MARGARET L. ESTAPA

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RESEARCH INTERESTS

Oceanic biogeochemical processes mediated by organic and inorganic particles in open ocean, coastal, and near-bottom environments; validation and application of *in situ* optical sensors for particles; autonomous platforms for ocean observations; ocean color remote sensing; photochemical reactions of suspended particulate matter.

EDUCATION

Ph.D., Oceanography, 2011. University of Maine, Orono, ME. Thesis: Photochemical reactions of marine particulate organic matter. Advisors: Dr. Lawrence M. Mayer and Dr. Emmanuel Boss.

B.A., Chemistry, *Magna cum laude*, 2001. Carleton College, Northfield, MN.

PROFESSIONAL APPOINTMENTS

Assistant Professor, Department of Geosciences, Skidmore College, 2016-present

Adjunct Scientist, Marine Chemistry and Geochemistry, Woods Hole Oceanographic Institution, 2016-present.

Visiting Assistant Professor, Department of Geosciences, Skidmore College, 2014-2016

Guest Investigator, Marine Chemistry and Geochemistry, Woods Hole Oceanographic Institution, 2014-2016.

Postdoctoral Investigator, Marine Chemistry and Geochemistry, Woods Hole Oceanographic Institution, 2013-2014.

Postdoctoral Scholar, Marine Chemistry and Geochemistry, Woods Hole Oceanographic Institution, 2011-2013.

Graduate Research Fellow, School of Marine Sciences, University of Maine, Orono, ME, 2008-2011.

Graduate Research Assistant, School of Marine Sciences, University of Maine, Orono, ME, 2005-2008.

Assistant Scientist, Sea Education Association, Woods Hole MA, June 2001 – Aug. 2005.

FELLOWSHIPS AND AWARDS

NASA New Investigator Program in Earth Sciences awardee, 2014.

Woods Hole Oceanographic Institution Postdoctoral Scholarship, 2011.

Dissertation Symposium in Chemical Oceanography selectee, 2010.

NASA Earth Systems Science Graduate Fellowship, 2008.

Woods Hole Oceanographic Institution Summer Student Fellowship, 2003.

Hypercube Scholar Award in Computational Chemistry, 2001.

Beckman Scholar Award, 1999-2000.

MANUSCRIPTS IN PREPARATION

Baker, C. A., **M. Estapa**, M. Iversen, R. Lampitt, and K. Buesseler, *in preparation*. Are all sediment traps created equal? An intercomparison study of carbon export methodologies at the PAP-SO site

Estapa, M.L., J. Valdes, K. Tradd, J. Sugar, M. Omand, and K. Buesseler*, in preparation*. The neutrally buoyant sediment trap: two decades of progress.

PUBLICATIONS (* indicates Skidmore student)

Estapa, M.L, M. Feen*, and E. Breves, *in press,* 2019. Direct observations of biological carbon export from profiling floats in the subtropical North Atlantic. *Global Biogeochemical Cycles*.

Estapa, M., C. Durkin, K. Buesseler, R. Johnson, and M. Feen*. 2017. Carbon flux from bio-optical profiling floats: Calibrating transmissometers for use as optical sediment traps. *Deep Sea Research Part I: Oceanographic Research Papers* 120: 100–111. doi:10.1016/j.dsr.2016.12.003

Estapa, M.L., Siegel, D.A., Buesseler, K.O., Stanley, R.H.R., Lomas, M.R., Nelson, N.B., 2015. Decoupling of net community production and export production at submesoscale fronts in the Sargasso Sea*. Global Biogeochemical Cycles,* 29, doi:10.1002/2014GB004913.

Estapa, M.L., Breier, J.A., German, C.R., 2015. Particle dynamics in the rising plume at Piccard Hydrothermal Field, Mid-Cayman Rise: new applications of optical sensors. *Geochemistry, Geophysics, Geosystems*, 16, doi:10.1002/2015GC005831.

Durkin, C. A., **M. L. Estapa**, and K. O. Buesseler 2015. Observations of carbon export by small sinking particles in the upper mesopelagic, *Marine Chemistry*, *175*: 72-81.

Estapa, M.L., Buesseler, K.O., Boss, E., Gerbi, G.P., 2013. Autonomous, high-resolution observations of particle flux in the oligotrophic ocean. *Biogeosciences, 10:* 5517-5531.

Estapa, M.L., Mayer L.M., Boss E., 2012. Rate and apparent quantum yield of photodissolution. *Limnology and Oceanography,* 57(6): 1743-1756.

Estapa, M.L., Boss E., Mayer L.M., Roesler C.R., 2012. Role of iron and organic carbon in mass-specific light absorption by particulate matter from Louisiana coastal waters, *Limnology and Oceanography*, 57(1): 97-112.

Estapa, M. L.*,* Mayer, L.M., 2010*.* Photooxidation of particulate organic matter. *Marine Chemistry*, 122: 138-147.

Mayer, L.M., L.L. Schick, K.R. Hardy, **M. L. Estapa**, 2009. Photodissolution and other photochemical changes upon irradiation of algal detritus*.* *Limnology and Oceanography,* 54: 1688-1698.

RESEARCH GRANTS AWARDED

M. Estapa, K. Buesseler (WHOI), C. Durkin (Moss Landing), M. Omand (URI): Linking Sinking Particle Chemistry and Biology With Changes in the Magnitude and Efficiency of Carbon Export Into the Deep Ocean. NASA Ocean Biology and Biogeochemistry. Award period: 9/1/2017-8/31-2020. Award amount: $1,715,174.

C. Durkin (Moss Landing, M. Omand (URI), **M. Estapa** – EAGER: Collaborative Research: Particle-specific DNA sequencing to directly observe ecological mechanisms of the biological pump. NSF Biological Oceanography. Award period: 12/15/2016-12/14/2018. Award amount (Skidmore portion): $76,915.

K. Buesseler (WHOI), **M. Estapa** - Collaborative Research: Are all traps created equal? A multi-method assessment of the collection and detection of sinking particles in the ocean. NSF Chemical Oceanography. Award period: 1/15/2017-6/30/2018. Award amount (Skidmore portion): $137,493.

I. Cetinic (NASA), W. Slade (Sequoia Scientific), P. Werdell (NASA), **M. Estapa** - Measurement of Oceanic Particle Size Distribution in Support of Carbon Cycle Research and Ocean Color Remote Sensing. Submitted to Schmidt Ocean Institute for R/V Falkor ship time during 2017 for activities supported by NASA NIP award (below).

M. Estapa – Linking Satellite Observations of the Biological Pump to Autonomous, Float-Based Measurements of Twilight Zone Carbon Flux. NASA New Investigator Program in Earth Science. Award period: 8/1/2014 to 6/30/2018. Award amount: $248,463.

M. Estapa, K. Buesseler (WHOI) - Rapid, Autonomous Particle Flux Observations in the Oligotrophic Ocean. NSF Chemical Oceanography. Award period: 2/1/2013 to 1/31/2015. Award amount: $480,827.

M. Estapa, J. A. Breier (WHOI) - Optical-proxies of particulate iron formation kinetics in hydrothermal plumes: a proof-of-concept study for future in-situ measurements. Woods Hole Oceanographic Institution Deep Ocean Exploration Institute and Ocean Ridge Initiative. Award period: 7/1/2012 to 6/1/2014. Award amount: $27,722.

M. Estapa, E. Boss (U. Maine) - Assessing impacts on carbon transport from land to ocean: photochemical transformations of particulate organic carbon. NASA Earth Systems Science Graduate Fellowship. Award period: 9/1/2008 to 8/31/2011. Award amount: $90,000.

TEACHING

Introduction to Oceanography (GE-112), Skidmore College, Fall 2014, 2015, 2016, 2018. Lecture and lab with undergraduate enrollment of ~50 general-education students. Survey of marine geology, physical oceanography, and biological oceanography with emphasis on human interactions with and impacts on the ocean.

Remote Sensing of the Earth and Environment (GE-251/GE-305), Skidmore College, Spring 2015, 2016, 2019. Lecture and lab with undergraduate enrollments ~10 students. Introduction to the physical priniciples and applications of satellite remote sensing in the Earth and environmental sciences.

The Coastal Ocean (GE-251), Skidmore College, Spring 2016, 2019. Combined lecture/lab with undergraduate enrollment of 10-20 students. Introduction to coastal ocean processes and dynamics, with emphasis on impacts of human activities.

Oceans and Global Change (GE-351), Skidmore College, Fall 2016. Seminar with undergraduate enrollment of 8 students. Primary literature-based exploration of modern changes in the global ocean.

One Fish, Two Fish (HF-200), Skidmore College, Fall 2015. Co-taught interdisciplinary science literacy seminar exploring fish population decline, fisheries management and human dependence on fisheries.

Advanced Oceanography (GE-351), Skidmore College, Spring 2015. Seminar with undergraduate enrollment of 16 students. Primary literature-based exploration of current research in ocean biogeochemistry and its interaction with changing climate.

Calibration and Validation for Ocean Color Remote Sensing (as Teaching Assistant), University of Maine, 2011: Graduate course for oceanography students. Instructors: Dr. Emmanuel Boss, Dr. Curt Mobley, Dr. Mary Jane Perry, Dr. Collin Roesler, Dr. Kurt Voss, and Jeremy Werdell. Prepared and taught laboratory sessions, operated optical instrumentation during training cruises, and assisted students during data analysis workshops.

Oceanography and Practical Oceanography (as Assistant Scientist – oceanography instructor): Sea Education Association, 2001-2005. Taught analytical techniques in physical, chemical, and biological oceanography to undergraduates in a shipboard setting, delivered lectures on various topics in introductory oceanography, graded practical and written examinations, managed data collection and archiving procedures, maintained sampling equipment, and trained new Assistant Scientists. Taught on 12 semester programs total.

UNDERGRADUATE RESEARCH ADVISING AT SKIDMORE

Ben Crooke (Biology), 2019-present
Laura Heinlein (Chemistry), 2017-present
Jared Rose (Chemistry), 2018-present
Lucy Walker (Geoscience), 2017-2018
Emily Cheung (Biology), 2015-2016
Evan Nitkin (Geoscience), 2015
Emma McCully (Geoscience), 2015-2016
Melanie Feen (Geoscience), 2014-2016

PUBLIC OUTREACH

Public presenter, Saratoga Springs "Science on Tap" series, November 2019. "Adventures at Sea: Finding Out How Ocean Life Affects Earth's Carbon Cycle"

Volunteer educator: Gulf of Maine Foundation, 2006-2010. Led marine science field trips for K-12 students.

TECHNICAL AND WORKSHOP REPORTS

Buesseler K.O., Adams A., Bellingham J.G., Dever M., Edgcomb V.P., Estapa M.L., Frank A., Gallager S.M., Govindarajan A.F., Horner T.J., Hunter J., Jakuba M.V., Kapit J., Katija K., Lawson G.L., Lu Y., Mahadevan A., Nicholson D.P., Omand M.O., Palevsky H.I., Rauch C., Sosik H.M., Ulmer K.M., Wurgaft E., Yoerger D.R. Pump it Up workshop report, Oct. 20 2017, Cape Cod, MA.

Estapa, M. L., and Boss, E. 2018. Observing the Biological Carbon Pump with Optical and Imaging Sensors, p. 66. In Rudnick, D., Costa, D., Johnson, K., Lee, C., and Timmermans, M.-L. [eds.], ALPS II – Autonomous Lagrangian Platforms and Sensors. A Report of the ALPS II Workshop, February 21-24, 2017, La Jolla, CA.

COLLEGE AND DEPARTMENTAL SERVICE

Skidmore Analytical Interdisciplinary Laboratory steering committee member, 2017-2020

Geosciences departmental representative for Center for Integrated Sciences building planning, 2016-2017, 2019-present.

Committee member for 2016-2017 tenure-track faculty search in solid-Earth geosciences

PROFESSIONAL SERVICE

Export Pathways Working Group lead, NASA EXPORTS Science Team, 2018-present.

U.S. Biogeochemical Argo steering committee member, 2017-present.

Science Planning Team member and invited DISCO 2010 representative for NSF Chemical Oceanography MEeting: A BOttom-up Approach to Research Directions, 2017.

Member of EXPORTS Science Definition Team, NASA Ocean Biology and Biogeochemistry, Sept. 2015-2016.

Reviewer of manuscripts and proposals for: Biogeosciences; Deep-Sea Research I; Geophysical Research Letters; Global Biogeochemical Cycles; Journal of Geophysical Research – Oceans; Limnology and Oceanography; Limnology and Oceanography: Methods; Nature Communications; Nature Geoscience; NSF Biological Oceanography, Chemical Oceanography, Ocean Technology and Interdisciplinary Coordination, and Office of Polar Programs; and NASA Ocean Biology and Biogeochemistry

WHOI Postdoctoral Association departmental representative, 2012-2013.

INVITED PRESENTATIONS AND SEMINARS

Estapa, M.L., "Direct Observations of Biological Carbon Export From Profiling Floats in the Subtropical North Atlantic", School of Marine Sciences Seminar Series, University of Maine, Orono, ME, March 2018.

Estapa, M.L., "Ocean biogeochemistry from autonomous platforms", 2nd Autonomous and Lagrangian Platforms and Sensors meeting (ALPS-II), La Jolla, CA, February 2017.

Estapa, M. L., "Carbon Flux from Bio-Optical Profiling Floats: A Side-by-Side Comparison to Neutrally-Buoyant Sediment Traps." Cornell University Biological Field Station seminar series, Bridgeport NY, June 2014.

Estapa, M. L., "Carbon Flux from Bio-Optical Profiling Floats: A Side-by-Side Comparison to Neutrally-Buoyant Sediment Traps." Bermuda Institute for Ocean Science seminar series, St. George, Bermuda, October 2013.

Estapa, M.L., "An exploration of photochemistry in the coastal ocean", Skidmore College, Departments of Chemistry and Geosciences, March 2012.

Estapa. M.L., L.M. Mayer, E. Boss. "Photochemical generation of DOC from suspended sediments in Louisiana". ASLO Aquatic Sciences Meeting, San Juan, PR, February 2011.

Estapa, M.L., "Filling the gaps in regional carbon budgets", Bates College, Departments of Chemistry and Geology, November 2010.

CONFERENCE PRESENTATIONS (as lead author only)

Estapa, M.L., C.A. Baker, L. Heinlein*, L. Walker*, M. Iversen, R. Lampitt, K. Buesseler. Are all sediment traps created equal? Preliminary results of an intercomparison study. Poster presentation at Ocean Sciences Meeting, Portland, OR, Feburary 2018.

Estapa, M., Durkin, C., Omand, M., Iverson, M., Cetinic, I, Lampitt, R.,Buesseler, K. Optical attenuance-based measurements of sinking carbon particles: Are differenct detectors quantifying the same thing? Poster presentation at the Gordon Research Conference on Chemical Oceanography, Colby-Sawyer College, New London, NH, July 2017.

Estapa, M.L., et al (EXPORTS Science Definition Team), "The EXPORTS Implementation Plan." Oral presentation, Ocean Carbon and Biogeochemistry Summer Workshop, Woods Hole, MA, July 2016.

Estapa, M.L., Durkin, C.A., Buesseler, K.O., and McGillicuddy, D.M., "Spatiotemporal variability in particulate carbon export observed using bio-optical profiling floats." Ocean Sciences Meeting, New Orleans, LA, February 2016.

Estapa, M.L, Buesseler, K.O., and McGillicuddy, D.M., "A year-long record of particulate carbon export and net primary production from profiling floats in the Sargasso Sea." Ocean Carbon and Biogeochemistry Summer Workshop, Woods Hole, MA, July 2015.

Estapa, M.L, "A year-long record of particulate carbon export and net primary production from profiling floats in the Sargasso Sea." Joint meeting of the International Ocean Color Coordinating Group and the NASA Ocean Color Research Team, San Francisco, CA, June 2015.

Estapa, M.L., Durkin, C. A., Buesseler, K. O., "Carbon flux from bio-optical profiling floats: calibrating transmissometers for use as optical sediment traps." Ocean Optics XXII, Portland, ME, October 2014.

Estapa, M.L., C.A. Durkin, J. Valdes, K.O. Buesseler, "Interpretation of particulate carbon flux data from bio-optical profiling floats at BATS." Ocean Sciences Meeting, Honolulu, HI, February 2014.

Estapa, M.L., K. Buesseler, E. Boss, G. Gerbi. "Rapid, autonomous particle flux observations in the oligotrophic ocean." ASLO Aquatic Sciences Meeting, New Orleans, LA, February 2013.

Estapa, M. L., "Autonomous, high resolution particle flux observations in the oligotrophic ocean." School of Marine Sciences, University of Massachusetts, Dartmouth, New Bedford, MA, December 2012.

Estapa, M.L., E. Boss, C.S. Roesler, B.A. Schaeffer. "Suspended sediment concentration and optical property observations of mixed-turbidity, coastal waters through multispectral ocean color inversion." Ocean Sciences Meeting, Salt Lake City, UT, February 2012.

Estapa, M. L., "Photochemical reactions of particulate organic carbon - implications for coastal carbon cycling." Woods Hole Oceanographic Institution, Marine Chemistry and Geochemistry departmental seminar, January 2012.

Estapa, M.L. "Photochemical reactions of marine particulate organic carbon". Dissertations in Chemical Oceanography Symposium, Honolulu, HI, October 2010.

Estapa, M.L., E. Boss, L.M. Mayer. "Role of iron in mass-specific absorption of particulate matter from Louisiana coastal waters". Ocean Optics Conference, Anchorage, AK, September 2010. Awarded Honorable Mention for Best Student Paper.

Estapa, M.L., E. Boss, L.M. Mayer, 2010. "An optical model for predicting rates of particle-hosted photoreactions". NASA Ocean Color Research Team Meeting, New Orleans, LA, May 2010.

Estapa, M.L., L.M. Mayer, E. Boss, 2010. "Photochemical POC dissolution in coastal Louisiana: A framework for estimation of in-situ rates". Ocean Sciences Meeting, Portland OR, February 2010.

Estapa, M.L., L.M. Mayer, E. Boss, 2009. "POC photodissolution: Apparent quantum yield and temperature dependence". Gordon Conference in Chemical Oceanography, Tilton, NH, August 2009

Estapa, M.L. "Inherent optical properties of suspended sediments in rivers and coastal margins: Towards modeling turbid-water photochemistry from space". NASA Ocean Color Research Team Meeting, New York City, NY, May 2009.

Estapa, M.L., L.M. Mayer, E. Boss, 2008. "The Role of Organic Carbon in Absorption Properties of Louisiana Shelf Suspended Particulate Matter". American Geophysical Union fall meeting, San Francisco, CA, December 2008.

Estapa, M.L., L.M. Mayer, E. Boss, 2008. "Photoremineralization of particulate organic carbon." Ocean Sciences Meeting, Orlando FL, March 2008.

Estapa, M.L., L.M. Mayer, E. Boss, 2007. "Oxygen and the Photodissolution of Shallow Coastal Suspended Sediments and Phytoplankton Detritus". Gordon Conference in Chemical Oceanography, Tilton, NH, August 2007.

Estapa, M.L., E.S. Boss, L.M. Mayer, 2006. "Absorption Changes Associated with CDOM Repartitioning in a Sediment-River Water Suspension". Ocean Optics Conference, Montreal, Quebec, October 2006. Awarded Honorable Mention for Best Student Paper.

CRUISE EXPERIENCE

Subpolar North Pacific, R/V *Revelle*, EXPORTS North Pacific Field Campaign, August-Sept. 2018 (35 days)

New England shelf/slope, R/V *Endeavor*, deployments of neutrally-buoyant sediment traps and optical characterization of sinking particles, November 2015, June 2016, March 2018 (15 days total)

Sargasso Sea, R/V *Atlantic Explorer,* deployments of autonomous profiling floats and neutrally-buoyant sediment traps, July-October 2013, March 2014, January 2018 (34 days total)

Subtropical North Pacific, R/V Falkor, deployments of neutrally-buoyant sediment traps and optical characterizaton of sinking particles, January-February 2017 (26 days)

Mid-Cayman Rise, R/V Falkor, characterization of optical properties of hydrothermal plume particles, June 2013 (19 days)

Sargasso Sea, R/V Atlantic Explorer, biogeochemical characterization of particles and export at submesoscales, September-October 2012 and September-October 2013 (40 days total)

Sargasso Sea, R/V *Atlantic Explorer,* measurements of particle size-property relationships, June and July 2012 (10 days total)

Sargasso Sea, R/V *Atlantic Explorer*, biogeochemical characterization of particles and export at submesoscales, September-October 2011 (23 days)

Gulf of Maine, R/V *Ira C. Darling*, bio-optical properties and radiometry, July 2011 (2 days)

Coastal Louisiana, R/V *Pelican* and *Acadiana*, bio-optical properties, carbon, and total suspended mass measurements, March 2008 (8 days)

Coastal Louisiana, R/V *Pelican* and *Acadiana*, bio-optical properties, carbon, and total suspended mass measurements, Februrary 2008 (8 days)

Subtropical N. Atlantic, Caribbean, Tropical Pacific, SSV *Westward, Corwith Cramer, and Robert C. Seamans*, CTDs, nutrient and chlorophyll analysis, zooplankton sampling, June 2001-August 2005 (over 600 days).

PROFESSIONAL AFFILIATIONS

American Geophysical Union