

TRACY L. MANDEL

Assistant Professor, Mechanical & Ocean Engineering
University of New Hampshire · 24 Colovos Rd. Durham, NH 03824
tracy.mandel@unh.edu · 603.862.0111 · www.tracymandel.com

RESEARCH INTERESTS

Environmental fluid mechanics, flow-vegetation interactions, turbulent canopy flows, density-driven flows, coastal hydrodynamics, and experimental methods

EDUCATION

Ph.D., Environmental Fluid Mechanics & Hydrology September 2018
Civil & Environmental Engineering
Stanford University, Stanford, CA

M.S., Environmental Fluid Mechanics & Hydrology June 2013
Civil & Environmental Engineering
Stanford University, Stanford, CA

B.S., Environmental Engineering May 2012
Biological & Environmental Engineering
Cornell University, Ithaca, NY

SELECTED EXPERIENCE

Assistant Professor, University of New Hampshire January 2020 - present
Mechanical Engineering & Ocean Engineering

Postdoctoral Scholar, University of California, Merced Sept. 2018 - Sept. 2019
Physics & Applied Math

AWARDS AND HONORS

2018 Lorenz G. Straub Award for the most meritorious PhD thesis in hydraulic engineering, ecohydraulics, or related fields, St. Anthony Falls Laboratory, University of Minnesota *awarded* 2021

Stanford Interdisciplinary Graduate Fellowship 2015-2018

Outstanding Presentation Award, Young Coastal Scientists & Engineers Conference June 2016

Leavell Fellowship for the Sustainable Built Environment (Stanford CEE) 2014-2016

John K. Vennard Fellowship (Stanford CEE) 2012-2013

EXTERNAL FUNDING (UNH TOTAL ~\$1.3M)

2022-24: New Hampshire Sea Grant, "What goes with the flow? Linking *Zostera marina* reproduction and genetic diversity with oceanographic drivers in Great Bay Estuary." (\$200,000; PI: C. Hayes (Keene State), Co-PIs: **T. Mandel**, T. Oehmke, T. Lippmann)

2021-24: U.S. Army Engineer Research & Development Center, "Biophysical drivers of sedimentation in salt marsh environments with implications for coastal resiliency." (\$599,978; PI: T. Lippmann, Co-PIs: **T. Mandel**, D. Foster, M. Palace, D. Burdick)

2021-24: Office of Naval Research, "Connecting the fluid free-surface with the interior acoustic field in a multiphase ocean." (\$599,754; PI: **T. Mandel**, Co-PIs: G. Venegas, T. Weber)

2021-22: New Hampshire Sea Grant Development Funds, "Seasonal changes in salt marsh biophysical properties: Feedback with overwash and sedimentation." (\$5,000; PI: **T. Mandel**)

PEER-REVIEWED PUBLICATIONS

Underlined names indicate student author.

Saeed, Z., Weidner, E., Johnson, B.A., & **Mandel, T.L.** (2022). Buoyancy-modified entrainment in plumes: Theoretical predictions. *Physics of Fluids* 34(1): 015112.

Chung, H., **Mandel, T.L.**, Zarama, F.J.M., & Koseff, J.R. (2020). Non-local impacts of gaps on submerged canopy flow. *Water Resources Research*: e2019WR026915.

Mandel, T.L., Zhou, D.Z., Waldrop, L.D., Theillard, M., Kleckner, D., & Khatri, S. (2020). Retention of rising droplets in density stratification. *Physical Review Fluids* 5: 12803.

Mandel, T.L., Gakhar, S., Chung, H., Rosenzweig, I., & Koseff, J.R. (2019). On the surface expression of a canopy-generated shear instability. *Journal of Fluid Mechanics* 867: 633-660.

Mandel, T.L., Rosenzweig, I., Chung, H., Ouellette, N.T. & Koseff, J.R. (2017). Characterizing free-surface expressions of flow instabilities by tracking submerged features. *Experiments in Fluids* 58: 153.

OTHER PUBLICATIONS

Mandel, T.L. (2018). Free-surface dynamics in the presence of submerged canopies. PhD Thesis, Stanford University, Stanford, CA.

INVITED TALKS

Cornell Fluids Seminar, Cornell University (April 2022).

Lorenz G. Straub Award Ceremony, St. Anthony Falls Laboratory, University of Minnesota (April 2021).

Mechanical Engineering Seminar, University of New Hampshire (March 2021).

Guest lecture on schlieren & shadowgraph methods for graduate course in Experimental Methods in Fluid Mechanics, University of Texas at Austin (December 2020).

Water Resources Engineering & Science and Mechanical Science & Engineering joint seminar, University of Illinois Urbana-Champaign (November 2020).

Civil & Environmental Engineering Seminar, University of Pittsburgh (October 2020)

CCOM/Ocean Engineering Seminar, University of New Hampshire (September 2020).

WHOI Coastal Ocean Fluid Dynamics Laboratory Seminar, Woods Hole Oceanographic Institute (March 2020, cancelled due to COVID-19).

Fluids & Health Conference, Institut d'Etudes Scientifiques, Cargese, France (July 2019). "Boundary layers and their application in health, agriculture, and the environment."

CCOM/Ocean Engineering Seminar, University of New Hampshire (March 2019).

Geophysical & Astrophysical Fluid Dynamics Seminar, UC Santa Cruz (May 2018).

Civil & Environmental Engineering Department Seminar, Georgia Tech (March 2018).

Ocean Engineering Seminar, University of New Hampshire (March 2018).

CONFERENCE PRESENTATIONS

Underlined names indicate student author.

- Mandel, T.L.,** Ehnnot, J., Bheeroo, V., Burdick, D. “Hydrodynamics and biomechanics at the plant-ocean interface.” (poster) Benthic Ecology Meeting, 29 Mar.-2 Apr. 2022, Portsmouth, NH.
- Villafane Pagan, J., Zapata, A., Ziervogel, K., & Mandel, T.L. “Settling of microplastics and marine snow in ambient density stratification.” (talk) Ocean Sciences Meeting, 24 Feb.-4 Mar. 2022 (virtual).
- Zapata, A., Villafane-Pagan, J., Mandel, T.L., Ziervogel, K. “Interactions between phytoplankton and microplastics in the ocean.” (poster) American Geophysical Union Fall Meeting, 13-17 Dec. 2021.
- Saeed, Z., Weidner, E., Johnson, B.A., Mandel, T.L. “Mechanisms of buoyancy-modified entrainment in plumes: Theoretical analysis.” 74th Meeting of the American Physical Society Division of Fluid Dynamics, 21-23 Nov. 2021, Phoenix, AZ.
- Tapia Silva, D., **Mandel, T.L.,** Cooper, C., Khatri, S. & Kleckner, D. “High-speed two color scanning VLIF.” 74th Meeting of the American Physical Society Division of Fluid Dynamics, 21-23 Nov. 2021, Phoenix, AZ.
- Mandel, T.L.,** Foster, D.L., Burdick, D. & Eberhardt, A. “Seasonal changes in salt marsh biophysical properties: Feedback with overwash and sedimentation.” (poster) New Hampshire Sea Grant Symposium, 28 Jan. 2021 (virtual).
- Tapia Silva, D., Cooper, C., **Mandel, T.L.,** Khatri, S. & Kleckner, D. “High-speed two color VLIF.” 73rd Meeting of the American Physical Society Division of Fluid Dynamics, 22-24 Nov. 2020 (virtual).
- Binswanger, A., Zhou, D.Z., Roe, J., **Mandel, T.L.,** Theillard, M., Kleckner, D., & Khatri, S. “Numerical simulations of oil droplets rising in a sharply stratified fluid.” 73rd Meeting of the American Physical Society Division of Fluid Dynamics, 22-24 Nov. 2020 (virtual).
- Zhou, D.Z., Binswanger, A., Roe, J., **Mandel, T.L.,** Theillard, M., Kleckner, D., & Khatri, S. “Marangoni forces on oil droplets rising in a stratified fluid.” 73rd Meeting of the American Physical Society Division of Fluid Dynamics, 22-24 Nov. 2020 (virtual).
- Mandel, T.L.,** Zhou, D.Z., Waldrop, L., Theillard, M., Kleckner, & Khatri, S. “Retention of oil droplets rising in a stratified fluid.” (poster) Ocean Sciences Meeting, 16-22 Feb. 2020, San Diego, CA.
- Zhou, D.Z., **Mandel, T.L.,** Waldrop, L., Theillard, M., Kleckner, & Khatri, S. “Retention of oil droplets rising in a stratified fluid: Part 1. Kinematics.” (talk) 72nd Meeting of the American Physical Society Division of Fluid Dynamics, 23-26 Nov. 2019, Seattle, Washington.
- Mandel, T.L.,** Zhou, D.Z., Waldrop, L., Theillard, M., Kleckner, & Khatri, S. “Retention of oil droplets rising in a stratified fluid: Part 2. Dynamics.” (talk) 72nd Meeting of the American Physical Society Division of Fluid Dynamics, 23-26 Nov. 2019, Seattle, Washington.
- Chung, H., **Mandel, T.L.,** & Koseff, J.R. “Non-local impacts of gaps on submerged canopy flow.” (talk) 72nd Meeting of the American Physical Society Division of Fluid Dynamics, 23-26 Nov. 2019, Seattle, Washington.
- Mandel, T.L.,** Zhou, D.Z., Waldrop, L., Theillard, M., Kleckner, & Khatri, S. “Retention of rising oil droplets in stratification” (talk, poster). Gordon Research Seminar & Conference on Coastal Ocean Dynamics, 15-21 June 2019, Manchester, NH.
- Mandel, T.L.,** Gakhar, S., Chung, H., Rosenzweig, I., & Koseff, J.R. “The surface signature of a canopy-generated shear instability.” (talk) 71st Meeting of the American Physical Society Division of Fluid Dynamics, 18-20 Nov. 2018, Atlanta, GA.
- Mandel, T.L.** “Hydrodynamics of aquatic canopies through the lens of the free surface.” (talk) Yosemite Fluids Meeting, 14-16 Sept. 2018, Wawona, CA.
- Mandel, T.L.,** Gakhar, S., Chung, H., Rosenzweig, I., & Koseff, J.R. “Characterizing submerged ecosystems and their hydrodynamics from surface disturbances.” (talk) Ocean Sciences Meeting, 11-16 Feb. 2018, Portland, OR.
- Mandel, T.L.,** Chung, H., & Koseff, J.R. “The evolution of the surface signature of a canopy-generated shear instability using free-surface synthetic Shlieren.” (talk) 70th Meeting of the American Physical Society Division of Fluid Dynamics, 19-21 Nov. 2017, Denver, CO.

- Mandel, T.L.**, Rosenzweig, I., Zarama, F.J.M., Chung, H., & Koseff, J.R. "Characterizing submerged ecosystems from surface disturbances: a glimmer of hope." (poster) Gordon Research Conference on Coastal Ocean Dynamics, 11-16 June 2017, Biddeford, ME.
- Mandel, T.L.**, Rosenzweig, I., Oullette, N.T., & Koseff, J.R. "Free-surface tracking of submerged features to infer hydrodynamic flow characteristics." (talk) 69th Meeting of the American Physical Society Division of Fluid Dynamics, 20-22 Nov. 2016, Portland, OR.
- Mandel, T.L.**, Suckale, J., & Koseff, J.R. "Modification of surf zone turbulence and the undertow by a vegetative canopy." (talk) Young Coastal Scientists & Engineers Conference - Americas, 13-15 June 2016, Queen's University, Ontario, Canada.
- Mandel, T.L.**, Rosenzweig, I., Zarama, F.J.M., Koseff, J.R. & Suckale, J. "Modification of surf zone turbulence and the undertow by a vegetative canopy." (poster) Ocean Sciences Meeting, 21-26 Feb. 2016, New Orleans, LA.
- Mandel, T.L.**, Weitzman, J.S., & Koseff, J.R. "Exploration of a novel high-resolution measurement technique for detecting the impact of heterogeneous bottom features on the free surface." (poster) Ocean Sciences Meeting, 23-28 Feb. 2014, Honolulu, HI.

TEACHING

OE 753/853: Ocean Hydrodynamics	Spring 2020, 2021, 2022
OE 757/857: Coastal Engineering & Processes	Spring 2022
IAM 550: Introduction to Engineering Computing	Fall 2020, 2021

ADVISING

PhD Students

- Zeeshan Saeed, Ph.D. Mechanical Engineering (expected 2025). *Project title: "Surfacing dynamics of turbulent buoyant plumes."*
- Vivek Bheeroo, Ph.D. Ocean Engineering (expected 2025). *Project title: "Laboratory investigation of the surface expression of submerged aquatic vegetation."*

Masters Students

- Matthew Dowling, M.Eng. Ocean Engineering (2022). *Project title: "Exploring the efficacy of bubble curtains in turbidity control."*

Undergraduate Students

- Matthias Page, Undergraduate Research Assistant (UNH BSOE student; Jan. 2020-May 2022). *Project title: "Wavemaker and flume development for environmental flow studies."*
- Jobel Villafane Pagan, Undergraduate Research Intern (UPRM Geology student; Summer 2021). *Project title: "Settling and wake dynamics of oceanic particles in density stratification."*
- Jenna Ehnot, Undergraduate Research Assistant (UNH BSOE student; June 2021-May 2022). *Project title: "Seasonal changes in the biomechanical properties of dune and salt marsh plants."*
- Aidan Thayer, Undergraduate Research Assistant (UNH BSOE student; August 2021-May 2022). *Project title: "Design and construction of full- and bench-scale experimental flumes."*
- Senior Project Team of 6 ME/OE undergraduate students (Sept. 2020-May 2021). *Project title: "Effectiveness of bubble screens on turbidity control in dredging."*
- Senior Project Team of 5 ME/OE/DBS undergraduate students (Sept. 2021-May 2022). *Project title: "Designing, building, & testing a variable-flow swim chamber for lumpfish."* (Primary advisor E. Fairchild)

Postdoctoral Scholars

Dr. Theresa Oehmke, Mechanical Engineering (Co-advised with C. White).

PhD Thesis Committee Member

Elizabeth Weidner, Ph.D. Oceanography (expected 2022; Advisors: L. Mayer, T. Weber).

Savannah DeVoe, Ph.D. Ocean Engineering (expected 2023; Advisor: D. Foster).

SERVICE AND LEADERSHIP

Mechanical Engineering faculty representative, College of Engineering & Physical Sciences committee on diversity, equity, & inclusion (2020-present)

Proposal review panelist, National Science Foundation (2020, 2021)

Reviewer for *Journal of Fluid Mechanics*, *JFM Rapids*, *Physical Review Fluids*, *Journal of Geophysical Research: Oceans*, *Journal of Hydraulic Research*, *Water Resources Research*

Session chair Ocean Sciences Meeting 2022, "Physical processes driving transport and dispersal of particles in the ocean"

Student lunch leader APS DFD 2021, Student networking and networking lunch

Session chair APS DFD 2021, "Turbulence: Buoyancy-driven flows, stratification, rotation, & magnetic fields"

Participant Ocean Mapping & Engineering pod for Unlearning Racism in the Geosciences (URGE) (Spring 2021)

Invited speaker for UNH Society of Women Engineers (November 2020)

Session chair Ocean Sciences Meeting 2020, "Physical processes governing the distribution and transport of dispersed particles in the ocean"

Session chair APS DFD 2017, "Free-surface flows: Turbulence & mixing"

Stanford Women in Fluid Dynamics, Co-Founder & President (2015-2017), **Speaker Liaison** (2017-2018). Awarded grants totaling \$6500 from the Stanford Diversity Innovation Fund program, as well as additional funding from the Stanford Mechanical Engineering and Civil & Environmental Engineering departments. Activities include hosting invited speakers, interdepartmental networking, and outreach to local high schools and community colleges.