

# Jing Yuan

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## RESEARCH INTERESTS

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

## PROFESSIONAL EXPERIENCE

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<b>Assistant Professor</b> National University of Singapore, Dept. of Civil and Environmental Engineering	09.2013-present Singapore
<b>Graduate Research Assistant</b> Massachusetts Institute of Technology, Dept. of Civil and Environmental Engineering	08.2008-09.2013 Cambridge, MA

## EDUCATION

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<b>Ph.D. in Civil and Environmental Engineering</b> Massachusetts Institute of Technology Advisor: Prof. Ole. S. Madsen Dissertation: Experimental and theoretical study of turbulent oscillatory boundary layers	September 2013 Cambridge, MA
<b>B.E. in Hydraulic Engineering</b> Tsinghua University	July 2008 Beijing, China

## RESEARCH PROJECTS

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

- 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***

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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>
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.

Papers under review:

20. Cao, D., Chen, H. & **Yuan, J. \***. Towards modeling wave-induced forces on an armour layer unit of coastal revetments (Submitted to Ocean Engineering, under review)
21. Tan, W., and **Yuan, J\***. Wave-current interaction inside a dense submerged aquatic canopy (Submitted to Journal of Fluid Mechanics, under review)

## ***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.

**STUDENT ADVISING**

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**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.

**AWARDS**

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**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

**SERVICES**

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- 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 revertment (Surbana Jurong Private Limited)
- Design of self-deployable flood barrier (JTC)

### ***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.