

# RACHEL HOUSEGO

## EDUCATION

- 2021            PhD-*Applied Ocean Science & Engineering* | MIT-WHOI Joint Program  
                  Advisor: Dr. Britt Raubenheimer  
                  Thesis: Barrier Island Groundwater Hydrodynamics
- 2014            BSc. with Highest Honors-*Environmental Science* | BA-*Mathematics*  
                  Minor-*Marine Science* | University of North Carolina at Chapel Hill

## RESEARCH INTERESTS

Coastal hydrogeology, groundwater-surface water interactions, aquifer salinization, storm impacts, coastal flooding, transport of sediment and pollutants, and community science.

## HONORS & AWARDS

- 2017            National Science Foundation Graduate Research Fellowship
- 2015            MIT Von Damm Fellowship
- 2014            UNC Curriculum for the Environment and Ecology Departmental Award  
                  for Outstanding Research
- 2013            Phi Beta Kappa
- 2013            Tom and Elizabeth Long Excellence Fund
- 2012            Mary and Watts Hill Jr. Student Internship fund
- 2012            NOAA Hollings Scholarship

## PUBLICATIONS

### *Peer-Reviewed Publications*

Published:

- [1] **Housego R**, Raubenheimer B, Elgar S, Cross S, Legner C. & Ryan D. 2021. *Coastal flooding generated by ocean wave-and surge-driven groundwater fluctuations on a sandy barrier island*. Journal of Hydrology, 603.
- [2] **Housego R** & Rosman J, 2016, *A model for understanding the effects of sediment dynamics on oyster reef development*, Estuaries and Coasts 39(2): 395-409.

Under Review:

- [3] Paldor A, Stark S, Florence M, Raubenheimer B, Elgar S, **Housego R**, Fredericks R, & Michael H.A. *Hydrogeologic controls on the spatio-temporal variability of surge-induced hydraulic gradients along coastlines: implications for beach surface stability*

In prep:

- [4] **Housego R**, Raubenheimer B, Elgar S & Wu M. *Propagation of storm and tide fluctuations in an intermediate depth aquifer*
- [5] **Housego R**, Raubenheimer B and Elgar S. Observations of fluid exchange between the ocean, sound and aquifer in a barrier island system.

*Other Publications:*

- [1] Contributor: Integrated Science Assessment for Sulfur Oxides-Health Criteria. U.S. Environmental Protection Agency, December 2017.
- [2] Contributor: Integrated Science Assessment for Oxides of Nitrogen-Health Criteria. U.S. Environmental Protection Agency, January 2016.

## GRANTS

- [1] **Housego R**, Raubenheimer B. Coastal Groundwater, Water Quality and Sediment Transport During Storms. Funded by USACE FY2019.
- [2] Raubenheimer B, Elgar S, **Housego R**. Total Groundwater Levels and Flooding During Major Storms. Funded by USACE FY2018.

## PRESENTATIONS

- [1] Housego R, Shi F, Paldor A, Frederiks R, & Michael H *Impact of ocean surge profiles on overwash-driven salinization in coastal aquifers*, Frontiers in Hydrology Meeting, San Juan, PR, USA, June 2022.
- [2] Housego R, Shi F, Paldor A, Frederiks R, & Michael H *Impact of ocean surge profiles on overwash-driven salinization in coastal aquifers*, Frontiers in Hydrology Meeting, San Juan, PR, USA, June 2022.
- [3] Raubenheimer R, Housego R, Elgar S, Gorrell L *Coastal groundwater: An oceanographer's perspective* Scripps Institute of Oceanography, May 2022
- [4] Housego R, Cross S, Legner C, Ryan D, Raubenheimer B, Elgar S, *iFlood-A citizen science approach to understanding groundwater contributions to flooding on barrier islands*. Coastal Solutions Workshop: Modeling, Prediction, and Sensor Networks for Coastal Flooding in the US East Coast. July 2020.
- [5] **Housego R**, Raubenheimer B, Elgar S, *Storm impacts on a barrier island aquifer*. American Shore and Beach Preservation Association Conference. Myrtle Beach, SC. October 2019.
- [6] **Housego R**, Raubenheimer B, Gorrell L, Elgar S, *Storm and tide effects on a coastal aquifer* International Union of Geodesy and Geophysics Conference. Montreal, Canada. July 2019.
- [7] **Housego R**, Raubenheimer B, Gorrell L, Elgar S, *Storm and tide effects on a coastal aquifer*. Young Coastal Scientists and Engineers Conference. Merida, Mexico. November 2018
- [8] **Housego R**, Raubenheimer B, Elgar S, Gorrell L, Wadman H, McNinch J, and Brodie K. *Barrier island groundwater*. International Conference on Coastal Engineering, Baltimore, MD. July 2018.

- [9] Maxwell, A, **Housego, R**, Benson A, Lassiter M, and Greaver T. 2016. *Ecotoxicological dose-response relationships from the aquatic acidification literature*. Invited talk at: Emerging Topics Seminar. US EPA, Research Triangle Park, NC. November 2016.
- [10] Maxwell A, **Housego R**, Benson A, Lassiter M, and Greaver T. *Ecotoxicological dose-response relationships from the aquatic acidification literature*. International Conference on Acid Rain Deposition. October 2015.
- [11] Oakes, M.M., Solomon D, Dutton S.J., Datko-Williams L, Gootman K.S., **Housego, R**, and Long, T. *Temporal and spatial variability of 5-minute SO<sub>2</sub> concentrations with relationships to hourly concentrations and health benchmarks*. International Society of Exposure Science Annual Meeting. Henderson, NV, October 2015.
- [12] Datko-Williams L, Alman B, **Housego R**, and Dutton S.J. *Spatial clustering of urban and rural sites in the United States by criteria air pollutant concentrations*. Air & Waste Management Association Conference. Raleigh, NC. June 2015.
- [13] Arriola J, Cable J, Bost M, and **Housego R**. *Sediment accretion and carbon burial rate variability with a Florida salt marsh: Econfina-Aucilla River Estuary*. Journal of Aquatic Sciences Meeting. Portland, OR. May 2014.
- [14] Felker-Quinn E, Lassiter M, **Housego R**, and Maxwell A. *Links between plant invasion, anthropogenic nitrogen enrichment, and wildfires: a systematic review*. American Geophysical Union Conference. San Francisco, CA. December 2014.
- [15] **Housego R** and Rosman J. *Investigating feedbacks between sediment dynamics and oyster reef growth using an idealized 1-d model*. Biennial Conference of the Coastal and Estuarine Research Federation. November 2013.
- [16] **Housego R**, Emanuelson L, and Hoover B. *Interpreting trends in water quality data from Snapshot Day in the Monterey Bay National Marine Sanctuary*. NOAA Science and Education Symposium. August 2013.

## TEACHING

### Hydrogeology Co-instructor (GEOL 428) University of Delaware Spring 2021

Mixed upper level undergrad and grad course (~30 students) aimed at understanding the basic principles of groundwater hydrology. Redesigned curriculum to include active learning activities in lectures and assessments.

**MIT Kaufman Teaching Certificate** Spring 2018A series of practice-based workshops where we learned and implemented evidence-based teaching techniques. Received individualized feedback on teaching methods from instructor and peers during microteaching sessions on earth science topics.

## **RESEARCH EXPERIENCE**

### **Postdoctoral Researcher 2021-Present**

*University of Delaware College of Earth, Ocean and Environment*

Using a coupled groundwater-surface water numerical model to assess salinization threats from surge-driven overwash, saltwater intrusion, and groundwater pumping decisions to water in the changing coastal environment of Delaware.

### **Graduate Research Assistant 2015-2021**

*Woods Hole Oceanographic Institution*

Used field observations and numerical models to characterize the hydrodynamics of groundwater in a barrier island system in response to waves, tides and precipitation. Applied results to assess flooding risk across the North Carolina Outer Banks.

### **ORISE Postgraduate Fellow 2014-2015**

*EPA National Center for Environmental Assessment*

Contributed to projects analyzing the health and ecological effects of criteria air pollutants. Project roles included algorithm development, data analysis, literature reviews and GIS mapping.

### **NOAA Intern**

*Monterey Bay National Marine Sanctuary*

Analyzed spatial and temporal trends in river water quality. Assisted with volunteer programs to educate the public about marine life in the sanctuary.

### **Undergraduate Researcher 2012-2014**

*Rosman Lab-UNC Institute of Marine Science*

Used a numerical model to investigate the relationship between initial oyster reef height, sedimentation, and reef survival (Honors Thesis). Worked in a team to collect hydrodynamic measurements in a local canal and analyzed how residence times impacted water quality (Capstone Project).

### **Lab Assistant 2011-2014**

*Cable Lab-UNC Department of Marine Science*

Assisted with sediment core analysis (LOI, porosity, Lead 210), managed and analyzed data sets, and assisted with fieldwork preparations.

## **FIELD STUDIES**

### **During Nearshore Event Experiment (DUNEX) August 2021**

Deployed buried stacks of paros pressure gauges between the dune toe and the lower swash at the USACE Field Research Facility

### **Barrier Island Groundwater 2015-2019**

Deployed and maintained a cross-island transect of 30 groundwater wells in Duck, NC. Each well contains a CTD to measure water depth, salinity and temperature variations.

### **During Nearshore Event Experiment (DUNEX) Pilot September 2019**

Assisted with deployment of vectors, paros pressure gauges, and RBR data loggers in the swash zone at the USACE Field Research Facility in Duck, NC.

### **Bathymetry in Sippewissett Salt Marsh November 2018**

Helped coordinate drone flights for structure from motion analysis and operated a small surface ROV equipped with a bathymetric echosounder in Sippewissett Salt Marsh as part of a project for an ocean instrumentation course.

### **Submarine Groundwater Discharge on a Barrier Island August 2016**

Assisted with collection of water samples from groundwater, wells, and ocean to investigate submarine groundwater discharge in Duck, NC. Worked as part of a team of divers to deploy a RAD7 sensor on the pier in the surf zone.

### **Nutrient Loading in Bolin Creek Spring 2014**

Collected water samples from seven sites along an urban stream in Chapel Hill to test for nutrients (nitrate, phosphate, DOC). Deployed an ISCO autosampler to collect hourly samples during a precipitation event.

### **Water Quality in the Pine Knoll Shores Canal Fall 2012**

Helped deploy Aquadopps and Lagrangian surface drifters from a small boat in Pine Knoll Shores canal to identify how residence times impacted water quality.

**SERVICE, DIVERSITY & OUTREACH**

University of Delaware Pitch 90 Competition Judge (2021)  
University of Delaware Climate Change Hub Grad Grant Reviewer (2021)  
Unlearning Racism in Geosciences (URGE)-Women in Coastal Science & Engineering Pod (2021)  
MIT Path of Professorship Workshop (2021)  
Science Pen Pal-Letters to a Pre-Scientist (2020)  
JP Ask Mentor (2020)  
WHOI Summer Student Fellow Mentor (Mary Burnham 2019, Elena Perez 2020)  
New England Regional Middle School Science Bowl Volunteer (2015-2019)  
Science Fair Judge-Lakeview Middle School (2017, 2019)  
There's a Scientist in my Classroom Workshop (2019)  
Visiting Scientist-Morse Pond Middle School (2019)  
MIT Sea Grant Blue Lobster Bowl Volunteer (2016, 2018)  
Visiting Scientist-Marguerite E. Small Elementary (2018)  
WHOI Field Trip Co-leader-Dedham Middle School (2018)  
Sisters in STEM Volunteer (2018)  
Society of Women in Marine Science (SWMS) Symposium (2015)  
MIT Xplore Volunteer (2015)  
Outdoor Classroom Durham County Public Schools (2015)

**SKILLS & CERTIFICATIONS**

- AAUS Scientific Scuba Diving (NITROX)
- Programming Languages: MATLAB, Python, R
- ArcGIS
- Groundwater modeling MODFLOW, SEAWAT and GMS
- Coupled surface water-groundwater modeling with HydroGeosphere
- Surface hydrodynamic modeling with NearCOM-TVD
- Numerical model visualization and analysis with Tecplot
- Deployment of field equipment (ADCPs, Vectors, Pressure Gauges, CTDs)
- Experience writing and presenting scientific research