

Zhengyu Hu, Ph.D.

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ID ORCID



Research Interests

Coupled ocean and coastal processes
Wave–structure–seabed interactions and coastal hazards
Breaking-wave impacts and hydroelasticity
Sediment transport, scour, and coastal morphodynamics
Sustainable, nature-based, and hybrid coastal protection

Professional Experience

- Oct 2024 – Present 📌 **Research Fellow, Project Manager**, National University of Singapore.
– Manage SGD 2.5 million National Research Foundation project on climate-driven coastal hazards and protection.
– Conduct large-scale CFD simulations to support regional coastal hazard analysis under extreme forcing.

Education

- Aug 2021 – Feb 2025 📌 **Ph.D. in Civil Engineering**, National University of Singapore.
Thesis title: *Fully Coupled Model for Wave–structure–seabed Interaction in Coastal Engineering*. Advisor: Asst. Prof. Yuzhu Pearl Li.
- Sep 2018 – Jun 2021 📌 **M.Eng. in Civil Engineering**, Zhejiang University.
Thesis title: *Laboratory Study on Characteristics of Wave Attenuation by Mangroves and Phragmites Australis*.

Teaching & Mentoring

- Aug 2023 – Nov 2024 📌 **Graduate teaching Assistant**, Sediment Transport & Coastal Protection, National University of Singapore
– Led lab tutorials to about 40 graduate students across 3 semesters.
- Aug 2022 – Nov 2024 📌 **Undergraduate teaching Assistant**, Fluid Mechanics, National University of Singapore
– Led lab and assignment tutorials to about 250 undergraduate students across 4 semesters.
- Dec 2021 – Nov 2025 📌 **Undergraduate co-supervisor**, Undergraduate/MSc Final Year Project, National University of Singapore
– Co-supervise the Final Year Project of 7 undergraduate and 4 MSc students.
- Mar 2019 – Jun 2020 📌 **Undergraduate teaching Assistant**, Port and Coastal Hydraulic Structures, Zhejiang University
– Led lab tutorials to over 120 undergraduate students across 3 semesters.
- Dec 2018 – Jun 2020 📌 **Undergraduate co-supervisor**, Undergraduate Final Year Project, Zhejiang University
– Co-supervise the Final Year Project of 3 undergraduate students.

Prizes and Awards

- 2025  **Chinese Government Award for Outstanding Students Abroad.**
China Scholarship Council, USD 6,000.
-  **Excellence in Reviewing.**
Ocean Engineering, Elsevier.
- 2021  **NUS Research Scholarship.**
National University of Singapore, SGD 80,000/year.
- 2018  **Academic Scholarship.**
Zhejiang University, CNY 8,000/year.

Professional Service

- Session Chair  Ocean engineering session, 45th International Conference on Ocean, Offshore and Arctic Engineering (OMA-E).
- Reviewer  *Coastal Engineering, Ocean Engineering, Physics of Fluids, Journal of Waterway, Port, Coastal, and Ocean Engineering, Fluids, Mathematics, Applied sciences*, etc. (90+ reviews).

Publications

Journal Articles

- 1 **Hu, Z.**, Chen, W., and Li, Y. P. *, “Sediment rheology governs wave damping over muddy shelves,” *Communications Earth & Environment*, 2026.  DOI: 10.1038/s43247-026-03886-1
- 2 **Hu, Z.**, Yue, L., Fuhrman, D., and Li, Y. P. *, “The role of dynamic seepage in surf and swash zone sediment transport and morphodynamics,” *Journal of Fluid Mechanics*, in revision, 2026.
- 3 **Hu, Z.** and Li, Y. P. *, “Breaking wave impacts on an elastic plate,” *Journal of Fluid Mechanics*, vol. 1015, A54, 2025.  DOI: 10.1017/jfm.2025.10397
- 4 **Hu, Z.** and Li, Y. P. *, “Full-scale tsunami-induced scour around a circular pile with three-dimensional seepage,” *Coastal Engineering*, vol. 197, p. 104 676, 2025.  DOI: 10.1016/j.coastaleng.2024.104676
- 5 **Hu, Z.**, Qi, W.-G., and Li, Y. P. *, “The role of dynamic seepage response in sediment transport and tsunami-induced scour,” *Journal of Geophysical Research: Oceans*, vol. 130, no. 3, e2024JC021084, 2025.  DOI: 10.1029/2024JC021084
- 6 **Hu, Z.**, Huang, L., and Li, Y. *, “Fully-coupled hydroelastic modeling of a deformable wall in waves,” *Coastal Engineering*, vol. 179, p. 104 245, 2023.  DOI: 10.1016/j.coastaleng.2022.104245
- 7 **Hu, Z.** and Li, Y. *, “Two-dimensional simulations of large-scale violent breaking wave impacts on a flexible wall,” *Coastal Engineering*, vol. 185, p. 104 370, 2023.  DOI: 10.1016/j.coastaleng.2023.104370
- 8 Zhou, Y., **Hu, Z.**, Wang, P. C., and Li, Y. P. *, “The efficacy of green and gray coastal structures in storm surge mitigation,” *Coastal Engineering*, vol. 207, p. 104 972, 2026.  DOI: 10.1016/j.coastaleng.2026.104972
- 9 Pan, S., Zhang, L., Zhao, X., and **Hu, Z.** *, “Fully coupled two-dimensional numerical simulation of wave interaction with an elastic wall in a narrow gap,” *Physics of Fluids*, vol. 38, no. 10, p. 102 105, 2026.  DOI: 10.1063/5.0347319
- 10 Tavakoli, S. *, Singh, M., Hosseinzadeh, S., **Hu, Z.**, and et al., “A review of flexible fluid-structure interactions in the ocean: Progress, challenges, and future directions,” *Ocean Engineering*, vol. 342, p. 122 545, 2025.  DOI: 10.1016/j.oceaneng.2025.122545

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Conference Proceedings

- 1 **Hu**, Z. and Li, Y. P., “Full-scale tsunami scour with three-dimensional seepage flows,” in *Proceedings of the 12th International Conference on Scour and Erosion (ICSE-12)*, 2025.
- 2 **Hu**, Z. and Li, Y. P., “Experimental study of the breaking wave impact on rigid and elastic plates,” in *Proceedings of the 38th International Conference on Coastal Engineering*, Rome, Italy, 2024, structures.11.  DOI: 10.9753/icce.v38.structures.11
- 3 **Hu**, Z. and Li, Y., “Numerical study on the interaction between periodic waves and a flexible wall,” in *Proceedings of the 37th International Conference on Coastal Engineering*, Sydney, Australia, 2022, structures.3.  DOI: 10.9753/icce.v37.structures.3
- 4 Li, Y. P. and **Hu**, Z., “The role of seepage response in tsunami scour,” in *Proceedings of the 38th International Conference on Coastal Engineering*, Rome, Italy, 2024, structures.11.  DOI: 10.9753/icce.v38.structures.11
- 5 Li, Y. P., **Hu**, Z., and Huang, L., “Hydroelastic simulation of breaking wave impact on a flexible coastal seawall,” in *41st International Conference on Ocean, Offshore and Arctic Engineering*, 2022.  DOI: 10.1115/OMAE2022-79099

Patents (selected)

- 1 He, F., **Hu**, Z., et al., “A hollow cylindrical submarine coral cultivation device and method,” Patent CN110269006A, Granted, 2022.
- 2 He, F., **Hu**, Z., et al., “A coral seabed cultivation device and method suitable for harsh marine conditions,” Patent CN110269005A, Granted, 2022.
- 3 He, F., **Hu**, Z., et al., “A submarine coral cultivation device that uses tidal energy to generate electricity,” Patent CN111165393A, Granted, 2021.
- 4 He, F., **Hu**, Z., et al., “A wave-powered floating box-type coral seabed cultivation device that facilitates coral growth,” Patent CN110338115A, Granted, 2021.
- 5 He, F., **Hu**, Z., et al., “A test device and method for simulating sediment scour and achieving automatic levelling based on electromagnetic induction,” Patent CN109323847A, 2020.

Data

- 1 **Hu**, Z., Chen, W., and Li, Y. P., *Wave2mud: Physics-based model for wave damping over muddy seafloors*, Zenodo, 2026.  DOI: 10.5281/zenodo.20482601
- 2 **Hu**, Z., Qi, W. G., and Li, Y., *Data and processing scripts used in the study “the role of dynamic seepage response in sediment transport and tsunami-induced scour”*, ScholarBank@NUS, 2024.  DOI: 10.25540/R97M-BFRV

Software

- 1 **Hu**, Z., Chen, W., and Li, Y. P., *Physics-based model for wave damping over muddy seafloors*, GitHub repository, Software, 2026.  URL: <https://github.com/huzhengyu/wave2mud>
- 2 **Hu**, Z., Huang, L., and Li, Y., *Fully-coupled WSI model combining olaflow with solids4Foam*, GitHub repository, Software, 2023.  URL: <https://github.com/huzhengyu/wave2solids>

Research Projects

- Aug 2026 – Present ■ **Proposal co-developer**, National Research Foundation, Singapore, SGD 2.2 million.
Project: *Impact of extreme coastal processes and flooding on the stability of coasts and green–grey protection structures.*
- Aug 2024 – Present ■ **Project manager**, National Research Foundation, Singapore, SGD 2.5 million.
Project: *Model development and quantifications of coupled near-shore processes impacted by climate change.*
- Dec 2021 – Present ■ **Researcher**, Ministry of Education, Singapore, SGD 0.4 million.
Project: *On the mechanisms of wave-structure-soil interaction in coastal regions.*
- Oct 2019 – Sep 2020 ■ **Principal investigator**, Zhejiang Provincial Department of Education, China.
Project: *Research on the mechanism, function, and optimised application of coastal vegetation for ecological disaster reduction.*
- Oct 2018 – Sep 2019 ■ **Researcher**, Ministry of Natural Resources, China, CNY 0.4 million. Project: *Study on the damage mechanism and the risk early warning method of marine dynamic hazard on coral reefs.*

Conference Presentations

- 7 – 12 Jun 2026 ■ **45th International Conference on Ocean, Offshore and Arctic Engineering**
Topic: *Hydroelastic response of a vertical elastic plate under breaking wave impacts*
- 4 – 7 Nov 2025 ■ **12th International Conference on Scour and Erosion (ICSE12)**, China.
Topic: *Full-scale tsunami scour with three-dimensional seepage flows*
- 22 – 27 Jun 2025 ■ **41st IAHR World Congress (IAHR2025)**, Singapore.
Topic: *Impact of seepage flows on tsunami-induced sediment transport and scour*
- 8 – 14 Sep 2024 ■ **38th International Conference on Coastal Engineering**, Rome, Italy.
Topic: *Experimental study of breaking wave impacts on rigid and elastic plates*
- 30 Aug 2024 ■ **NSCC's Singapore HPC Users Symposium**, Singapore.
Topic: *NUS Computational Coastal Lab: Fluid-Structure Interaction, Marine Energy Harvesting, Sediment Transport, and Coastal Protection.*
- 18 – 22 Jun 2024 ■ **Singapore International Water Week (SIWW 2024)**, Singapore
Topic: *An assessment of coastal protection effectiveness with soft structures*
- 9 – 14 Jun 2024 ■ **43rd International Conference on Ocean, Offshore and Arctic Engineering**
Topic: *Scour assessment around jack-up footings in wave-current conditions*
- 1 – 4 Aug 2023 ■ **Asia Oceania Geosciences Society 2023**
Topic: *A coupled numerical model of tsunami-induced scour and seepage around a pipeline*
- 4 – 9 Dec 2022 ■ **37th International Conference on Coastal Engineering**, Sydney, Australia.
Topic: *Numerical study on the interaction between periodic waves and a flexible wall*