation presented at the American Geophysical Union Annual Meeting 2024, Washington, DC, USA.
- Kumar, N.* , Mathieu, A., **Tsai, B.**, Hsu, T.-J., Puleo, J. A., and Chauchat, J. (2024, December). *Cross-shore Beach Profile Evolution Driven by Successive Wave Breaking in Swash Zone*. Poster presented at the American Geophysical Union Annual Meeting 2024, Washington, DC, USA.
- Chen, J.* , Raubenheimer, B., Elgar, S., and **Tsai, B.** (2024, December). *Simulations of Depth Resolved Cross-shore Momentum Transfer in the Surfzone*. Poster presented at the American Geophysical Union Annual Meeting 2024, Washington, DC, USA.
- Kumar, N.* , Mathieu, A., **Tsai, B.**, Hsu, T.-J., Puleo, J. A., and Chauchat, J. (2024, September). *SedInterFoam: a multi-phase numerical model for sediment transport and its application to swash zones*. Oral presentation presented at the 38th International Conference on Coastal Engineering, Rome, Italy.
- Tsai, B.***, Buckley, M., Palmsten, M. L., and Hsu, T.-J. (2024, February). *Numerical Investigation on Coastal Hydrodynamics under Irregular Waves*. Oral presentation presented at the Ocean Sciences Meeting 2024, New Orleans, LA, USA.
- Tsai, B.***, Mathieu, A., Hsu, T.-J., and Chauchat, J. (2023, September). *An Eulerian two-phase model investigation on wave-induced scour around a vertical circular cylinder*. Oral presentation presented at the 11th International Conference on Scour and Erosion, Copenhagen, Denmark.
- Tsai, B.***, Mathieu, A., Hsu, T.-J., Puleo, J. A., Wengrove, M. E., and Chauchat, J. (2022, December). *Large-Eddy Simulations for Two Nearshore Applications*. Oral presentation presented at the American Geophysical Union Fall Meeting 2022, Chicago, IL, USA.
- Zhang, J.* , **Tsai, B.**, Hsu, T.-J., Stark, N., Puleo, J. A., and Wengrove, M. E. (2022, December). *XBeach Modeling of Cross-shore Hydrodynamics and Morphodynamics in a Shallow Surf Zone*. Oral presentation presented at the American Geophysical Union Fall Meeting 2022, Chicago, IL, USA.
- Chauchat, J.* , Bonamy, C., Mathieu, A., Montellà, E. P., Chassagne, R., Nagel, T., Salimi-Tarazouj, A., **Tsai, B.**, Gilletta, A., Divil, H., Cheng, Z., and Hsu, T.-J. (2022, July). *Sedfoam: a Two-Fluid Model for Particulate Flows in Geophysics*. Oral presentation presented at the 17th OpenFOAM Workshop (OFW17), Cambridge, UK.
- Tsai, B.***, Mathieu, A., Hsu, T.-J., and Chauchat, J. (2022, June). *An Eulerian two-phase model investigation on wave-induced scour around a vertical circular cylinder*. Oral presentation presented at the 5th symposium on two-phase modeling for sediment dynamics (THESIS-2022), Les Houches, France.
- Feagin, R. A.* , Innocenti, R. A., Bond, H., Wengrove, M., Huff, T. P., Lomonaco, P., Chávez, V., Silva, R., **Tsai, B.**, Figlus, J., Pontiki, M., Puleo, J.A., and Hsu, T.-J. (2022, March). *Does coastal dune vegetation accelerate wave erosion during extreme events?* Oral presentation presented at the Ocean Sciences Meeting 2022, Honolulu, HI, USA.
- Hsu, C.-J.* , Hsu, T.-J., Salimi-Tarazouj, A., and **Tsai, B.** (2022, February). *Nonlinear wave-induced momentary pressure gradient on sediments*. Oral presentation presented at the Ocean Sciences Meeting 2022, Honolulu, HI, USA.
- Tsai, B.***, Rafati, Y., Hsu, T.-J., Pontiki, M., Puleo, J. A., Lee, S.-B., Wengrove, M., and Cox, D. T. (2021, July). *Large-Eddy Simulation of Cross-Shore Hydrodynamics under Random Wave in the Surf and Swash Zones*. Oral presentation presented at the Coastal Dynamics 2021, Delft, Netherlands.
- Rafati, Y.* , **Tsai, B.**, Hsu, T.-J., Pontiki, M., Puleo, J. A., Lee, S.-B., Wengrove, M., and Cox, D. T. (2021, July). *Phase-resolving Simulation of Waves, Currents, and Sediment Fluxes in a Large Wave Flume Under Storm Wave Scenarios*. Oral presentation presented at the Coastal Dynamics 2021, Delft, Netherlands.
- Tsai, B.***, Kim, Y., and Hsu, T.-J. (2020, February). *A Large-Eddy Simulation Study on the Flow Structure of a Solitary Wave Breaking in the Inner-Surf and Swash Zones*. Oral presentation presented at the Ocean Sciences Meeting 2020, San Diego, CA, USA.

- Tsai, B.***, Kim, Y., Hsu, T.-J., Chauchat, J., and Calantoni, J. (2019, September). *Toward linking fluid mechanics with soil mechanics - Extension of SedFoam model for simulating underwater slumping and sliding processes*. Poster presented at the 4th symposium on two-phase modeling for sediment dynamics (THESIS-2019), Newark, DE, USA.
- Tsai, B.***, Kim, Y., and Hsu, T.-J. (2019, August). *Modeling the Flow Structure of the Solitary Wave Breaking in the Inner-Surf and Swash Zones Using the Large Eddy Simulation*. Oral presentation presented at the 6th Young Coastal Scientists and Engineers Conference – Americas, Corvallis, Oregon, USA.
- Tsai, B.***, Kim, Y., and Hsu, T.-J. (2018, December). *Large Eddy Simulation of Solitary Wave Breaking and Flow Structures in the Inner-Surf and Swash Zones*. Poster presented at the American Geophysical Union Fall Meeting 2018, Washington, D.C., USA.
- Tsai, B.***, Kim, Y., and Hsu, T.-J. (2018, November). *Modeling the Flow Structures in the Inner-Surf and Swash Zones Using a Large Eddy Simulation*. Oral presentation presented at the 5th Young Coastal Scientists and Engineers Conference – Americas, Mérida, Yucatán, Mexico.

Advising

Students

2025-Present **Jack Taylor**, Oregon State University

PhD

Thesis/Dissertation committees

2026 **Eli Faigle**, Oregon State University

MS

2026 **Finley Taylor**, Oregon State University

Honors BS

Teaching Experience

Winter 2026 **CE 372 Geotechnical Engineering**, Oregon State University

Instructor

Fall 2021 **CIEG 320 Soil Mechanics**, University of Delaware

Teaching Assistant

Fall 2014 **HOE 2003 Structural Theory**, National Cheng Kung University

Teaching Assistant

Spring 2014 **HOE 3071 Soil Mechanics Laboratory**, National Cheng Kung University

Teaching Assistant

Spring 2013 **HOE 3071 Soil Mechanics Laboratory**, National Cheng Kung University

Teaching Assistant

Outreach & Professional Development

Peer Review

Advances in Water Resources

Coastal Engineering

Coastal Engineering Journal

Journal of Geophysical Research: Oceans

Journal of Geotechnical and Geoenvironmental Engineering

Journal of Waterway, Port, Coastal, and Ocean Engineering

Nature-Based Solutions

Ocean Engineering

Professional Memberships

American Geophysical Union (AGU)

American Society of Civil Engineers (ASCE)