Morteza Derakhti

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EDUCATION

2016	Ph.D., Civil Engineering, University of Delaware
2009	M.Sc., Civil Marine Engineering, University of Tehran
2006	B.Sc., Civil Engineering, University of Tehran

PROFESSIONAL APPOINTMENTS

2024 – present	Assistant Professor, Dept. of Civil and Environmental Eng., University of Washington, Seattle, WA
2020 – present	Affiliate Faculty, Dept. of Mechanical Eng., University of Washington, Seattle, WA
2020 – 2023	Affiliate Faculty, Dept. of Civil and Environmental Eng., University of Washington, Seattle, WA
2019 – present	Senior Research Scientist/Engineer, Applied Physics Laboratory, University of Washington, Seattle, WA
2016 – 2018	Postdoctoral Fellow, Dept. of Civil Engineering, Johns Hopkins University, Baltimore, MD
2011 – 2016	Graduate Research Assistant, Center for Applied Coastal Res., Dept. of Civil and Environmental Eng., University of Delaware, Newark, DE
2009 – 2011	Coastal Engineer, University of Tehran Water Institute, Tehran

RESEARCH INTERESTS

- Coastal Engineering, Extreme events, Environmental Fluid Mechanics, Marine Renewable Energy
- Surface Waves and Turbulence, Air-Sea Interaction, Nearshore Hydrodynamics and Transport, River Plumes
- Fluid-Structure Interaction, Debris Flows, Multiphase & Particle-laden Flows, Vegetated Flows
- Numerical Modeling, Computational Fluid Dynamics, Particle Methods, Machine Learning, Data-assimilative & Data-driven Modeling

AWARDS & HONORS

2012	Elisha Conover Award, College of Engineering, University of Delaware: awarded to a selected first-year graduate student studying fluid mechanics
2012	Best Poster Prize, SIAM Summer School, Monterey, CA
2003, 2004, 2005	Faculty of Engineering Award, University of Tehran: awarded annually to the top three students in each engineering major
2002	Ranked 81st in the nationwide university entrance examination for B.Sc. degrees among more than 400,000 applicants, Iran

PUBLICATIONS (* STUDENT & POSTDOC ADVISEES)

- Google Scholar

Books

1. **Derakhti**, **M.**, Calculus-Solved Problems, 5th Print, 2013 (First print in 2005), ISBN: 964-8601-48-8, 354 Pages, *Khoshkhan Publisher* (In Persian).

Peer-Reviewed Journal Articles

14. **Derakhti**, **M.**, Thomson J., Bassett C., Malila M., and Kirby, J. T., "Statistics of bubble plumes generated by breaking surface waves", *Journal of Geophysical Research: Oceans,* in press, doi: 10.22541/essoar.167751591.11265648/v1.

13. Rainville* E., Thomson, J., Moulton, M., and **Derakhti, M.,** (2023) "Measurements of nearshore waves through coherent arrays of free-drifting wave buoys", Earth Syst. Sci. Data, 15, doi:10.5194/essd-15-5135-2023.

12. **Derakhti**, **M.**, Kirby, J. T., Banner, M. L., Grilli, S., and Thomson, J., (2020) "A unified breaking-onset criterion for surface gravity water waves in arbitrary depth", *Journal of Geophysical Research: Oceans*, 125, e2019JC015886, doi: 10.1029/2019JC015886.

11. **Derakhti**, **M.**, Thomson, J., Kirby, J. T., (2020), "Sparse sampling of intermittent turbulence generated by surface wave breaking", *Journal of Physical Oceanography*, 50, 867–885*,* doi: 10.1175/JPO-D-19-0138.1.

10. **Derakhti**, **M.**, Dalrymple, R. A., Okal, E., A., and Synolakis, C. E., (2019), "Temporal and topographic source effects on tsunami generation", *Journal of Geophysical Research: Oceans,* 124, 5270-5288, doi: 10.1029/2019JC015041.

9. Kirby, J. T., and **Derakhti, M.**, (2019), "Short-crested wave breaking", *European Journal of Mechanics B/Fluids*, 79, 100-111, doi: 10.1016/j.euromechflu.2017.11.001.

8. Wei, Z., Li, C., Dalrymple, R. A., **Derakhti, M.**, and Katz, J., (2018), "Chaos in breaking waves", *Coastal Engineering*, 140, 272-291, doi: 10.1016/j.coastaleng.2018.08.001.

7. **Derakhti**, M., Banner, M. L. and Kirby, J. T., (2018), "Predicting the breaking strength of surface water waves in deep and intermediate depth", *Journal of Fluid Mechanics,* 848, R2, doi: 10.1017/jfm.2018.352.

6. Wei, Z., Dalrymple, R. A., Xu, M., Garnier, R., and **Derakhti, M.**, (2017), "Short-crested waves in the surf zone", *Journal of Geophysical Research: Oceans*, 122, 4143–4162, doi: 10.1002/2016JC012485.

5. **Derakhti**, **M.** and Kirby, J. T., (2016), "Breaking-onset, energy and momentum flux in unsteady focused wave packets", *Journal of Fluid Mechanics*, 790, 553-581.

4. **Derakhti**, **M.**, Kirby, J. T., Shi, F. and Ma, G., (2016), "NHWAVE: Consistent boundary conditions and turbulence modeling", *Ocean Modelling*, 106, 121-130.

3. **Derakhti**, **M.**, Kirby, J. T., Shi, F. and Ma, G., (2016), "Wave breaking in the surf zone and deep-water in a non-hydrostatic RANS model. Part 1: Organized wave motions", *Ocean Modelling*, 107, 125-138.

2. **Derakhti**, **M.**, Kirby, J.T., Shi, F. and Ma, G., (2016), "Wave breaking in the surf zone and deep-water in a non-hydrostatic RANS model. Part 2: Turbulence and mean circulation", *Ocean Modelling*, 107, 139-150.

1. **Derakhti**, **M.** and Kirby, J. T., (2014), "Bubble entrainment and liquid-bubble interaction under unsteady breaking waves", *Journal of Fluid Mechanics*, 761, 464-506.

Invited Talks

17. **Derakhti, M.**, "Emerging GPU-based CFD models of nearshore hydrodynamics and fluid-structure interaction," OSU, Corvallis, US, March 6, 2024.

16. **Derakhti, M.**, "Turbulence and bubble plumes generated by breaking surface waves," Physical Oceanography Seminar, UW, Seattle, US, Nov 08, 2023.

15. **Derakhti, M.**, Kirby, J., Grilli, S., Fotia M., and Thomson, J., "A unified framework for predicting the breaking onset, type, and strength of surface gravity waves from deep to shallow water", presented at B'Waves 2023, Bordeaux, France, May 30 – June 1, 2023.

14. Ducrozet, G.,Wang, Y., **Derakhti, M.**, "Enhanced wave breaking modelling in a High-Order Spectral model", presented at B'Waves 2023, Bordeaux, France, May 30 – June 1, 2023.

13. Grilli S. T., **Derakhti, M.,** Folia, M., Harris, J.C., Kirby, J.T., Mohanlal, S., and Yates, M., "Implementation and performance in shallow water of the B/Gamma breaking onset and dissipation criteria in a fully nonlinear potential flow model", presented at B'Waves 2023, Bordeaux, France, May 30 – June 1, 2023.

12. **Derakhti, M.**, Kirby, J., Grilli, S., and Thomson, J., "From deep to shallow water: A unified scaling and parameterization of wave breaking dissipation", the WISE Zoominar series, virtual meeting, April 27, 2023. The recording is available at https://www.youtube.com/channel/UCjJ_v6Ta0EDVI9kDCXpXh2Q.

11. **Derakhti, M.,** "Wave Breaking Parameterizations in Forecast Models", France Énergies Marines, Brest, France, July 8, 2022.

10. **Derakhti, M.,** "Parameterizations of the onset & strength of breaking surface gravity waves", Ecole Centrale Nantes, Nantes, France, July 6, 2022.

9. **Derakhti, M.,** "High-fidelity modeling of breaking surface gravity waves", Saint-Venant Hydraulics Laboratory, Ecole des Ponts ParisTech, Chatou, France, June 13, 2022.

8. **Derakhti, M.,** Thomson, J., and Kirby, J. T., "High-fidelity observations and modeling of wave breaking dissipation and bubble plumes", *B'Waves 2021*, virtual meeting, June 16-18, 2021.

7. **Derakhti, M.,** "Turbulence Characteristics and Intermittent Transport in Breaking Surface Waves", *Scripps Institution of Oceanography*, UC San Diego, virtual seminar, May 6, 2020.

6. **Derakhti**, **M.**, Kirby, J. T., and Thomson, J., "Wave breaking turbulence: significance of bubbles", *THESIS-2019 Symposium*, Newark, DE, US, September 17 – 19, 2019.

5. Kirby, J. T. and **Derakhti, M**., "Intermittent bubble transport in surf zone breaking waves", *THESIS-2019 Symposium*, Newark, DE, US, September 17 – 19, 2019.

4. **Derakhti**, **M.**, "Recent advances in observations, modeling, and scaling of surface wave breaking-induced energy dissipation rates", Oregon State University, Corvallis, OR, July 30, 2019.

3. **Derakhti**, **M.**, "Modeling fluid-structure interactions with GPUSPH: applications in marine energy converters", *Pacific Marine Energy Center (PMEC) meetings*, University of Washington, Seattle, WA, US, March 7, 2019.

2. Kirby, J. T. and **Derakhti**, **M.**, "Short-crested wave breaking", *B'Waves 2016*, University of Bergen, Bergen, Norway, June 13-17, 2016.

1. Kirby, J. T. and **Derakhti**, **M.**, "Turbulent bubbly flow under breaking water waves", *13th US National Congress on Computational Mechanics 2015*, San Diego, CA, US, July 2015.

Conference Proceedings and Abstracts (last two years)

2023

50. Rainville* E. J., Thomson, J., Moulton, M., and **Derakhti, M.**, "Nearshore waves and circulations observed with swarms of small buoys", presented at *ASBPA 2023 National Coastal Conference*, Providence, RI, October 10 – 13.

49. Rainville* E. J., Thomson, J., **Derakhti, M.**, and Moulton, M., "Case Study Investigation of Depth Induced Breaking Energy Dissipation Parameterizations in the SWAN Wave Model", presented at *Young Coastal Scientists and Engineers Conf.-North America 2023*, Madison, WI, August 10 – 12.

48. Lou*, Y., Horner-Devine, A., **Derakhti, M.**, "Plume transport and surf-zone circulation regulated by wave-current interactions", presented at *2023 Coastal Ocean Dynamics,* Bryant University, Smithfield, RI, June 18 – 23.

47. **Derakhti, M.**, "A unified parameterization of wave breaking onset, type, and dissipation in arbitrary depth", presented at *2023 Coastal Ocean Dynamics,* Bryant University, Smithfield, RI, June 18 – 23.

46. **Derakhti, M.**, Fotia M., Kirby, J., Grilli, S., and Thomson, J., "A unified parameterization of wave breaking onset and dissipation in arbitrary depth", presented at 2023 *WISE Meeting*, Princeton, NJ, May 7 – 10.

45. Fotia M., Kirby, J., **Derakhti, M.**, and Grilli, S., "Wave breaking onset and dissipation in a fully non-linear staggered grid Boussinesq model", presented at 2023 *WISE Meeting*, Princeton, NJ, May 7 – 10.

44. Rainville* E. J., Thomson, J., Moulton, M., and **Derakhti, M.**, "Estimates of energy dissipation from depth-limited breaking waves using arrays of drifting wave buoys", presented at 2023 *WISE Meeting*, Princeton, NJ, May 7 – 10.

2022

43. Zago*, V., **Derakhti, M.**, Rusch, C., Thomson, J., "SPH model of a sea wave powered UUV docking station", presented at *UMERC/METS 2022*, Portland, OR, September 13-14.

42. Rainville* E. J., Thomson, J., Moulton, M., and **Derakhti, M.**, "Development of a nearshore wave dataset from coherent arrays of small-scale drifters", presented at *ASBPA 2022 National Coastal Conference*, The Westin Long Beach, CA, September 13 – 16.

41. Rainville* E. J., Thomson, J., Moulton, M., and **Derakhti, M.,** "Surf-zone measurements with arrays of 'microSWIFT' drifters", presented at *2022 WISE meeting*, Brest, France, May 29 – June 2.

40. **Derakhti**, **M.**, Thomson, J., Malila M., and Kirby, J. T., "Statistics of bubble plumes generated by oceanic whitecaps and their relation to wave breaking dissipation", presented at *Ocean sciences Meeting 2022*, Honolulu, HI, Feb 27 – March 4.

39. Fotia M., Kirby, J., **Derakhti, M.**, and Grilli, S., "Wave breaking onset and strength in a fully non-linear Boussinesq model", presented at *Ocean sciences Meeting 2022*, Honolulu, HI, Feb 27 – March 4.

38. Rainville* E., Moulton, M., Thomson, J., **Derakhti, M.**, and Hegermiller C., "Mapping phase-resolved wave breaking and currents in the surf-zone during extreme conditions using arrays of 'microSWIFT' drifters", presented at *Ocean sciences Meeting 2022*, Honolulu, HI, Feb 27 – March 4.

37. Kirby, J., and **Derakhti, M.**, "Intermittent bubble transport in surf zone breaking", presented at *Ocean sciences Meeting 2022*, Honolulu, HI, Feb 27 – March 4.

36. Rusch, C., Leary, M., **Derakhti, M.**, Polagye, B., Robertson, B., Manalang, D., and Thomson, J., "Utilizing a wave energy converter for UUV recharge", presented at *Ocean sciences Meeting 2022*, Honolulu, HI, Feb 27 – March 4.

35. Lou*, Y., Horner-Devine, A., Giddings S., **Derakhti, M.**, Rodriguez, A., Wu, X., Yuan Y., "Tidally modulated buoyant plume transport in the surf zone", presented at *Ocean sciences Meeting 2022*, Honolulu, HI, Feb 27 – March 4.

TEACHING & MENTORING EXPERIENCE

Teaching

2022 – present CEE 473 / CEWA 573: "Coastal Engineering / Water Wave Mechanics for Coastal Engineers", Dept. of Civil and Environmental Engineering (CEE), University of Washington (UW)

Postdoctoral Advising

2022 Vito Zago, APL-UW (now a researcher at INGV, Italy)

Graduate Students Advising

2024 – present Ethan Evans, PhD, CEE-UW

2023 – present Alireza Zarei, PhD, CEE-UW

2023 Manjaree Binjolkar, MS, CEE-UW

2022 – present Rainville Edwin, PhD, CEE-UW (co-advising)

2021 – present Yingzhong Lou, PhD, CEE-UW (co-advising)

2022 – 2023 Shakti Patel, MS, ME-UW

2020 – 2022 Rainville Edwin, MS, CEE-UW (co-advising)

PROFESSIONAL SERVICE, COMMUNITTY LEADERSHIP

Advisory Panels and Committees

- Member, Early Career PIs advisory group, APL-UW (since 2019)
- Member, APL-IT Policy Working Group (since 2021)

Reviewer and Editorial Boards

- Review editor, Frontiers in Marine Science (since 2023)
- Reviewer board member, Journal of Marine Science and Engineering (since 2021)
- Reviewer, National Science Foundation
- Reviewer for a wide range of international journals, including: J. Fluid Mechanics, J. Geophysical Research: Oceans, Ocean Modelling, Ocean Dynamics, J. Waterway, Port, Coastal and Ocean Eng., Proceedings of the Royal Society of London A, Engineering Applications of Computational Fluid Mechanics, J. Physical Oceanography, Applied Ocean Research

Conference/Symposium Organizations

- Organizer team member, WISE seminar series, Since 2023
- Session co-chair, the Nearshore Processes session, AGU Fall Meeting 2020
- Session chair, Young Coastal Scientists and Engineers Conference - North America 2015

Public Domain Code Developments

- Partner in the development of a number of public domain 3D wave resolving CFD models to study hydrodynamic processes and fluid-structure interactions, including an LES / VOF multiphase (e.g., water and bubbles) model, a terrain-following non-hydrostatic model NHWAVE, and a Smoothed Particle Hydrodynamics (SPH) model GPUSPH
- Partner in the development of a new framework for breaking parameterizations in phase-resolving, energy-conserving models such as a Boussinesq model FUNWAVE, and an HOS model HOS-NWT (in collaboration with French partners at Ecole Centrale Nantes)

Professional Organizations

- Member, American Geological Union (AGU)
- Member, American Society of Civil Engineering (ASCE)
- Member, American Physical Society (APS)