Jing Yuan

Associate Professor
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RESEARCH INTERESTS

- Coastal boundary layer and sediment transport
- Wave-structure interaction
- Turbulence mixing and transport processes in coastal and fluvial environments
- Eco-engineering methods

PROFESSIONAL EXPERIENCE

Associate professor 10.2021-present
Tsinghua university, Dept. of Hydraulic Engineering Beijing, China

Assistant Professor 09.2013-09.2021
National University of Singapore, Dept. of Civil and Environmental Engineering Singapore

EDUCATION

Ph.D. in Civil and Environmental Engineering September 2013
Massachusetts Institute of Technology Cambridge, MA
Advisor: Prof. Ole. S. Madsen
Dissertation: Experimental and theoretical study of turbulent oscillatory boundary layers

B.E. in Hydraulic Engineering July 2008
Tsinghua University Beijing, China

RESEARCH PROJECTS

Currencies: (S$: Singapore dollars, ¥: Chinese RMB)

Projects in Tsinghua University

- Groundwater and slope stability of area III of Yiming open-pit coral mine (PI, ¥:8.5m, China Huaneng Group, 2023.1-2023.10)
- Feasibility study of using artificial reef to control scour of offshore monopile (PI, ¥:0.5 m, China Huaneng Group, 2024.3-2024.10)
- Development of computational fluid dynamic (CFD) model for floating wind turbine (PI, ¥:0.75 m, Water Conservancy Hydropower Planning Design General Institute, Singapore-China joint flagship project, 2024.1-2026.1)
- Development of a novel floating tidal-wave energy device (2024.04-2027.04, co-PI, ¥:1.06 m)
- Mechanism of scour of offshore monopile foundation (co-PI, ¥:1.30 m, China Huaneng Group, 2022.1-2023.1)
- Wave boundary layer streaming over rippled seabed (PI, ¥:0.3 m, State Key Research Laboratory of Hydroscience and Hydraulic Engineering, China, 2022.1-2022.12)

Projects in National University of Singapore

- National Coastal-Inland Flood Model for Climate Change (Co-PI, Yuan's contribution: ~$700 k, Public Utility Board, Singapore, 2021.4-2025.4)

- Risk assessment and mitigation for seawall wave overtopping in the context of climate change (PI, S$ 627,200, Public Utility Board, 2018.4-2021.3)
- On sediment transport in wave-current benthic boundary layer (co-PI, S$ 755,376, Ministry of Education, Tier-2, 2019.5-2022.5)
- Eco-engineering Singapore's seawalls for enhancing biodiversity (Collaborator, S$ 819,318.38, National Research Foundation, MSRDP program, 2016.10-2021.4)
- An experimental study of coastal sediment transport under waves and currents(PI, S$ 45,000, Singapore-MIT Alliance for Research and Technology, 2017.3-2018.1)
- Full-scale experimental study of sediment transport by oscillatory flows and currents (PI, S$ 180,000, Singapore-MIT Alliance for Research and Technology, 2015.4-2017.3)
- Sheet-flow sediment transport in the coastal environment (PI, S$ 150,000, Ministry of Education, Tier-1, 2015.3-2018.8)
- Sediment transport rates in combined wave-current flows (PI, S$ 167,417, Singapore-MIT Alliance for Research and Technology, 2013.9-2015.3)
- Turbulent bottom boundary layers under random waves (PI, S$179,900, Ministry of Education, NUS faculty member start-up fund, 2013.10-2016.10)

JOURNAL PUBLICATIONS

corresponding author, Supervised PhD. Student, Supervised Post-doc fellow*

1. **Yuan, J.*** and O.S. Madsen (2014), Experimental study of turbulent oscillatory boundary layers in an oscillating water tunnel. *Coastal Engineering*. 89: p. 63-84 doi: http://dx.doi.org/10.1016/j.coastaleng.2014.03.007.
2. **Yuan, J.*** and O.S. Madsen (2015), Experimental and theoretical study of wave–current turbulent boundary layers. *Journal of Fluid Mechanics*. 765: p. 480-523 doi: https://doi.org/10.1017/jfm.2014.746.
3. **Yuan, J.***, Turbulent boundary layers under irregular waves and currents: experiments and the equivalent-wave concept (2016). *Journal of Geophysical Research: Oceans.* 121(4): p. 2616-2640 doi: 10.1002/2015JC011551.
4. **Yuan, J.*** and S.M. Dash (2017), Experimental investigation of turbulent wave boundary layers under irregular coastal waves. *Coastal Engineering*. 128: p. 22-36 doi: https://doi.org/10.1016/j.coastaleng.2017.07.005.
5. **Yuan, J.***, Z. Li, and O.S. Madsen (2017), Bottom-slope-induced net sheet-flow sediment transport rate under sinusoidal oscillatory flows. *Journal of Geophysical Research: Oceans*. 122(1): p. 236-263 doi: 10.1002/2016JC011996.
6. **Yuan, J.*** and W. Tan (2018), Modeling net sheet-flow sediment transport rate under skewed and asymmetric oscillatory flows over a sloping bed. *Coastal Engineering*. 136: p. 65-80 doi: https://doi.org/10.1016/j.coastaleng.2018.02.004.
7. **Yuan, J.*** and D. Wang (2018), Experimental investigation of total bottom shear stress for oscillatory flows over sand ripples. *Journal of Geophysical Research: Oceans*. 123(9): p. 6481-6502 doi:10.1029/2018JC013953.
8. Wang, D. and **J. Yuan*** (2018), Bottom-slope-induced net sediment transport rate under oscillatory flows in the rippled-bed regime. *Journal of Geophysical Research: Oceans*, 123, 7308–7331. doi:10.1029/2018JC013810.
9. Önder, A. and **J. Yuan** (2019), Turbulent dynamics of sinusoidal oscillatory flow over a wavy bottom. *Journal of Fluid Mechanics*, 858, 264-314. doi:10.1017/jfm.2018.754
10. Zhao, K., **J. Yuan***, et al. (2019), Modelling surface temperature of granite seawalls in Singapore, *Case Studies in Thermal Engineering* 13: 100395.
11. Tan, W., and **J. Yuan*** (2019), Experimental study of sheet-flow sediment transport under nonlinear oscillatory flow over a sloping bed, *Coastal Engineering*, 147, 1-11. doi:https://doi.org/10.1016/j.coastaleng.2019.01.002.

12. Wang, D., and **J. Yuan*** (2019), Geometric characteristics of coarse-sand ripples generated by oscillatory flows: A full-scale experimental study. *Coastal Engineering*, 147, 159-174. doi:https://doi.org/10.1016/j.coastaleng.2019.02.007.
13. **Yuan, J.*,** and Wang, D. (2019), An experimental investigation of acceleration-skewed oscillatory flow over vortex ripples. Journal of Geophysical Research: Oceans, 124., https://doi.org/10.1029/2019JC015487
14. Wang, D. and **J. Yuan*** (2020), Modelling of net sediment transport rate due to wave-driven oscillatory flows over vortex ripples Applied Ocean Research, vol. 94, p. 101979, doi: https://doi.org/10.1016/j.apor.2019.101979.
15. Wang, D. and **J. Yuan*** (2020), Measurements of net sediment transport rate under asymmetric oscillatory flows over wave-generated sand ripples, Coastal Engineering, vol. 155, p. 103583, doi: https://doi.org/10.1016/j.coastaleng.2019.103583
16. Cao, D., Chen, H*., & **Yuan, J.** (2021). Inline force on human body due to non-impulsive wave overtopping at a vertical seawall. Ocean Engineering, 219(October 2020), 108300. https://doi.org/10.1016/j.oceaneng.2020.10830
17. Cao, D., **Yuan, J.***, Chen, H., Zhao, K., & Li-Fan Liu, P. (2021). Wave overtopping flow striking a human body on the crest of an impermeable sloped seawall. Part I: physical modeling. Coastal Engineering, 167(September 2020), 103891. https://doi.org/10.1016/j.coastaleng.2021.103891
18. Chen, H., **Yuan, J***., Cao, D., & Liu, P. (2021). Wave overtopping flow striking a human body on the crest of an impermeable sloped seawall. Part II: Numerical modelling. Coastal Engineering, 103892. https://doi.org/https://doi.org/10.1016/j.coastaleng.2021.103892
19. Tan, W., and **Yuan, J*** (2021). A two-layer numerical model for coastal sheet-flow sediment transport. Journal of Geophysical Research: Oceans, 126, e2021JC017241.
20. Cao, D., **Yuan, J***, & Chen, H. (2021). Towards modelling wave-induced forces on an armour layer unit of rubble mound coastal revetments. Ocean Engineering, 239(May), 109811. https://doi.org/10.1016/j.oceaneng.2021.109811
21. Cao, D., Tan, W., & **Yuan, J*** (2022). Assessment of wave overtopping risk for pedestrian visiting the crest area of coastal structure. Applied Ocean Research, 120. https://doi.org/10.1016/j.apor.2021.102985
22. Tan, W., Cao, D., & **Yuan, J.** (2022). Numerical modelling of green-water overtopping flow striking a pedestrian on the crest of a sloped coastal structure. Ocean Engineering, 260. https://doi.org/10.1016/j.oceaneng.2022.112153
23. Tan, W., & **Yuan, J*** (2022). Net sheet-flow sediment transport rate: Additivity of wave propagation and nonlinear waveshape effects. Continental Shelf Research, 240. https://doi.org/10.1016/j.csr.2022.104724
24. Tan, W., & **Yuan, J*** (2022). Drag-related wave-current interaction inside a dense submerged aquatic canopy. Journal of Fluid Mechanics, 941. https://doi.org/10.1017/jfm.2022.293
25. Fan, Q., Wang, X., **Yuan, J.**, Liu, X., Hu, H., & Lin, P. (2022). A Review of the Development of Key Technologies for Offshore Wind Power in China. Journal of Marine Science and Engineering, 10(7), 929.
26. **Yuan, J*** (2023). Observations of net sediment transport rate and boundary layer of wave–current flows over vortex ripples." Coastal Engineering 181: 104288.
27. Dong, Y., & **Yuan, J*** (2023). Projections of offshore wind energy and wave climate in Guangdong's nearshore area using CMIP6 simulations. Journal of Intelligent Construction, 1(1), 9180007.
28. Xiang, Y., Lin, P., An, R., **Yuan, J.**, Fan, Q., & Chen, X. (2023). Full participation flat closed-loop safety management method for offshore wind power construction sites. Journal of Intelligent Construction, 1(1), 9180006.
29. Cao, D., Lin, Z., **Yuan, J.**, Tan, W., & Chen, H. (2024). Swash-flow induced forces on human body standing on a smooth and impermeable slope: A numerical study with experimental validations. Engineering Applications of Computational Fluid Mechanics, 18(1), 2319768.
30. Dong, Y., Tan, W., Chen, H., & **Yuan, J.*** (2024). Numerical modeling of wave interaction with a porous floating structure consisting of uniform spheres. Physics of Fluids, 36(8).
31. Wang, X., **Yuan, J.***, Qiu, X., Huang, H., Lin, P., Liu, X., & Hu, H. (2024). Time development of live-bed scour around an offshore-wind monopile under large current–wave ratio. Coastal Engineering, 190, 104509.

Journal in Chinese (中文期刊)

32. Wang, X, Lin, P., Huang, H., **Yuan, J.**, Qiu, X., Liu, X.(2023). Scour dynamic properties and online monitoring of offshore wind power foundation[J]. Journal of Tsinghua University (Science and Technology), 2023, 63(7): 1087-1094.

CONFERENCE PRESENTATIONS

1. **Yuan, J.,** and O.S. Madsen (2010), On choice of random wave simulations in the surf zone processes, the 32nd international conference on coastal engineering, Shanghai, China, 2010
2. **Yuan, J.**, E. S. Chan, and O.S. Madsen (2012), Experimental study of turbulent oscillatory boundary layers in a new oscillatory water tunnel, the 33rd international conference on coastal engineering, Santander, Spain, 2012
3. **Yuan, J.**, and O.S. Madsen (2014), Experimental determination of bottom shear stress for turbulent oscillatory flows in oscillatory water tunnels, the 34th international conference on coastal engineering, Seoul, South Korea, 2014.
4. **Yuan, J.**, D. Wang and O.S. Madsen (2017), A laser-based bottom profiler system for measuring net sediment transport rates in an oscillatory water tunnel, Coastal Dynamics, 2017, Helsingør, Denmark, pp. 1495-1505.
5. **Yuan, J.**, and D. Wang (2018), Form drag and equivalent sand-grain roughness for wave-generated sand ripples, the 36th international conference on coastal engineering, Baltimore, MD, U.S, 2018.
6. Wang, D. and **J. Yuan** (2018), Geometric characteristics of wave-generated sand ripples: a full-scale experimental study, the 36th international conference on coastal engineering, Baltimore, MD, U.S, 2018.
7. Zhao K., **J. Yuan**, et al. (2018), Modeling tide's influence on seawall's surface temperature in tropical regions, the 36th international conference on coastal engineering, Baltimore, MD, U.S, 2018.
8. Tan W. and **J. Yuan** (2019), A process-based sediment transport model for sheet flows with the pickup layer resolved in an empirical way, in: International Conference on Asian and Pacific Coasts, Springer. pp. 385-392.

TEACHING EXPERIENCE

The following courses in Dept. of Hydraulic Engineering，Tsinghua University

Introduction to Coastal Engineering	Undergraduate-level course on coastal engineering
Offshore Engineering Design	Undergraduate-level course on design of offshore wind farm
Fluid Mechanics	Core undergraduate-level course

The following courses in Dept. of Civil and Environmental Engineering, NUS

CE2134: hydraulics	An entry-level course on fluid mechanics for all undergraduate students in CEE department (100-200 students).
CE5308: Coastal processes and	A graduate-level course (10-20 students) covering coastal

sediment transport	boundary layer flows, fundamentals of sediment transport, hard and soft engineering solutions for coastal erosion and scour problems.
CE5312: River Mechanics	A graduate-level course (10-20 students) covering steady and unsteady open-channel flows.
TCE2134: Hydraulics	The equivalent course to CE2134 for part-time undergraduate students pursuing bachelor of technology degree in CEE of NUS.

STUDENT ADVISING

PhD students:

@ Tsinghua University

- Dong Yiyong (2022.9-): Development of porous floating breakwater
- Gao Yuan (2023.9-): Hydrodynamics of fixed porous coastal structure

@ NUS

- Wang Dongxu (2019.12): Full-scale experiments of sediment transport processes over wave-generated sand ripples
- Tan Wekai (2020.11): Experimental and Numerical Study of Sheet-Flow Sediment Transport in Coastal Environments

AWARDS

Faculty of Engineering Teaching Commendation List (2015)
National University of Singapore

Best undergraduate thesis award (2008)
Tsinghua University, on Numerical modeling of typhoon induced storm surge and wind wave

Toshiba scholarship for academic excellence (2005, 2007)
Tsinghua University

Editorial Board Member

- Applied Ocean Research (2021-)
- Engineering Applications of Computational Fluid Mechanics (2022-)
- International Journal of Coastal and Ocean Engineering (2019-)
- Journal of Intelligent Construction (2023-)

SERVICES

- Member of the international steeling committee of the International Conference on Asian and PAcific Coasts (APAC) (2019-present)
- Associate head, Hydraulic engineering department (2023-present)

CONSULTANCY

- Determination of hydraulic performance for storm-water-detention tanks (Uniseal Singapore Pte Ltd, Elmich Pte Ltd).
- Short course on coastal engineering for coastal-engineering consultants (organizer and cover 1/3 lectures) (Surbana Jurong Private Limited)
- Design of coastal caisson and revetment (Surbana Jurong Private Limited)
- Design of self-deployable flood barrier (JTC)