

# Jing Yuan

Assistant Professor

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<https://yuanjinglab.github.io/YuanJing/>

## RESEARCH INTERESTS

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- Coastal boundary layer flows
- Sediment transport
- Wave-structure interaction
- Coastal structures under extreme conditions
- Turbulence mixing and transport processes in coastal and fluvial environments
- Eco-engineering methods

## PROFESSIONAL EXPERIENCE

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

**Graduate Research Assistant** 08.2008-09.2013  
Massachusetts Institute of Technology, Dept. of Civil and Environmental Engineering Cambridge, MA

## EDUCATION

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**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

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*All research funding is from Singapore's funding agencies (S\$ 1 ≈ USD 0.74)*

- Risk assessment and mitigation for seawall wave overtopping in the context of climate change (PI, S\$ 627,200, Building and Construction Authority, 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***

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*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.2020.108300>
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>

### ***CONFERENCE PRESENTATIONS***

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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***

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*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). Lecture content covers hydrostatics, Bernoulli Equation, conservation laws, pipe flow analysis, dimensional analysis, and etc.

***CE5308: Coastal processes and sediment transport***

A graduate-level course (10-20 students) covering coastal 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.

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***STUDENT ADVISING***

***PhD students:***

- 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

***Master students:***

- Sun Letian (2016.05): Laboratory observation of ripple dynamics on sloped bottom under the oscillating waves
- Chen Puluo (2017.12): A literature study and field survey on Singapore's coastal water front
- Zhu Yudi (2018.05): Assessment of water retention for a novel eco-engineering units for enhancing biodiversity on Singapore's seawall
- Wang Chaojie (2018.05): Numerical investigation of beach erosion with XBEACH
- Xu Mingxuan (2018.12): An Artificial Neural Network predictor for dimensions of wave-generated sand ripples
- Zhang Dongzhi (2018.12): Experimental study of sheet-flow sediment transport under nonlinear waves
- Zhang Yanan (2018.12): GIS-based rapid inundation mapping
- Zhang Haodong (2020.5): Laboratory study of wave-overtopping induced force on a cylinder
- LYU Shenglan (2020.5): X-beach modeling of sediment transport along Singapore's east coast
- Zhang Ying (2020.5): Numerical modeling of Singapore's extreme coastal waves

***Undergraduate Final Year Project:*** Chua Ming Yew (2018.07), Lei Chon Hei (2018.07), etc.

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***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

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***SERVICES***

- Supervisor of hydraulic lab, CEE department, NUS (2014 - present)
- Member of Curriculum Review Committee, CEE department, NUS (2017 - present)
- Member of Research Benchmarking Committee, CEE department, NUS (2017 - present)

- member of the international steering committee of the International Conference on Asian and Pacific Coasts (APAC) (2019-present)

### ***CONSULTANCY***

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- 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 reversionment (Surbana Jurong Private Limited)

### ***REVIEW***

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Journal of Fluid Mechanics, Journal of Geophysical Research: Oceans, Applied Ocean Research, Advances in water resources, Ocean Engineering, Geomorphology, Journal of Hydraulic Engineering, Journal of Hydrodynamics, Ser B, Intl. Journal of Ocean and Coastal Engineering.