

Mallory Ringham

Postdoctoral Associate, Stony Brook University

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EDUCATION

Ph.D., Chemical Oceanography , MIT & Woods Hole Oceanographic Institution (WHOI)	2022
M.S., Earth Sciences , Syracuse University	2015
B.S., Physics & Chemical Engineering, minor in Mathematics , Syracuse University	2013

RESEARCH INTERESTS

- Monitoring and validation of ocean carbon dioxide removal efforts
 - Development of in-situ sensors for marine carbon system observations
 - Marine biogeochemistry, coastal carbon cycling, ocean acidification
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RESEARCH EXPERIENCE

Eisaman Laboratory, Electrical Engineering, Stony Brook University March 2022 - Present
Postdoctoral Associate under the supervision of Dr. Matthew Eisaman

- Experimental investigation of inorganic carbon chemistry as part of SEA MATE, the Safe Elevation of Alkalinity for the Mitigation of Acidification through Electrochemistry
- Responsible for large tank experiments that include the identification of pH and saturation states relevant to brucite and carbonate precipitation induced by the return of alkalinity to seawater
- Sensor testing for monitoring and verifying tank and eventual field deployments includes the use of SAMI-pH units, an automated spectrophotometric pH system, CTDs, and oxygen sensors
- Developed a home-built benchtop open-cell total alkalinity titration system to allow for full resolution of the inorganic carbon system while waiting for seawater bottle sample analysis by collaborators

Wang Laboratory, Marine Chemistry & Geochemistry, WHOI

Guest Investigator March 2022 - Present
Graduate Research Assistant under the supervision of Dr. Zhaohui 'Aleck' Wang 2016 – March 2022

- Currently finalizing publications from thesis work and coordinating submission of seawater chemistry and sensor data to NOAA and NSF BCO-DMO data portals
- Currently advising on the continuation of abiotic particle-induced carbonate precipitation experiments in the Red Sea. Laboratory and field work conducted during my PhD program was not included in my thesis due to pandemic delays and travel restrictions, but has been picked up by other members of the laboratory.
- *Thesis: "High resolution, in-situ studies of seawater carbonate chemistry and carbon cycling in coastal systems using CHANOS Optical System II"*
- Developed an autonomous in-situ dissolved inorganic carbon sensor for high frequency time-series or mobile platforms, including ROVs, CTD Rosettes, and towed vehicles. Deployments included:
 - ROV exploration of carbonate chemistry conditions across deep coral mounds on the West Florida Slope
 - In-situ coastal mesocosm experiments at the Inter-University Institute of Marine Sciences in Eilat, Israel
 - Small boat towing during high-frequency tidal surface mapping across Waquoit Bay, MA
 - Underway & CTD profiling missions during *R/V Armstrong* maintenance at the PIONEER array, MA
- Advised on installation of commercial carbon sensors including General Oceanics underway $p\text{CO}_2$ system on the *R/V Dong Fang Hong II* and *R/V Armstrong*, and SAMI-pH and $p\text{CO}_2$ sensors for OOI's LTER coastal arrays. Participated in testing and calibration of commercial salinity and oxygen sensors for collaborative squid & jellyfish tagging projects.

E/V Nautilus, Ocean Exploration Trust Summer 2015, 2016, 2017
Science Manager (2017), Manager in Training (2016), Ocean Science and Mapping Intern (2015)

- Participated in three Ocean Networks Canada VENUS/ NEPTUNE cabled observatory maintenance cruises and exploration of Cascadia Margin hydrocarbon seeps and benthic habitats
- Responsible for dive logging, metadata, sample preservation/ inventory, training & lab safety briefings for scientists & interns, and assisting with multibeam mapping & subbottom profiling operations

Hoke Laboratory, Department of Earth Sciences, Syracuse University

2013 – 2015

Graduate Research Assistant under the supervision of Dr. Gregory Hoke

- *Thesis: "Influence of vegetation type and site-to-site variability on soil carbonate clumped isotope records, Andean piedmont of central Argentina (33-34°S)"*
- Field work involved the collection of pedogenic carbonates and installation of multiple in-situ soil & atmospheric monitoring stations in the central Andes of Argentina and Chile
- Conducted clumped and conventional stable isotope analysis of carbonate samples at the University of Washington Isolab, and Picarro Ring-down Spectroscopy of precipitation & river samples at Syracuse University
- Related modeling, "Simulating the effect of seasonal precipitation on soil carbonate formation," broadened thesis to consider study impacts over a larger geographical region

Siegel Laboratory, Department of Earth Sciences, Syracuse University

2012 – 2013

Undergraduate Research Assistant under the supervision of Dr. Donald Siegel

- *Senior Capstone: "A Temporal Geochemical Characterization of Water Sources in the Lives of Storms"*
- ICP-OES & Picarro stable H/O isotope analysis of precipitation during winter storms in Upstate NY

Summer Student Fellow, AOPE, Woods Hole Oceanographic Institution

Summer 2012

Deep Submergence Laboratory Intern under the supervision of Dr. John "Chip" Breier

- *Summer REU project: "An Autonomous Sampler for Multi-time Scale River Chemistry Observations"*
- Development of early prototype autonomous water sampling unit for in situ river chemistry observations

Maye Laboratory, Chemistry Department, Syracuse University

2011 – 2012

Undergraduate Research Assistant under the supervision of Dr. Matthew Maye and Dr. Peter Njoki

- Cyclic voltammetry study of methanol oxidation reactions using gold/silver nanoparticle alloys for alternative fuels

Bader Laboratory, Syracuse Biomaterials Institute, Syracuse University

2010 – 2011

Undergraduate Research Assistant under the supervision of Dr. Rebecca Bader

- Synthesis of oral rotavirus vaccine delivery beads with UV-visible spectrometry & fluorescence spectroscopy analysis

PUBLICATIONS

Wurgaft E., Wang, Z.A., Churchill, J.H., Dellapenna, T.M., Song, S., Du, J., **Ringham, M.C.**, Rivlin, T., and Lazar, B. 2021. Particle triggered reactions as an important mechanism of alkalinity and inorganic carbon removal in river plumes. *Geophysical Research Letters*, doi: 10.1029/2021GL093178)

Ringham, M.C., Hoke, G.D., Huntington, K.W., and Aranibar, J.N., 2016. Influence of vegetation type and site-to-site variability on soil carbonate clumped isotope records, Andean piedmont of central Argentina (33-34°S). *Earth and Planetary Science Letters*, v. 440, pp. 1-11.

Burgener, L., Huntington, K.W., Hoke, G.D., Schauer, A., **Ringham, M.C.**, Latorre, C., and Díaz, F.P., 2016. Variations in soil carbonate formation and seasonal bias over >4 km of relief in the western Andes (30°S) revealed by clumped isotope thermometry. *Earth and Planetary Science Letters*, v. 441, pp. 188-199.

IN PREPARATION

*For submission to *ES&T*, June 2022: **Ringham, M.C.**, Wang, Z.A., Sonnichsen, F., and Lerner, S. An in-situ sensor for high-frequency measurements of dissolved inorganic carbon to enable fine-scale studies of seawater carbonate chemistry.

*For *ACS In Focus*, August 2022: Briggs E. and Ringham, M.C., Observing Marine Inorganic carbon.

*For *GRL*, August 2022: **Ringham, M.C.**, Wang, Z.A. An analysis of carbon dynamics of various end-members and fate of lateral DIC export from tidal salt marshes in Waquoit Bay, MA.

*For *GRL*, September 2022: **Ringham, M.C.**, Wang, Z.A., Jiang, M., and Brooke, S. Exploration of fine-scale biogeochemistry over deep coral reefs on the West Florida slope using integrated ROV-lander-sensor systems.

*For *Marine Chemistry*, November 2022: **Ringham, M.C.**, Wurgaft, E., Evaradson, G., Lazar, B., and Wang, Z.A. An investigation of nuclei-induced carbonate precipitation on natural particles from dust deposition & flash flooding events in the Red Sea.

CONFERENCE PRESENTATIONS (Lead Author)

Ringham, M.C., Wang, Z.A., Sonnichsen, F.N., and Lerner, S. (Feb. 2022). High-frequency time series and spatial mapping of Dissolved Inorganic Carbon using the CHANnelized Optical System II (CHANOS II) in-situ sensor. *Ocean Sciences Meeting*, remote.

Ringham, M.C., Wang, Z.A., Jiang, M., and Brooke, S. (Sept. 2021). Exploration of fine-scale physical-biogeochemical environment over deep coral reefs on the West Florida slope using integrated ROV-lander-sensor systems. *Deep-Sea Biology Symposium*, remote.

Ringham, M.C., Wang, Z.A., Sonnichsen, F.N., Lerner, S., Brooke, S., and Jiang, M. (June 2021). A first look at high resolution, in-situ seawater carbonate chemistry across deep coral reefs using CHANOS II. *Ocean Carbon & Biogeochemistry*, Woods Hole, MA. (*Poster)

Ringham, M.C., Wang, Z.A., Sonnichsen, F.N., Lerner, S., and Morkeski, K. (Feb. 2020). Developing an in-situ sensor for high-frequency measurements of dissolved inorganic carbon, $f\text{CO}_2$, and pH to enable fine-scale studies of seawater carbonate chemistry. *Ocean Sciences Meeting*, San Diego, CA.

Ringham, M.C., Wang, Z.A., Sonnichsen, F.N., Morkeski, K., Lerner, S., McDonald, G., and Wurgaft, E. (Feb. 2018). Developing an in-situ sensor for continuous measurements of total CO_2 on mobile platforms. *Ocean Sciences Meeting*, Portland, OR.

Ringham, M.C., Hoke, G.D., and Huntington, K.W. (Nov. 2015). Timing of pedogenic carbonate formation in arid soils in relation to clumped isotope temperature records. *Geological Society of America*, Baltimore, MD. (*Poster)

Ringham, M.C., Hoke, G.D., Huntington, K.W., and Aranibar, J.N. (Dec. 2014). Influence of environment on soil carbonate clumped isotope records, Andean piedmont of Central Argentina (33-34 °S). *American Geophysical Union Fall Meeting*, San Francisco, CA. (*Poster)

CONFERENCES (Contributing Author)

Wang, Z.A., Wurgaft, E., **Ringham, M.C.**, Song, S., Dellapenna, T., Churchill, J.H., Rivlin, T., and Lazar, B. (Feb 2020). The role of particle-triggered calcium carbonate precipitation in the coastal ocean: A significant factor to seawater carbonate chemistry? *Ocean Sciences Meeting*, San Diego, CA.

Wurgaft, E., Wang, Z.A., **Ringham, M.C.**, Song, S., Churchill, J.H., and Lazar, B. (Feb 2018). Nuclei induced CaCO_3 precipitation in the northern Gulf of Mexico. *Ocean Sciences Meeting*, Portland, OR.

Burgener, L.K., Huntington, K.W., Hoke, G.D., Schauer, A.J., **Ringham, M.C.**, Hidalgo, C.L., and Díaz, F. (Dec 2015). Clumped isotope thermometry reveals variations in soil carbonate seasonal biases over >4km of relief in the semi-arid Andes of Central Chile. *American Geophysical Union Fall Meeting*, San Francisco, CA. (*Poster)

ADDITIONAL INVITED TALKS

Ringham, M.C. (April 2022). Measuring carbon in our coastal waters. Research at the Reserve Home Addition, Waquoit Bay National Estuarine Research Reserve (WBNERR), remote.

Ringham, M.C. (Dec. 2021). Spatial mapping of dissolved inorganic carbon across Waquoit Bay. NERRS Coastal and Ocean Acidification Workgroup Meeting, remote.

Ringham, M.C. (May 2021). First look at high-resolution, in-situ seawater carbonate chemistry across deep coral reefs using Channelized Optical System II. Marine Chemistry & Geochemistry Department Seminar, WHOI, Woods Hole, MA.

CRUISE AND FIELD EXPERIENCE:

- 2021 Local time-series deployments of CHANOS II over 6 months in the Pocasset River, MA
- 2021 R/V *Trifly*. Small-boat towed mapping deployments of the CHANOS II in Waquoit Bay, MA
- 2019 R/V *Point Sur*/ ROV *Global Explorer*. Deployment of the CHANOS II from an ROV and CTD rosette casts during exploration of deep sea coral mounds on the West Florida Slope, Gulf of Mexico
- 2019 Inter University Institute for Marine Science. In-situ coastal mesocosm experiments of abiotic carbonate precipitation on the Red Sea in Eilat, Israel
- 2018 R/V *Armstrong*. Deployment of the CHANOS II as an underway flow-through benchtop system and from CTD rosette casts during a cruise for PIONEER array maintenance and LTER sample collection off Cape Cod, MA

- 2017 R/V *Pelican*. Participated in the deployment of an underway flow-through General Oceanics pCO₂ system, and seawater and sediment sampling for experiments on abiotic carbonate precipitation in the Brazos and Mississippi Rivers and coastal waters in the Gulf of Mexico.
- 2017 R/V *Nautilus*/ ROV *Hercules*. Sailed as a contract science manager during an Ocean Networks Canada VENUS/NEPTUNE cabled observatory maintenance.
- 2017 R/V *Dong Fang Hong 2*. Participated in the installation of an underway flow-through General Oceanics pCO₂ system for a student cruise on the Yellow Sea, Qingdao, China.
- 2016 R/V *Nautilus*/ ROV *Hercules*. Sailed as a contract science manager during an Ocean Networks Canada VENUS/NEPTUNE cabled observatory maintenance, as well as seeps and ecosystems of the Cascadia Margin.
- 2015 R/V *Nautilus*/ ROV *Hercules*. Sailed as an ocean science intern during an Ocean Networks Canada VENUS/NEPTUNE cabled observatory maintenance.
- 2014 Collected soil carbonates and installed soil/ atmospheric stations in the central Andes of Chile, ~29-31°S
- 2013 Collected soil carbonates and installed soil/ atmospheric stations in the central Andes of Argentina, ~31-35°S

TEACHING EXPERIENCE

- Teaching Assistant (2020) and guest lecturer (2021) for 12.702 Elements of Modern Oceanography, MIT-WHOI. Facilitated graduate level discussion sessions, developed and taught course lectures on seawater inorganic carbon chemistry & ocean instrument development.
- Teaching Assistant for EAR 105 Earth Sciences, Syracuse University (2013, 2014). Taught 3-4 recitation sections of ~30 students each, graded problem sets and exams, conducted weekly office hours.
- Mathematic Department Grader, Syracuse University (2010- 2013). Graded for Ordinary Differential Equations, Partial Differential Equations, & Linear Algebra courses, including biweekly office hours.

GRADUATE & UNDERGRADUATE RESEARCH MENTORING

- Stony Brook University, 2022. Current postdoc position includes advising two graduate students in marine chemistry, sensor work, and experimental design related to ocean carbon dioxide removal projects.
- MIT-WHOI, 2017 – 2022. Advised multiple undergraduate students and interns on summer carbon cycling and sensor development projects in the Wang Lab at WHOI. Taught multiple guest Ph.D. and Masters students sampling and laboratory analysis methods for seawater inorganic carbon chemistry.

SERVICE and LEADERSHIP

- 2020 – 2022 WHOI Workplace Climate Committee, graduate student representative
- 2020 – 2022 WHOI, Room Naming Working Group honoring diverse researchers, graduate student representative
- 2017 – 2020 WHOI Women’s Committee, graduate student representative
- 2018 – 2019 MIT-WHOI Student Organization, At-Large Representative
- 2014 – 2015 Museum of Science and Technology (MoST) Volunteer, Syracuse, NY
- 2013 – 2014 Syracuse University Graduate Student Organization, Senator
- 2010 – 2015 Science Olympiad Volunteer, coach, judge, proctor
- 2010 – 2013 Syracuse University Academic Integrity Committee, Student Representative

AWARDS & ACHIEVEMENTS

- 2020 ASLO Limnology & Oceanography Research Exchange (LOREX) Fellowship (research grant to support work at the Interuniversity Institute in Eilat, Israel)
- 2020 WHOI Grassle Fellowship (research grant to support tidal carbon cycling research and sensors deployment in the Waquoit Bay National Estuarine Research Reserve)
- 2019 WHOI Grassle Fellowship (research grant to support CHANOS II deployment over deep coral reefs on the ROV *Global Explorer*)
- 2017 Honorable Mention, Link Foundation Ocean Engineering & Instrumentation Fellowship
- 2015 Marjorie Hooker Award for Outstanding Thesis Proposal in Earth Sciences, Syracuse University
- 2013 George M. Barry Best All-Around Senior Award, College of Engineering & Computer Sciences, Syracuse Univ.
- 2013 Allen J. Barduhn Award for Academic Excellence & Commitment to Service in Chemical Engineering, Syracuse U.
- 2013 Prize for Academic Excellence in Physics, Syracuse University
- 2009 Syracuse University College of Arts & Sciences Coronat Scholar (full ride merit scholarship)