

# Melissa M. Omand

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Assistant Professor  
Graduate School of Oceanography  
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## EDUCATION

Ph.D. Scripps Institution of Oceanography UCSD, Physical Oceanography, 2004-2011  
IGERT associate, Center for Marine Biodiversity and Conservation, Scripps Institution of Oceanography, 2005-2011  
BSc. Honors in Physics, University of Guelph, 1999-2003

## POSITIONS HELD

2015 (Jan) - present. Assistant Professor; Graduate School of Oceanography, with a joint position in Ocean Engineering (Sept 2018-present). University of Rhode Island, Narragansett, RI.

2015 (Jan) - present. Adjunct Scientist; Woods Hole Oceanographic Institution, Woods Hole, MA.

2011 (June) -2014 (Dec) Postdoctoral Investigator; Woods Hole Oceanographic Institution, Woods Hole, MA.  
*Advisor:* Dr. Amala Mahadevan, Physical Oceanography Department.

2011 (Mar-May) *Postdoctoral Associate*; Boston University, Boston, MA.  
*Advisor:* Dr. Amala Mahadevan, Department of Earth Sciences.

2004-2011 *Graduate Research Assistant*; Scripps Institution of Oceanography, UCSD, La Jolla CA. Integrative Oceanography Division.

*Co-advisor:* Dr. Falk Feddersen, Integrative Oceanography Division.

*Co-advisor:* Dr. Peter J.S. Franks, Integrative Oceanography Division.

2003-2004 *Research Technician*; University of Guelph, Guelph Ont. Canada. Physics Dept. *Advisor:* Dr. Iain L. Campbell, Physics Department.

## STUDENTS ADVISED

Noah Walcutt (PhD, Jan 2016-present)

Alexis Johnson (MS, Sept 2016-2020)

Melanie Feen (PhD, Jan 2018-present)

Ben Grassian (PhD, Jan 2018-present, co-advised with C. Roman)

Jackson Sugar (OE undergraduate intern 1000+ hours, June 2017-Aug 2019, MS, Sept 2019 - present)

NSF REU SURF undergraduate students Hyunung Boo (2015) Jennie Warmack (2016), Jackson Sugar (2017), Agnella Dougal (2019).

EPSCOR SURF undergraduate students Jackson Sugar (2019) , Ellie Felderman (2020)

High school students Jack Flaherty (2016), Megan Del Deo (2017), Gavin Pariseault (2018) Tri-County Community action work placement (128 hours each)

High School student Athena Viera (2019)- work placement through local technical high school (500+ hours).

**PEER-REVIEWED PUBLICATIONS** \*indicates student advisee

Omand, M.M., Steinberg, D.K., Stamieszkin K.S. (2021) Cloud shadows drive vertical migrations of deep-dwelling marine life. *PNAS in press*.

Rosby, T., Omand, M., Palter, J., & Hebert, D. (2021). On rates of isopycnal dispersion at the submesoscale. *Geophysical Research Letters*, 48, e2021GL093526. <https://doi-org.uri.idm.oclc.org/10.1029/2021GL093526>

Estapa, M, Buesseler, K, Durkin, CA, **Omand, M.M.**, Benitez-Nelson, CR, Roca-Martí, M, Breves, E, Kelly, RP, Pike, S. (2021). Biogenic sinking particle fluxes and sediment trap collection efficiency at Ocean Station Papa. *Elementa:Science of Anthropocene* 9(1). <https://doi.org/10.1525/elementa.2020.20.00122>.

Dever, M., Nicholson, D., **Omand, M.M.** and Mahadevan A. (2021). Size-differentiated export in a different dynamical regimes in the ocean, *Global Biogeochem. Cycles*

\*Johnson, A. and **Omand, M.M.** (2021). Evolution of a subducted carbon-rich filament on the edge of the North Atlantic Gyre. *Journal of Geophysical Research* 10.1029/2020JC016685

\*Walcutt, N.L., Knörlein, B., Cetinic I., Ljubescic, Z., Bosak, S., Sgouros, T., Montalbano, A.L., Neeley, A., Menden-Deuer, S., **Omand, M.M.** (2020). Assessment of Holographic Microscopy for Quantifying Marine Particle Size and Concentration. *Limnology and Oceanography: Methods* doi: 10.1002/lom3.10379

**Omand, M.M.**, Govindarajan, R., Mahadevan, A., (2020). Sinking flux of particulate organic matter in the oceans: Sensitivity to particle characteristics. *Nature: Scientific Reports* 10, 5582 doi: 10.1038/s41598-020-60424-5

Estapa, M., Valdes, J., Tradd, K., Sugar, J., **Omand, M.M.**, Buesseler K., (2020). The neutrally buoyant sediment trap: two decades of progress. *JAOTech* 37, 957–973, doi: 10.1175/JTECH-D-19-0118.1.

\*Walcutt, N.L., Knorlein, B., Sgouros, T., Cetinic, I. and **Omand M.M.**, (2019). Virtual Reality and Oceanography: Overview, Applications, and Perspective. *Front. Mar. Sci.* doi: 10.3389/fmars.2019.00644

Sherin, C.K., Sarma, V.V.S.S., Rao, G.D., Viswanadham R., **Omand, M.M.**, Murty, V.S.N. (2018). New to total primary production ratio (f-ratio) in the Bay of Bengal using isotopic composition of suspended particulate organic carbon and nitrogen. *Deep Sea Research I*, 139: 43-54, <https://doi.org/10.1016/j.dsr.2018.06.002>.

**Omand, M.M.**, Cetinic, I., Lucas, A.J., and Mahadevan, A. (2017). Using bio-optics to reveal phytoplankton physiology from a WireWalker autonomous platform. *Oceanography* 30(2):128–131, <https://doi.org/10.5670/oceanog.2017.233>.

Lee, C.M., Paluszkiwicz, T., Rudnick, D.L., **Omand, M.M.**, and Todd, R.E. (2017). Autonomous Instruments Significantly Expand Ocean Observing. *Oceanography* 30(2):18–28, <https://doi.org/10.5670/oceanog.2017.211>.

Rosby, T., Fischer, G. and **Omand, M.M.** (2017). A new technology for continuous long-range tracking of fish and lobster. *Oceanography* 30(2):36–37, <https://doi.org/10.5670/oceanog.2017.217>.

Lotliker, A.A., **Omand, M.M.**, Lucas, A.J., Laney, S.R., Mahadevan, A. and Ravichandran, M. (2016). Penetrative Radiative Flux in the Bay of Bengal. *Oceanography*. 29(2):214–221, <http://dx.doi.org/10.5670/oceanog.2016.53>.

Lucas, A. J., Nash, J. D., Pinkel, R., MacKinnon, J. A., Tandon, A. Mahadevan, A. **Omand, M.M.**, Freilich, M., Sengupta, D., Ravichandran, M. and Le Boyer, A. (2016). Adrift Upon a Salinity-Stratified Sea: A View of Upper-Ocean Processes in the Bay of Bengal During the Southwest Monsoon. *Oceanography*. 29(2):134–145, <http://dx.doi.org/10.5670/oceanog.2016.46>.

Sutanu Sarkar, S., Pham, H.T., Ramachandran, S., Nash, J.D., Tandon, A., Buckley, J., Lotliker, A. A. and **Omand, M.M.** (2016). The Interplay Between Submesoscale Instabilities and Turbulence in the Surface Layer of the Bay of Bengal. *Oceanography*. 29(2):146–157, <http://dx.doi.org/10.5670/oceanog.2016.47>.

Mahadevan, A., Spiro Jaeger, G. Freilich, M. **Omand, M.M.**, Shroyer, E., Sengupa, D. (2016). Freshwater in the Bay of Bengal: Its fate and role in air-sea heat exchange. *Oceanography*. 29(2): 72-81, <http://dx.doi.org/10.5670/oceanog.2016.40> (28)

V.V.S.S. Sarma, Rao, G.D., Viswanadham, R., Sherin, C.K., Salisbury, J., **Omand, M.M.** Mahadevan, A., Murty, V.S.N., Shroyer, E.L., Baumgartner, M. and Stafford K. (2016) Effects of Freshwater Stratification on Nutrients, Dissolved Oxygen, and Phytoplankton in the Bay of Bengal. *Oceanography*. 29(2):222–231, <http://dx.doi.org/10.5670/oceanog.2016.54>.

Wijesekera, H.W., E. Shroyer, A. Tandon, M. Ravichandran, D. Sengupta, S.U. Jinadasa, H.J. Fernando, N. Agrawal, K. Arulananthan, G.S. Bhat, M. Baumgartner, J. Buckley, L. Centurioni, P. Conry, J.T. Farrar, A.L. Gordon, V. Hormann, E. Jarosz, T.G. Jensen, S. Johnston, M. Lankhorst, C.M. Lee, L.S. Leo, I. Lozovatsky, A.J. Lucas, J. Mackinnon, A. Mahadevan, J. Nash, **M.M. Omand**, H. Pham, R. Pinkel, L. Rainville, S. Ramachandran, D.L. Rudnick, S. Sarkar, U. Send, R. Sharma, H. Simmons, K.M. Stafford, L. St. Laurent, K. Venayagamoorthy, R. Venkatesan, W.J. Teague, D.W. Wang, A.F. Waterhouse, R. Weller, and C.B. Whalen, 2016: ASIRI: An Ocean–Atmosphere Initiative for Bay of Bengal. *Bull. Amer. Meteor. Soc.*, 97, 1859–1884, <https://doi.org/10.1175/BAMS-D-14-00197.1>

**Omand, M.M.**, Perry, M.J., D’Asaro, E., Lee, C., Briggs, N.A., Cetinic, I. and Mahadevan, A. (2015) Eddy-driven subduction exports particulate organic carbon from the spring bloom. *Science*, 348(6231) p. 222-225. doi: 10.1126/science.1260062

**Omand, M.M.** and Mahadevan, A. (2014) Shape of the Oceanic Nitracline. *Biogeosciences Discuss.* 11, p. 14729-14763, doi:10.5194/bgd-11-14729-2014

**Omand, M.M.** and Mahadevan, A. (2013) Large-scale alignment of oceanic nitrate and density. *Journal of Geophysical Research: Oceans*, 118, p. 1–11, doi:10.1002/jgrc.20379

**Omand, M.M.**, Feddersen, F., Guza, R.T. and Franks, P.J.S. (2012) Episodic vertical nutrient fluxes and nearshore phytoplankton blooms in Southern California. *Limnology and Oceanography*, 57(6) p. 1673-1688.

**Omand, M.M.**, Leichter, J.L., Franks, P.J.S., Guza, R.T., Lucas, A.J., and Feddersen, F. (2011). Physical and Biological processes underlying the sudden appearance of a red-tide patch in the nearshore. *Limnology and Oceanography*, 56(3) p. 787-801.

**Omand, M.M.**, Feddersen, F., Clark, D.B., Franks, P.J.S., Leichter, J.L., and Guza, R.T. (2009) The influence of bubbles and sand on Chlorophyll-a fluorescence measurements in the surfzone. *Limnology and Oceanography: Methods*, 7 p. 354-362.

Clark, D.B., Feddersen, F., **Omand, M.M.** and Guza, R.T. (2009). Measuring fluorescent dye in the bubbly and sediment laden surfzone. *Water, Soil and Air Pollution*, 204(1-4) p. 103-115.

**Omand, M.M.**, Campbell, J.L. and Maxwell, J.A. (2005) Simulation of the relationship between element concentrations and X-ray yields in the Mars Exploration Rover's X- ray spectrometer. *Nucl. Instrum. Meth. In Phys. Research B*229 123-136.

#### NON PEER-REVIEWED PUBLICATIONS

Fassbender, A.J., Bourbonnais, A., Clayton, S., Gaube, P., **Omand, M.M.**, Franks, P.J.S., Altabet, M.A., and McGillicuddy Jr., D.J. (2018) Interpreting Fine-Scale Mosaics of Ocean Biogeochemistry. *Eos*, 99, <https://doi.org/10.1029/2018EO109707>.

Clayton, S., Gaube, P., Nagai, T. **Omand, M.M.**, and Honda, M. (2017) Fine-scale biophysical controls on nutrient supply, phytoplankton community structure, and carbon export in western boundary current regions. *US CLIVAR Variations Newsletter*. 15(4): 17-21.

## SUBMITTED PUBLICATIONS

Durkin, C.A, Buesseler, K.O., Cetinić, I., Estapa, M.L, Kelly, R.P., **Omand, M.M.** A visual tour of carbon export by sinking particles. *Submitted*.

## HONORS

Science News magazine SN 10: Scientists to Watch (2016)  
Keynote speaker NSF Frontiers in Ocean Science: Future of the Oceans (2021)

## RESEARCH FUNDING

*CAREER: Toward a Sensor Laden Future Ocean* (02/2021 - 01/2026, \$852,273) Funding Source: NSF OTIC. **Lead PI**

*Ocean Twilight Zone Networked Array* (01/2021 - 12/2021, \$197,963) Funding Source: Ocean Twilight Zone Audacious Project, Woods Hole Oceanographic Institution. **Lead URI PI**.

*OTZ Minions* (07/2020 - 12/2021, \$30,000) Funding Source: Ocean Twilight Zone Audacious Project, Woods Hole Oceanographic Institution. **Lead URI PI**.

*Submesoscale Ocean Currents and Vertical Transport* (05/01/19-04/31/24, \$335,363) Funding Source: NASA EVS-3. **Lead URI PI**.

*Minions: A low-cost float for distributed, Lagrangian observations of the biological carbon pump* (with Drs. K. Buesseler, K. Young, A. Adams, X. Wang, H.T. Rossby, I Cetinic, D. Yoerger) (11/01/18-10/31/21, \$1,280,841) Funding Source: NSF OTIC. **Lead PI**.

*Glider-Based Observations of Hydrography and Nutrients in Rhode Island Sound in Support of RI C-AIM Modeling* (with Drs. D. Ullman (lead) and B. Knorlein) (06/01/18 - 05/31/19, \$79,968). Funding Source: Rhode Island STAC.

*Cells to Satellite: Imaging Rhode Island Harmful Algal Blooms.* (with Dr. C. Mouw (lead)) (02/01/18-01/31/20, \$297,872). Funding Source: Rhode Island Sea Grant. Work complete.

*Linking sinking particle chemistry and biology with changes in the magnitude and efficiency of carbon export into the deep ocean.* (with Drs. M. Estapa(lead), C. Durkin, K. Buesseler) (07/15/17 - 07/14/20, \$354,411). Funding Source: NASA (Subcontract through Skidmore University).

*Autonomous Investigation of Export Pathways from Hours to Seasons* (with Drs. C. Lee (lead), E. D'Asaro, M.J. Perry, A. Thompson, D. Nicholson) (07/15/17 - 07/14/20, \$145,627). Funding Source: NASA (Subcontract through University of Washington/APL).

Penetrative flux, barrier layer collapse, and Intraseasonal Oscillation feedbacks. (6/1/17-5/31/19. \$65,865). Funding Source: ONR. **Lead PI**. Work complete.

*SnowClops: Putting Eyes in the Twilight Zone* (with Drs. K. Buesseler, A. Michel). (05/5/17 - 5/14/19. \$100,000). Funding Source: National Academies Keck Futures Initiative. **Lead PI**. Work complete.

Collaborative Research: Particle-specific DNA sequencing to directly observe ecological mechanisms of the biological pump (with Drs. C. Durkin (lead), M. Estapa). (11/01/16 - 10/31/18. \$59,710) Funding Source: NSF.

Collaborative Research: Orientation of elongate diatoms as a strategy of light harvesting (with Drs. J. Sullivan (lead), J. Rines, A. Nayak, M. McFarland). (3/1/2017-2/28/2020. \$318,001) Funding Source: NSF. Work complete.

*Modeling Studies for Exports in a Dynamic Ocean Environment* (with Drs. A. Mahadevan (lead), D. Nicholson, A. Thompson). (07/01/16 - 06/30/18. \$40,654) Funding Source: NASA (Subcontract through Woods Hole Oceanographic Institution). Work complete.

HoLoYurt: Visualizing plankton with a holographic microscope. (02/01/2016-01/31/2017. \$99,069) Funding source: RI STAC. **Lead PI**. Work complete.

Coastal and Submesoscale Process Studies for Air-Sea Interactions (07/01/2015 – 10/31/2016. \$23,991) Funding source: ONR (subcontracted through Woods Hole Oceanographic Institution). **Lead PI**. Work complete.

*Eddy-Driven Subduction of Particulate Carbon During the North Atlantic Spring Bloom (with Dr. A. Mahadevan (lead))* (01/2013 – 01/2014. \$235,893). Funding source: NSF. Work complete.

## SELECTED CONFERENCE PRESENTATIONS AND INVITED TALKS

*High frequency migrations by zooplankton*, Earth Research Institute, University of California Santa Barbara, Santa Barbara, CA, 2019 (invited talk)

*Imaging marine snow with a fleet of miniature, neutrally buoyant, floats*, Ocean Carbon Hot-Spots Workshop, Monterey Bay Aquarium Research Institute, Monterey, CA, 2017 (invited talk)

*Carbon export processes at meso- and submesoscales*. Ocean Carbon Biogeochemistry Meeting. Woods Hole Oceanographic Institution. Woods Hole MA, 2017 (invited talk)

*Diel rhythms in phytoplankton physiology and marine snow export observed from a Wirewalker autonomous platform*. Rutgers University, New Brunswick, NJ. 2017. University of Rhode Island Graduate School of Oceanography. Narragansett, RI. 2017. (invited talks)

*Quantifying the sinking of oceanic particulate organic matter*: University of Washington, Seattle, WA. 2014. Massachusetts Institute of Technology. Cambridge MA. 2014. (invited talks)

*Submesoscale subduction of particulate organic carbon, oxygen and spice*. Ocean Sciences Meeting, Honolulu, HI 2014. (oral presentation)

*Eddy-driven subduction of particulate carbon during the North Atlantic spring bloom*. Applied Physics Laboratory. Seattle WA. 2014. University of Rhode Island, Kingston RI. 2014. University of Maine. Orono, ME. 2014. Woods Hole Oceanographic Institution. Woods Hole MA. 2013, Massachusetts Institute of Technology. Cambridge MA. 2013, Stanford University, Palo Alto, CA. 2012 and Hopkins Marine Station, Monterey, CA. 2012 (invited talks).

## TEACHING

Honors Class (HPR 202N, HPR 202S). Spring 2017, 2019.  
Introduction to Physical Oceanography (OCG 501). Fall 2015 through 2019.  
MatLab for Physical Oceanography (OCG 593), Fall 2015.

## FIELD AND SEA TIME

Honors Program class of 11 undergraduates, Rhode Island Endeavor Program (6 days, April 2017, 2019, 2020)  
EXPORTS campaign, North Pacific Ocean (33 days, Aug-Sept 2018)

Sea2Space Particle Expedition, Schmidt Ocean Institute. (25 days, Jan-Feb 2017)  
New England Shelf Break, Rhode Island Endeavor Program (5 days, March 2015; 5 days, Nov 2015; 6 days, June 2016)  
Air-Sea Interactions in the Northern Indian Ocean (ASIRI), (21 days, Nov-Dec 2013, 14 days, June 2014)  
Huntington Beach (35 days), Imperial Beach (30 days) and New River Inlet (14 days) experiments, daily small boat work.

## **SERVICE AND AFFILIATIONS**

US Biogeochemical-Argo steering committee, 2017, ongoing.  
Reviewer for >10 oceanographic journals.  
Reviewer for NSF physical and biological oceanography programs, CA and RI SeaGrant.

### **Association Memberships**

American Geophysical Union  
American Society of Limnology and Oceanography