

## JOHANNA H. ROSMAN

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### EDUCATION

Ph.D., Civil and Environmental Engineering, Stanford University, 2007  
M.S., Environmental Fluid Mechanics and Hydrology, Stanford University, 2000  
B.S./B.E. (1<sup>st</sup> class Honours), Physics/Environmental Engineering, University of Western Australia, 1998

### PROFESSIONAL APPOINTMENTS

2021-present Associate Professor, Earth, Marine and Environmental Sciences, UNC Chapel Hill.  
2019-2021 Associate Professor, Institute of Marine Sciences, UNC Chapel Hill  
2019-2021 Joint Appointment, Department of Marine Sciences, UNC Chapel Hill  
2013-2021 Joint Appointment, Institute for the Environment, UNC Chapel Hill  
2017-2019 Research Associate Professor, Institute of Marine Sciences, UNC Chapel Hill  
2013-2019 Adjunct Appointment, Department of Marine Sciences, UNC Chapel Hill  
2009-2017 Research Assistant Professor, Institute of Marine Sciences, UNC Chapel Hill  
2007-2009 Postdoctoral Scholar, Environmental Fluid Mechanics Laboratory, Stanford University

### PUBLICATIONS (\* postdoc, \*\* graduate student, \*\*\* undergraduate student)

Wang, J.\*\* , **J.H. Rosman**, J.L. Hench, N.S. Hall, A.C. Whipple, R.A. Luettich Jr., in review, Interplay between wind-driven advection and mixing of salinity and oxygen in a microtidal estuary, *J. Geophys. Res. Oceans*.

Duvall\*\*, M.S., **J.H. Rosman**, and J.L. Hench, in review, Observations of combined wave-current flow interactions with a high relief coral reef bottom, *J. Geophys. Res.*

Haddad\*\*, J., **J.H. Rosman**, R.L. Luettich, and C.M. Voss, 2024, Canopy drag parameterization from field observations for modeling wave transformation across salt marshes, *Coastal Eng.* 107: 104407.

Viehman, T.S., B.G. Reguero, H.S. Lenihan, **J.H. Rosman**, C.D. Storlazzi, E.A. Goergen, M.F. Canals Silander, S.H. Groves, D.M. Holstein, A.W. Bruckner; J.V. Carrick, B.K. Haus, J.B. Royster, M.S. Duvall, W.I. Torres, and J.L. Hench, 2023, Coral Restoration for Coastal Resilience: Integrating Ecology, Hydrodynamics, and Engineering at Multiple Scales. *Ecosphere*: 14(5): e4517.

Yu\*, X., **J.H. Rosman**, and J.L. Hench, 2022, Boundary layer dynamics and bottom friction in combined wave current flow over large roughness elements, *J. Fluid Mech.* 931. doi: 10.1017/jfm.2021.941

Duvall\*\*, M.S., **J.H. Rosman**, and J.L. Hench, 2020, Estimating geometric properties of coral reef topography using obstacle- and surface-based approaches, *J. Geophys. Res.* doi: 10.1029/2019JC015870.

Duvall\*\*, M.S., J.L. Hench, and **J.H. Rosman**, 2019, Collapsing complexity: quantifying multi-scale properties of reef topography, *J. Geophys. Res.* doi: 10.1029/2018JC014859.

- Paxton, A.B., J.C. Taylor, C.H. Peterson, S.R. Fegley, **J.H. Rosman**, 2019, Consistent spatial patterns in multiple trophic levels occur around artificial habitats. *Mar. Ecol. Progr. Ser.* 611: 189-202.
- Yu\*, X., **J.H. Rosman**, and J.L. Hench, 2018, Interaction of waves with idealized high-relief bottom roughness, *J. Geophys. Res.* 123: 3038–3059.
- Rosman, J.H.**, and G.P. Gerbi, 2017, Interpreting fixed-location observations of turbulence advected by waves: Insights from spectral models, *J. Phys. Oceanogr.* 47: 909-931.
- Housego\*\*\*, R.M., and **J.H. Rosman**, 2016, A Model for understanding the effects of sediment dynamics on oyster reef development, *Estuaries and Coasts* 39(2): 495-509.
- Berg, P., C.E. Reimers, **J.H. Rosman**, M. Huettel, T. Özkan-Haller, M.L. Delgard, and M.A. Reidenbach, 2015, Time lag corrections of aquatic eddy covariance data measured in presence of waves, *Biogeosciences* 12: 6721-6735.
- Rosman, J.H.**, M.W. Denny, R.B. Zeller, S.G. Monismith, and J.R. Koseff, 2013, Interaction of waves and currents with a kelp forest (*Macrocystis pyrifera*): Insights from a dynamically scaled laboratory model, *Limnol. Oceanogr.* 58(3): 790-802.
- Hench, J.L., and **J.H. Rosman**, 2013, Observations of spatial flow patterns at the coral colony scale on a shallow reef flat, *J. Geophys. Res.*, 118(C3): 1142-1156.
- Kirincich, A., and **J.H. Rosman**, 2011, A comparison of methods for estimating Reynolds stress from ADCP measurements in wavy environments, *J. Atmos. Oceanic Technol.* 28(11): 1539-1553.
- Rosman, J.H.**, and J.L. Hench, 2011, A framework for understanding drag parameterizations for coral reefs, *J. Geophys. Res.* 116, C08025, doi:10.1029/2010JC006892.
- Rosman, J.H.**, S.G. Monismith, M.W. Denny and J.R. Koseff, 2010, Currents and turbulence within a kelp forest (*Macrocystis pyrifera*): Insights from a dynamically scaled laboratory model, *Limnol. Oceanogr.* 55(3): 1145-1158.
- Hench, J.L., and **J.H. Rosman**, 2010, Analysis of bottom-track and compass error in a self-contained diver navigation console, *J. Atmos. Oceanic Technol.* 27(7): 1229-1238.
- Monismith, S.G., K.A. Davis, G.G. Shellenbarger, J.L. Hench, N.J. Nidzieko, A.E. Santoro, M.A. Reidenbach, **J.H. Rosman**, R. Holtzman, C.S. Martens, N.L. Lindquist, M.W. Southwell and A. Genin, 2010, Flow effects on benthic grazing on phytoplankton by a Caribbean reef, *Limnol. Oceanogr.* 55(5): 1881-1892.
- Rosman, J.H.**, J.L. Hench, J.R. Koseff and S.G. Monismith, 2008, Extracting Reynolds stresses from acoustic Doppler current profiler measurements in wave-dominated environments, *J. Atmos. Oceanic Technol.* 25(2): 286-306.
- Gaylord, B.P., **J.H. Rosman**, D.C. Reed, J.R. Koseff, J. Fram., S. MacIntyre, K. Arkema, C. McDonald, M. Brzezinski, J.L. Largier, P.T. Raimondi, S.G. Monismith and B. Mardian, 2007, Spatial patterns of flow and their modification within and around a giant kelp forest, *Limnol. Oceanogr.* 52(5): 1838-1852.
- Rosman, J.H.**, J.R. Koseff, S.G. Monismith and J. Grover, 2007, The Effects of a kelp forest (*Macrocystis pyrifera*) on coastal hydrodynamics and transport, *J. Geophys. Res.* 112: C02016, doi:10.1029/2005JC003430.
- Crimaldi, J.P., J.K. Thompson, **J.H. Rosman**, R.J. Lowe and J.R. Koseff, 2002, Hydrodynamics of larval settlement: the influence of turbulent stress events at potential recruitment sites, *Limnol. Oceanogr.* 47(4): 1137-1151.

**Rosman, J.H.**, P. Jacobs and G.N. Ivey, 1999, The Effects of a surface-driven ambient circulation on open ocean convection, *Geophys. Astro. Fluid Dyn.* 91: 199-222.

**CONFERENCE PRESENTATIONS** (Past 5 years: \* postdoc, \*\* graduate student, \*\*\* undergraduate student)

Hart\*\*, S., **J.H. Rosman**, X. Yu, and J.L. Hench, Feb 2024, Friction associated with oscillatory flow over a multiscale random bottom, AGU Ocean Sciences Meeting (poster).

Malila\*, M.P., **J.H. Rosman**, A.C. Whipple, G.W. Wilson, F. Feddersen, and J.H. MacMahan, Feb 2024, Modification of wave properties over a sub-wavelength rock in the nearshore, AGU Ocean Sciences Meeting (talk).

Jeffress\*\*, N.S., **J.H. Rosman**, T.S. Kalra, and J.L. Hench, Feb 2024. Deconstructing bottom friction parameterizations in coral reef wave models. AGU Ocean Sciences Meeting (talk).

Wang\*\*, J., **J.H. Rosman**, J.L. Hench, N.S. Hall, A. Whipple, R. Luetlich, Feb 2024, Interplay between wind-driven advection and mixing of salt and dissolved oxygen in a microtidal estuary, AGU Ocean Sciences (poster).

Cope, L., X. Yu, **J.H. Rosman**, J.L. Hench, Feb 2024, Oscillatory flow over idealized multiscale high-relief topography, AGU Ocean Sciences Meeting (poster).

Jeffress\*\*, N.S., **J.H. Rosman**, T.S. Kalra, and J.L. Hench, Nov 2023. Deconstructing bottom drag parameterizations in wave models over reef substrates. Biennial Conference of the Coastal and Estuarine Research Federation (talk).

Malila\*, M., **J.H. Rosman**, A. Whipple, et al., May 2023, Field measurements of wave transformation around a submerged nearshore rock formation, Waves in Sea Environments meeting (poster).

Badaró Marques\*, O., J. MacMahan, F. Feddersen, et al. (incl. **J.H. Rosman**), Dec 2022, Wave transformation and circulation on rough rocky seabeds: Initial results from ROXSI, AGU Annual Meeting (poster).

Haddad\*\*, J., **J.H. Rosman**, R.A. Luetlich, C.M. Voss, Nov 2021, Observations and modeling of wave transformation across salt marshes, Biennial Conference of the Coastal and Estuarine Research Federation (talk).

Haddad\*\*, J., **J.H. Rosman**, R.A. Luetlich, C.M. Voss, Oct 2021, Observations and modeling of wave transformation across salt marshes, American Shore and Beach Preservation Association Conference, New Orleans, Louisiana (talk).

**Rosman, J.H.**, X. Yu\*, and J.L. Hench, Feb 2020, Interaction of combined waves and current with high-relief bottom roughness, AGU Ocean Sciences Meeting, San Diego, CA (talk).

Duvall\*\*, M.S., **J.H. Rosman**, and J.L. Hench, Feb 2020, Reconciling Reef Representations: A Comparison of Obstacle and Surface Models, and Consequences for Drag, AGU Ocean Sciences Meeting, San Diego, CA (talk).

Haddad\*\*, J., **J.H. Rosman**, R.A. Luetlich, and C.M. Voss, Nov 2019, Impacts of incident wave and vegetation properties on wave attenuation by salt marshes, Biennial Conference of the Coastal and Estuarine Research Federation, Mobile, AL (talk).

Haddad\*\*, J., **J.H. Rosman**, R.A. Luetlich, and C.M. Voss, Nov 2019, Impacts of incident wave and vegetation properties on wave attenuation by salt marshes, North Carolina Coastal Conference, Wilmington, NC (talk).

**Rosman, J.H.**, J. Haddad\*\*, R. Luettich, and C.M. Voss, Oct 2019, Modelling wave transformation across vegetated shorelines to aid living shoreline evaluation and design, Living Shorelines Technology Transfer Workshop, Beaufort, NC (talk).

**Rosman, J.H.**, X. Yu\*, M. Duvall\*\*, and J.L. Hench, Jun 2019, Interaction of waves and current with multi-scale reef topography, Gordon Conference on Coastal Ocean Dynamics, Manchester, NH (poster).

## GRANTS

### *Extramural Grants Awarded*

Collaborative Research: Combined waves and currents over multi-scale topography: from boundary layer dynamics to parameterization, NSF Physical Oceanography program, \$313,734, 9/2021-8/2024. PI.

ROXSI: ROcky Shores eXperiments and SIMulations, Office of Naval Research/Scripps Institution of Oceanography, \$1,200,706, 5/2021-4/2026, UNC PI. Lead PIs: J. MacMahan and F. Feddersen.

Observing multi-scale ocean dynamics off rough rocky coastlines: obstacle-scale pressure and velocity sensor array, Office of Naval Research, \$363,035, 8/2021-8/2023. PI.

Understanding thermal mixing, water quality improvements, and algae dynamics with the pulsing of releases from Jordan Reservoir, Army Corps of Engineers, \$119,174, 9/2020-9/2023, co-PI. PI: N. Hall (PI).

A process-based model of wind wave and boat wake attenuation to aid evaluation and design of living shorelines, NC Sea Grant, \$119,991, 2/2020-1/2024, PI.

Understanding and predicting changes in coastal marsh ecosystem services: realizing the combined effects of sea-level rise, tides, and storm surge on marshes and their capacity to protect shorelines, NOAA Ecological Effects of Sea Level Rise program, \$598,885, 9/2015-8/2019, co-PI. PI: C. Voss.

Collaborative Research: Relating topographic complexity and circulation patterns on coral reefs from colony-scale to reef-scale, NSF Physical Oceanography program, \$292,101, 9/2014-8/2019, PI.

Understanding and predicting the frequency and duration of hypoxic exposure in fish habitats in the lower Neuse River Estuary, NC Division of Marine Fisheries Coastal Recreational Fishing License Program, \$196,763, 7/2015-6/2019, PI.

Idealized simulations of turbulence advected by surface waves: Implications for interpreting turbulence measurements in shallow water, NSF Physical Oceanography program, \$184,988, 4/2011-3/2016, PI.

Three dimensional measurements of rugosity on the Moorea reef using a mechanical scanning sonar, Moorea Coral Reef LTER small grant, 6/2014-9/2014, \$3,100, 2014, PI.

Spatial flow patterns on tropical reefs, PADI Foundation, \$6,740, 5/2012-11/2013, PI.

Small-scale flow and scalar patterns within and around coral colonies, Moorea Coral Reef LTER small grant, \$10,000, 12/2009-12/2010.

## TEACHING

### *Classes Taught*

- Dynamics of Ocean Waves: Spring 2024.
- Interdisciplinary Seminar in Marine Sciences: Spring 2024
- Marine Life in a Fluid World, Instructor: Spring 2023.
- Environmental Capstone, Instructor or co-instructor: fall 2011, 2012, 2013, 2015, 2018, 2019, 2022. Course coordinator and mentor of physics component: each fall 2012-2019; Projects led or co-led:
  - Evaluation of living shorelines in Bogue Sound to develop a recommendation for the IMS-DMF waterfront (2022)
  - Processes influencing water quality and ecosystem health in Town Creek, Beaufort (2019)
  - Processes controlling water quality in the Atlantic Beach canal system (2018)
  - Distribution and impacts of marine debris along Carteret County shorelines (2015)
  - Environmental effects of floating docks in a commercial marina (2013)
  - Processes controlling water quality in the Pine Knoll Shores canal system (2012)
  - Boat wake effects on shallow water environments (2011)
- Environmental Seminar, Seminar series organizer (10-12 invited speakers per semester), discussion leader and faculty mentor, each fall 2012-2021.
- Human Impacts on Estuarine Processes (team taught), Instructor of Estuarine Circulation module (2 weeks), each fall 2010-2022.
- Estuarine and Coastal Marine Ecology (team taught), Instructor of Role of Water Motion in Marine Ecology module (2 weeks), each fall 2012-2021.

### *Graduate Students Advised*

- Sean Hart, M.S. candidate, Marine Sciences, 2022-present. Thesis topic: Boundary layers and bottom friction in combined waves and currents over multiscale topography.
- Jianxing Wang, Ph.D. candidate, Marine Sciences, 2021-present. Thesis topic: Circulation, salinity and oxygen dynamics in wind-dominated estuaries.
- Jana Haddad (co-advised with R. Luettich), Ph.D., Marine Sciences, 2022. Thesis topic: Wave transformation in salt marshes.
- David Marshall, Ph.D., Marine Sciences, 2018. Thesis topic: Dynamics and mixing in a micro-tidal wind-forced estuary.

### *Graduate Student Committees*

- Nadya Gutierrez, M.S. candidate, Earth and Marine Sciences, UNC-CH, 2023-present.
- Zachary Hudspeth, M.S. candidate, Marine Sciences, UNC-CH, 2023-present.
- Camryn Blawas, M.S. candidate, Ecology, UNC-CH, 2023-present.
- Yubeen Jeong, Ph.D. candidate, Marine Sciences, UNC-CH, 2022-present.
- Eve Eisemann, Ph.D. candidate, Geological Sciences, UNC-CH, 2022-present.
- Nicolas Jeffress, Ph.D. candidate, Marine Science and Conservation, Duke University, 2022-present.
- Mingying Chuo, Ph.D. candidate, Marine Sciences, UNC-CH, 2021-present.
- Gibson Leavitt, M.S. candidate, Marine Sciences, UNC-CH, 2021-present.
- Yun Chang, Ph.D. candidate, Marine Sciences, UNC-CH, 2020-2022.
- Lu Han, Ph.D. candidate, Marine Sciences, UNC-CH, 2017-2022.
- Shuo Li, Ph.D. candidate, Marine Sciences, UNC-CH, 2021.

- Walter Torres, Ph.D., Marine Science and Conservation, Duke University, 2018-2021.
- Amy Yarnall, Ph.D., Ecology, UNC-CH, 2018-2021.
- Martin Benavides, Ph.D., Marine Sciences, UNC-CH, 2015-2020.
- Sarah Donaher, M.S., Marine Sciences, UNC-CH, 2017-2020.
- Melissa Duvall, Ph.D., Marine Science and Conservation, Duke Univ., 2016-2020.
- Elaine Monbureau, Ph.D., Marine Sciences, UNC-CH, 2016-2020.
- Adam Rok, M.S., Marine Sciences, UNC-CH, 2016-2019.
- Barbara Zemskova, Ph.D., Marine Sciences, UNC-CH, 2018.
- Avery Paxton, Ph.D., Biology, UNC-CH, 2013-2018.
- Jie Gao, Ph.D., Marine Sciences, UNC-CH, 2011-2018.
- Michelle Brodeur, Ph.D., Marine Sciences, UNC-CH, 2014-2016.
- Stephen Lockhart, Ph.D. candidate, Marine Sciences, UNC-CH, 2013-2016.
- Erika Young, Ph.D., Marine Sciences, UNC-CH, 2010-2016.
- Andrea Anton, Ph.D., Ecology, UNC-CH, 2012-2013.

#### *Honors Theses Advised*

- Joanna Carter, Highest Honors, 2022, Environmental Science. Thesis: Wave transformation across living shoreline sills.
- Nathalie Eegholm, Honors, 2018, Biology. Thesis: Modeling oxygen dynamics and predicting hypoxia in the Neuse River Estuary.
- Katharine Krovetz, Honors, 2017, Environmental Science. Thesis: Quantifying the capacity of marshes to protect shorelines from waves.
- Rachel Housego, Highest Honors, 2014, Environmental Science. Thesis: Investigating feedbacks between sediment dynamics and oyster reef growth using an idealized differential equation model.

#### *Other Undergraduate Research Advised*

- Kylie Showalter, Environmental Science major, UNC-CH, 2022.
- Max Buglisi, Physics major, UNC-CH, 2021.
- Zachary Hudspeth, Environmental Science/Applied Math major, UNC-CH, 2020.
- Thomas Dix, Biology major, UNC-CH, 2019.
- Zack Saklad, Economics major, UNC-CH, 2018.
- Patrick Combe, Mechanical Engineering major, Duke University, 2015-2016.
- Roy Tian, Applied Math/Physics major, UNC-CH, 2014.
- Kyle Hinson, Environmental Science major, UNC-CH, 2013.
- Elizabeth Paul, NSF-REU, Ocean Engineering major, University of Rhode Island, 2013.
- Adam Balfour, Environmental Science major, UNC-CH, 2012.
- Christopher Cook, Environmental Science major, UNC-CH, 2012.
- Jeremy Pivor, summer REU, co-advised, Biology major, Washington University, MO, 2011.
- Shelby Marshall, Environmental Science major, UNC-CH, 2010.

## PROFESSIONAL SERVICE

### *Departmental and University Service*

- Director of Graduate Admissions, 2021-present.
- Graduate Program Committee, Earth, Marine and Environmental Sciences, 2022- present.
- Dive Control Board, UNC AAUS dive program, 2017-present.
- Faculty Search Committee, Earth, Marine and Environmental Sciences, 2023.
- Undergraduate planning task force, 2021-2022. Development of undergraduate curriculum for the new Earth, Marine and Environmental Sciences department.
- Reviewer and panelist, UNC Summer Undergraduate Research Fellowship, 2022.
- Curriculum and Visioning Committee for new department formed from a merger of the Institute of Marine Sciences, Department of Marine Sciences, and Geology, 2020-2021.
- IMS fall seminar series organizer, each fall, 2012-2021.
- Assistant Director, Institute for the Environment Morehead City Field Site, a semester-long immersive marine science undergraduate program that emphasizes field research. Field site administration, coordination of field site activities, and recruiting, 2012-2019.

### *Service to the Scientific Community*

- Technical review panelist, NSF, 2021.
- Session organizer, Connecting roughness and bathymetry: resolving the often-unresolved interactions between time-varying flow and topography, AGU Ocean Sciences meeting, Portland, OR, 2018.
- Technical review panelist, NSF, 2015.
- Technical review panelist, New York Sea Grant core funding, 2015.
- External international examiner for University of Western Australia PhD thesis, 2015.
- Session organizer and chair, Measuring and understanding turbulence in the presence of surface waves, AGU Ocean Sciences meeting, Portland, OR, 2010.
- Manuscript reviewer (~6/yr)
- Proposal reviewer (~4/yr) for National Science Foundation, Sea Grant.

### *Outreach*

- Girls Exploring Science and Technology (GEST), a graduate student-led 1-day event for high school girls. Faculty mentor, organization team member, and hands-on activity leader, 2019. Panelist, 2023.
- Camps Seagull and Seafarer, summer camps for 7-14 yr-olds that emphasize water sports on the Neuse River estuary. Conducted “Meet a scientist” sessions, ran hands-on estuarine circulation experiments, and coordinated daily Neuse salinity sampling from piers by campers, 2015.
- Visiting oceanographer and “STEM Superstar” role model at the Project Scientist Academy, a summer program for girls aged 4-14 yrs, Charlotte, NC, 2015.
- Generated lesson plans and demonstrated hands-on class for K-12 teachers at the SciREN Researcher Educator Networking event at the NC Aquarium at Pine Knoll Shores 2012, 2013.
- Hands-on demonstrations and talks about ocean circulation for middle- and high-school students at Harkers Island School and Croatan High School, 2012, 2013.
- Hands-on demos of wind- and density-driven flow for school groups visiting IMS and local summer camps 2011-present.