

Ocean Carbon & Biogeochemistry **Compendium of Recent and Upcoming OCB Activities and Products**

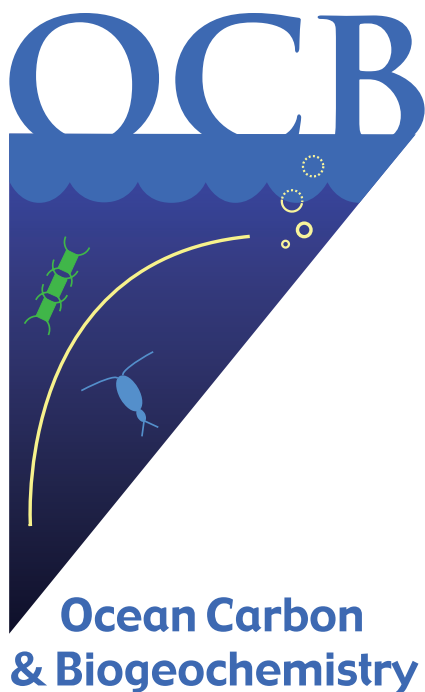


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See notes for ways to get more involved!

Scientific Steering Committee (SSC)

<https://www.us-ocb.org/about/scientific-steering-committee/>



Victoria Coles



Jessica Cross



Scott Doney



Andrea Fassbender



Marjorie Friedrichs



Julie Granger



Raleigh Hood



Bethany Jenkins



Matthew Long



Amy Maas



Adam Martiny



Uta Passow



Clare Reimers



Alyson Santoro



Benjamin Twining



Maria Tzortziou

[Victoria Coles](#) (UMCES) (2020)- observation and modeling of ocean and estuarine circulation; climate impact; biogeochemical, ecological, and genomic modeling

[Jessica Cross](#) (NOAA/PMEL) (2019) - Arctic biogeochemistry, ocean acidification, inorganic carbon system

[Scott Doney](#) (Univ. Virginia) (ex officio) - marine biogeochemical modeling, ocean acidification

[Andrea Fassbender](#) (MBARI) (2020) (**Early career**) - marine biogeochemical cycling, the ocean's role in global climate through the carbon cycle

[Marjorie Friedrichs](#) (VIMS) (2021) (**Vice Chair**) - biogeochemistry of estuarine and coastal systems, biophysical modeling

[Julie Granger](#) (Univ. Connecticut) (2021) - nitrogen cycle, stable isotope geochemistry, high latitude biogeochemistry, benthic-pelagic coupling

[Raleigh Hood](#) (UMCES) (2021) - biological oceanography and biogeochemical modeling

[Bethany Jenkins](#) (URI) (2019) (**Chair**) - marine microbial genetics and implications for biogeochemical processes in marine ecosystems

[Matt Long](#) (NCAR) (2020) - biogeochemical and climate modeling

[Amy Maas](#) (BIOS) (2020) - physiology, distribution, and RNA sequencing of zooplankton, genetic response of pteropods to ocean acidification, carbon flux, circadian rhythms, diel vertical migration

[Adam Martiny](#) (Univ. California, Irvine) (2021) - marine bacteria, elemental stoichiometry, genomics

[Uta Passow](#) (Memorial Univ.) (2019) - biological pump, particle dynamics

[Clare Reimers](#) (OSU) (2020) - coastal and deep-sea benthic biogeochemistry, eddy covariance and microsensor profiling, redox processes and microbial metabolic pathways linking O₂, C, N and S cycles

[Alyson Santoro](#) (Univ. California, Santa Barbara) (2019) - microbes, nitrogen cycle, molecular (-omics) techniques

[Benjamin Twining](#) (Bigelow) (2019) - interactions between plankton and trace metals

[Maria Tzortziou](#) (CCNY CUNY & Columbia Univ., Lamont Doherty Earth Observatory) (2021) - anthropogenic and natural stressors on biogeochemical exchanges, photochemical processes, and ecosystem functioning

To learn more about serving on the OCB SSC, please read the [charge](#) and [terms of reference](#).

Ocean Time-series Subcommittee

<https://www.us-ocb.org/about/ocean-time-series-committee/>

The primary focus of the Ocean Time-series Committee (OTC) is shipboard time-series stations, but this committee also seeks to improve existing and develop new ocean observing capabilities in support of OCB science, including autonomous instrument time-series. OTC continually works to align the evolving scientific needs of the OCB community with existing ocean observing capabilities and draw attention to critical observational gaps.



Matthew Church



Michael DeGrandpre



Stephanie Henson



Richard Lampitt



Naomi Levine



David Nicholson



Oscar Schofield



Heidi Sosik



Angel White

Recent Activities and Outcomes

Benway, H. M., L. Lorenzoni, A. E. White, B. Fiedler, N. M. Levine, D. P. Nicholson, M. D. DeGrandpre, H. M. Sosik, M. J. Church, T. D. O'Brien, M. Leinen, R. A. Weller, D. M. Karl, S. A. Henson, R. M. Letelier (Accepted, 2019). Ocean time series observations of changing marine ecosystems: An era of integration, synthesis, and societal applications. *Frontiers in Marine Science*. OceanObs19 Community White Paper.

Neuer, S., H. Benway, N. Bates, C. Carlson, M. Church, M. DeGrandpre, J. Dunne, R. Letelier, M. Lomas, L. Lorenzoni, F. Muller-Karger, M. J. Perry, P. Quay (2017). Monitoring ocean change in the 21st Century. *Eos* 98, doi:10.1029/2017EO080045 (published on 08 September 2017).

Biogeochemical Argo Subcommittee

<https://www.us-ocb.org/about/ocb-subcommittees/us-biogeochemical-argo-subcommittee/>

This committee serves as a focal point for US community input on the implementation of the global biogeochemical float array and associated science program development. This committee also engages with and provides US input to the International Biogeochemical-Argo steering committee.



Emmanuel Boss



Brendan Carter



Scott Doney



John Dunne



Steve Emerson



Meg Estapa



Alison Gray



Ken Johnson



Todd Martz



Jorge Sarmiento



Megan Scanderbeg



Joellen Russell



Lynne Talley



Toby Westberry



Cara Wilson

Recent Activities and Outcomes (Ken Johnson will provide update during the OCB workshop)

- [Building ocean biogeochemistry observing capacity, one float at a time: An update on the Biogeochemical-Argo Program](#)
- NSF MSRI proposal for 500 new BGC-Argo floats
- BGC-Argo Science & Implementation Plan being updated
- OO19 white paper on Argo 2020 mission, in which core Argo, Deep Argo, and BGC-Argo operate as single entity

Ocean-Atmosphere Interaction Subcommittee

<https://www.us-ocb.org/about/ocb-subcommittees/subcommittee-on-ocean-atmosphere-interactions/>

The scientific focus of this subcommittee is on ocean-atmosphere interactions and their role in marine biogeochemical cycles. There is a substantial overlap between the scientific goals of the OCB and [SOLAS](#) (Surface Ocean and Lower Atmosphere) communities, and this subcommittee seeks to strengthen communication and collaboration between ocean and atmospheric scientists to create a thriving, collaborative air-sea interaction research community in the US.



Rachel Stanley



Tom Bell



Yuan Gao



Cassandra Gaston



David Ho



Dave Kieber



Kate Mackey



Nicholas Meskhidze



Bill Miller



Henry Potter



Penny Vlahos



Patricia Yager

Recent Activities and Outcomes

Workshop: Ocean-Atmosphere Interactions: Scoping directions for U.S. research
October 1-3, 2019 - application deadline: July 1

Workshops

Upcoming

[EarthCube Workshop for Ocean Time Series Data](#) (September 13-15, 2019, Univ. Hawai'i)
[Application deadline: July 15](#)

Do you generate, use, or manage ocean time series data? Fill out this [short survey](#) - your feedback will help shape future cyber-infrastructure for ocean time series.

[Ocean-Atmosphere Interactions: Scoping directions for U.S. research](#) (October 1-3, 2019, Sterling, Virginia) – [application deadline: July 1](#)

Ocean nucleic acids 'omics intercalibration and standardization workshop (January 9-11, 2020) [Working Group webpage](#) [More information coming soon!](#)

Recent

[Oceanic Methane and Nitrous Oxide: The present situation and future scenarios](#) (October 28-31, 2018 Lake Arrowhead, CA) - [this website is now an information and resource hub for the trace gas community](#)

[OCB Biogeochemical Profiling Float Workshop](#) (July 9-13, 2018, Seattle, WA)

[4th U.S Ocean Acidification PI Meeting](#) (February 17-19, 2018, Portland, OR)

[Ocean Carbon Hot Spots Workshop](#) (joint with US CLIVAR) (September 25-26, 2017, Moss Landing, CA)

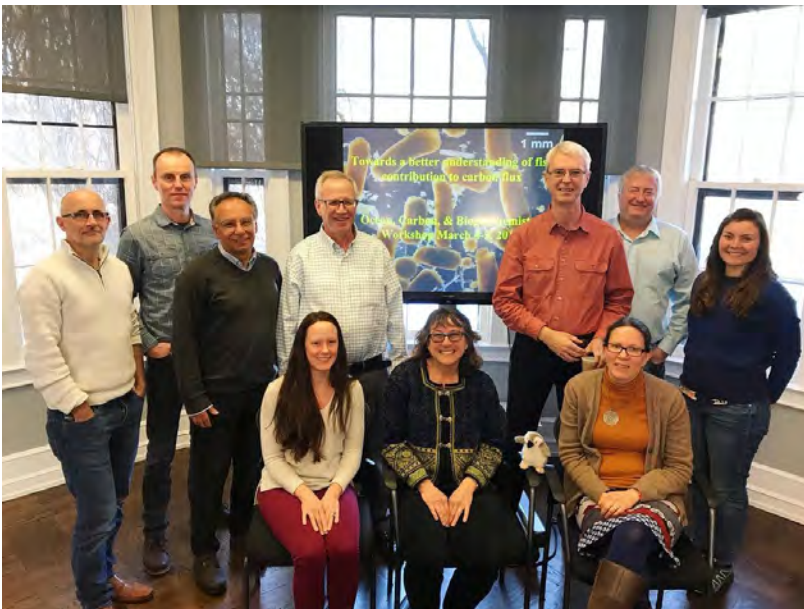
[Indian Ocean Science Workshop](#) (September 11-13, 2017, La Jolla, CA) - [OCB now hosts the US IIOE2 \(International Indian Ocean Expedition\) website at <https://web.whoi.edu/iioe2/>](#)

Small Group Activities

Working Group: Towards a better understanding of fish contribution to carbon flux

<https://www.us-ocb.org/wg-fish-carbon/>

The goals of this working group are to 1) synthesize the existing research on fish carbon flux, 2) recognize challenges in measuring fish carbon flux and discuss approaches to resolve them, 3) develop research priorities to fill in the large gaps in understanding fish carbon flux, 4) identify opportunities to obtain resources needed to move this research forward.



Members: Grace Saba (Rutgers Univ.), Nicola Beaumont (Plymouth Marine Laboratory), Adrian Burd (Univ. of Georgia), Peter Davison (Farallon Institute), John Dunne (NOAA GFDL), Santiago Hernández-León (Institute of Oceanography and Global Change), Angela Martin (Univ. of Agder), Kenneth Rose (UMCES), Joe Salisbury (Univ. of New Hampshire), Deborah Steinberg (VIMS), Clive Trueman (National Oceanography Centre), Rod Wilson (Univ. of Exeter), Stephanie Wilson (Bangor Univ.)

Recent Activities and Outcomes

The working group gathered for a workshop in March 2019 at Rutgers Univ. focused on synthesizing the existing research on fish carbon flux, discussing challenges in measuring fish carbon flux, and determining approaches for estimating fish contribution to carbon flux on variable scales. Presentations and discussions targeted best approaches for determining: fish biomass on regional and global scales, relative amounts of carbon forms produced from fish (i.e., release of sinking fecal pellets, excretion of particulate inorganic carbon and dissolved organic carbon, respiration of carbon dioxide), and carbon flux estimates from fish biomass (i.e., bioenergetics, size-based allometric relationships, stable isotopes). Upcoming products include two peer-reviewed manuscripts focused on the synthesis of fish carbon flux research and a quantitative analysis of fish carbon flux. Learn more about the working group and view presentations on the [workshop webpage](#).

Working Group: Developing best practices for measurement of oceanic $^{15}\text{N}_2$ fixation rates and relationships to communities

<https://www.us-ocb.org/n-fixation-working-group/>

Using field and laboratory data from a recently funded NSF EAGER award, this working group is conducting a thorough assessment of the $^{15}\text{N}_2$ tracer incubation method (accuracy, error analysis, detection limit, etc.) for measuring nitrogen fixation rates and accompanying molecular methods that identify responsible diazotrophs.



Mar Benavides



Ilana Berman-Frank



Sophie Bonnet



Annie Bourbonnais



Bonnie Chang



Dreux Chappell



Anne Dekas



Wally Fulweiler



Rosie Gradoville



Julie Granger



Bethany Jenkins



Todd Kana



Angela Knapp



Etai Landou



Wiebke Mohr



Pia Moisander



Margie Mulholland



Eric Raes



Lasse Riemann



Corday Selden



Kendra Turk-Kubo



Angel White



Sam Wilson

Recent Activities and Outcomes

- Visit the [webpage](#) to view or contribute to the $^{15}\text{N}_2$ Contaminant Database and the Metadata: ^{15}N tracer incubations for N_2 fixation measurements
- White, A. E., J. Granger, C. Selden, M. R. Gradoville, L. Potts, A. Bourbonnais, R. W. Fulweiler, A. N. Knapp, W. Mohr, P. Moisander, C. R. Tobias, M. Mulholland (Submitted, 2019). A Roadmap for Measurement of $^{15}\text{N}_2$ Fixation in Pelagic Ecosystems. *L&O Methods*

Working Group: Phytoplankton Taxonomy

<https://www.us-ocb.org/phytoplankton-taxonomy-working-group/>

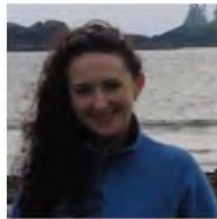
Working Group Objective: In an effort to facilitate community-wide access to phytoplankton data products that support critical satellite algorithm development and validation, this working group convenes relevant expertise (e.g., phytoplankton ecology and taxonomy, data systems, informatics, etc.) to develop a set of standards and best practices for phytoplankton taxonomy data.



Stace Beaulieu



Ivona Cetinić



Susanne Craig



Emmanuel Devred



Joe Futrelle



Lee Karp-Boss



Aimee Neely



Marc Picheral



Nicole Poulton



Chris Proctor



Collin Roesler



Adam Shepherd



Heidi Sosik

Recent Activities and Outcomes (Heidi Sosik and Aimee Neeley will provide an update during OCB 2019)

- **December 13, 2018: Fall AGU poster:** [Building Essential Biodiversity Variable Data Sets from Plankton Imaging Systems to Support Satellite Ocean Color Algorithm Development and Validation](#)
- **Developing prototypes** for submitting phytoplankton taxonomic data and metadata to public data repositories (e.g., SeaBASS and BCO-DMO)
- **Publishing a technical memo** that outlines standards and best practices for taxon-resolved phytoplankton data

Workshop: Lateral Carbon Flux in Tidal Wetlands

<https://www.us-ocb.org/lateral-c-flux-tidal-wetlands/>

The OCB-supported activity “Lateral Carbon Flux in Tidal Wetlands” brought together experts to review methods and synthesize data on tidal exchange of carbon between wetlands and the coastal ocean. The ultimate, ongoing goal is to estimate annual rates of carbon exchange across the contiguous U.S. Knowledge of the magnitude and mechanisms of carbon cycling in tidal wetlands, including salt marshes, mangroves and tidal fresh wetlands, is necessary to understand their role in coastal ecology and carbon budgets, as well as interaction with the chemistry of the coastal ocean. The high rate of carbon exchange in tidal wetlands provides a strong linkage between the atmosphere and the coastal ocean, since lateral aquatic export appears to be an important or dominant fate of that fixed carbon.

During the workshop, two approaches were agreed to pursue the U.S.-scale flux estimation:

1. Develop a set of new flux rate estimates based on ongoing research of participants; test relationships to measures of carbon supply rate and frequency of aquatic exchange between wetland and ocean. Derive predictive relationships, and use to map rates.
2. Calculate the lateral flux as the unknown in the net ecosystem carbon balance, based on measured or estimated rates of carbon storage and productivity.



Kevin Kroeger



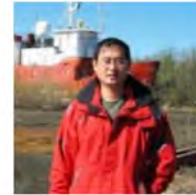
Maria Tzortziou



Meagan Gonneea



Chris Osburn



Aleck Wang



Neil Ganju

Recent Activities and Outcomes

- Successful development of mapped products to support the lateral flux estimations, led by workshop participants:
 - Tidal wetland Gross Primary Production (GPP) across the continental U.S., 2000-2018. Feagin, R.A. et al., In preparation for the coastal carbon special section of *Global Biogeochemical Cycles*
 - A CONUS-scale map of relative tidal marsh elevation: an essential variable for coastal wetland sustainability. Holmquist, J, et al. Journal article in preparation.
- Continued progress by workshop participants toward new, measured rates of lateral carbon flux at several sites around the U.S.
- A planned session with significant focus on lateral fluxes at the upcoming Coastal & Estuarine Research Federation conference, led by workshop participants R. Chen et al.: CERF 2019, Nov 3-7, 2019 in Mobile, AL, Carbon fluxes in coastal systems
- Presentation from K. Kroeger et al. at OCB 2019 to report outcomes and progress



Brian Bergamaschi



Alana Menendez

Ocean Carbonate System Intercomparison Forum

<https://www.us-ocb.org/ocean-carbonate-system-intercomparison-forum/>

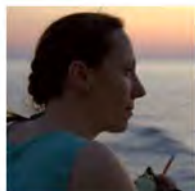
Recent literature has highlighted several ongoing challenges regarding the consistency of seawater CO₂ measurements with estimates from alternate input pairs. These gaps in our knowledge of the ocean carbonate system are probably related to carbonate constant uncertainties, frequently-unknown concentrations of organic bases in seawater, and unrecognized measurement uncertainties. CO₂ measurement intercomparability is also challenged by the large and growing variety of instruments and approaches used for measurements and the lack of robust assessments or certified reference materials for some methods. While measurement strategies diversify and evolve, the need remains for consistent records of key measurements over time to assess marine CO₂ cycling and its impacts: e.g. dissolved inorganic carbon (DIC) records for anthropogenic carbon storage and changes in the biological pump, partial pressure of CO₂ (pCO₂) records for air-sea CO₂ flux estimates, pH records for ocean acidification (OA) monitoring, and seawater alkalinity (AT) records for assessing the impacts of OA on carbonate mineral cycling. It is therefore more critical than ever that scientists develop a strategy for identifying and addressing carbonate system intercomparability uncertainties, thus enabling existing and future data to be reconciled into internally-consistent data products with associated uncertainties. A forum between experts in carbonate system parameter measurements, data documentation, and interconversion to debate the nature of the problems, advocate for needed research to resolve these problems, and provide guidance for data product assembly and documentation.



Brendan Carter



Marta Alvarez



Leticia Barbero



Robert Byrne



Wei-Jun Cai



Melissa Chierici



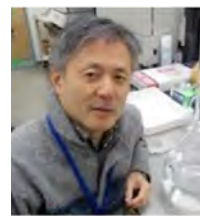
Regina Easley



Andrew Dickson



Andrea Fassbender



Akihiko Murata



Yui Takeshita



Nancy Williams



Ryan Woosley

Recent Activities and Outcomes

First meeting June 22-23, 2019 in Woods Hole, MA

OCB-NACP Aquatic Continuum Science Focus Group

<https://www.us-ocb.org/ocb-nacp-science-focus-group/>

OCB coordinated with the NACP and the US Carbon Cycle Science Program leadership to establish new OCB-NACP Aquatic Continuum Science Focus Group to help identify community-based mechanisms (e.g., workshops, small group efforts, publications, etc.) to facilitate exploration of and progress on high-priority coastal carbon research and other high-level, pertinent NACP-OCB cross-cutting questions.



Simone Alin (NOAA/PMEL)



Cecilia Chapa (Universidad del Mar, Mexico)



Kyle Cavanaugh (UCLA)



Marjy Friedrichs (VIMS)



Maria Herrmann (Penn State)



Sara Knox (UBC, Canada)



Maria Tzortziou (CUNY)



Peter Raymond (Yale)

Agency Representatives

- NSF - [Dave Garrison](#), [Hedy Edmonds](#), [Elizabeth Canuel](#)
- NASA - [Paula Bontempi](#), [Laura Lorenzoni](#)
- USDA - [Nancy Cavallaro](#)
- USGS - [Zhiliang Zhu](#)
- NOAA - [Kathy Tedesco](#)
- OPP - [Xujing Jia Davis](#)

Program Representatives

- U.S. Carbon Cycle Science Program - [Gyami Shrestha](#)
- North American Carbon Program (NACP) - [Libby Larson](#)
- Ocean Carbon and Biogeochemistry (OCB) Program - [Heather Benway](#)

Recent Activities and Outcomes

This group provided input on a land-ocean interactions session for OCB 2019 and will also plan a follow-on session at the next NACP All Investigators meeting (March 16–20, 2020 "The future is here: North American carbon cycle science for a changed climate," George Mason University, Fairfax, VA).

Ocean Nucleic Acids 'Omics Workshop

<https://www.us-ocb.org/ocean-nucleic-acids-omics-workshop/>

The Ocean Nucleic Acids 'Omics Intercalibration and Standardization Workshop is aimed at developing a focused marine microbial nucleic acid (na) 'omics intercomparison and intercalibration effort. Increasingly, field programs of relevance to the OCB community include major components that use high-throughput molecular barcoding, metagenomics, and transcriptomics (nucleic acid 'omics or na'omics herein) to understand the functioning of prokaryotic and eukaryotic microbes in the ocean. A pressing challenge for both our community and the broader microbiome research community is the need for more standardization and intercalibration to facilitate comparison between na'omics data.



Bethany Jenkins



Andrew Allen



Paul Berube



Scott Gifford



Adrian Marchetti



Alyson Santoro

Recent Activities and Outcomes

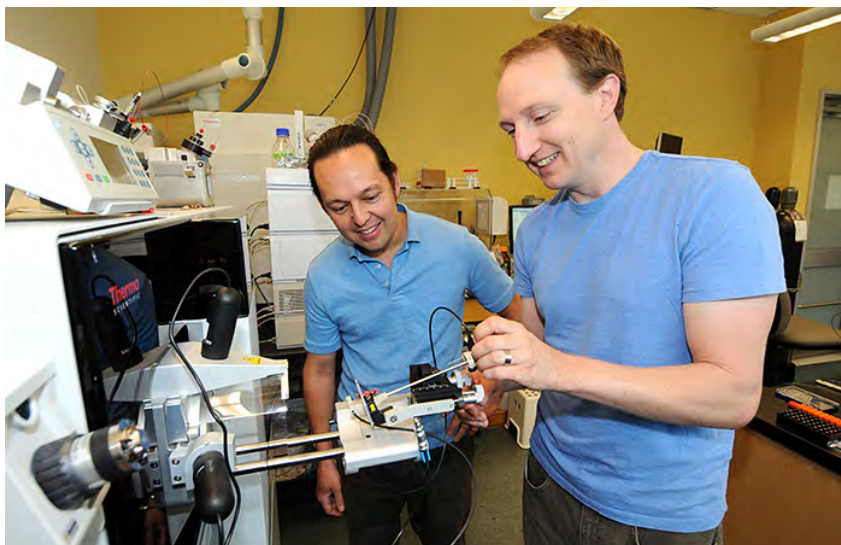
SAVE THE DATE

The workshop will be held January 9-11, 2020 at the University of North Carolina, Chapel Hill campus. More information coming soon via the OCB eNewsletter and website.

Intercomparison and Intercalibration of Ocean Metaproteomic Analyses

<https://www.us-ocb.org/intercomparison-and-intercalibration-metaproteomics/>

Ocean metaproteomics is an exciting new datatype that has the potential to provide valuable new insights into the metabolic functions of marine microbes and their impact on ecological and biogeochemical processes. However, as for most new measurement types there are uncertainties associated with the accuracy and precision of measurements due to the limited extent of the application of analyses thus far, and hence there is a need to generate community confidence in metaproteomics. We propose to initiate an intercomparison and intercalibration effort whereby an ocean metaproteome sample from the Bermuda Atlantic Time Series is collected, divided and shared among multiple laboratories for global and targeted metaproteomic analyses. The results will be collated and discussed at a workshop of intercalibration participants. In addition, an informatic intercomparison will also be conducted using a representative mass spectra data file. This effort is a follow up of the 2010 OCB scoping workshop “[The Molecular Biology of Biogeochemistry: Using molecular methods to link ocean chemistry with biological activity](#)” and NSF EarthCube workshop that assembled US and Canadian scientists involved in metaproteomic research in May of 2017: [Ocean Proteomics Data Sharing and Best Practices Workshop Report](#).



PIs Mak Saito and Matthew McIlvin

Recent Activities and Outcomes

This past year, participants collected an ocean metaproteome sample from the Bermuda Atlantic Time-series Study (BATS) site and divided and shared the sample among multiple laboratories for global and targeted metaproteomic analyses. The results will be collated and discussed at a Fall 2019 workshop of intercalibration participants to be held at Woods Hole Oceanographic Institution.

Training Activities

CMIP6 Hackathon - October 16-18, 2019

The CMIP6 Hackathon will be a hands-on event including tutorials, software development, data analysis, and opportunities for collaboration centered around effective computational workflows and CMIP-related science.



The event will be held concurrently at two locations: the NCAR Mesa Lab, in Boulder CO, and the Lamont Doherty Earth Observatory, in Palisades NY. Limited funding is available to support travel and lodging, with preference given to early career scientists. Participants will be selected on the basis of interests, experience, and potential to contribute to collaborative initiatives. People from observational or application-related backgrounds are encouraged to apply. Application deadline: 31 July 2019.

The CMIP6 Hackathon Team: Matthew Long (NCAR), Ryan Abernathy (Columbia/LDEO), John Dunne (NOAA/GFDL), Joseph Hamman (NCAR), Flavio Lehner (NCAR), Galen McKinley (Columbia/LDEO), Angeline Pendergrass (NCAR), Isla Simpson (NCAR), and Kevin Paul (NCAR)

More information: <https://cmip6hack.github.io>

Instrumenting our ocean for better observation: A training course on a suite of biogeochemical sensors - June 10-19, 2019

Co-sponsored by OCB

A poster for a training course. At the top left is the logo for the International Ocean Carbon Coordination Project (IOCCP). To its right is the text 'International Ocean Carbon Coordination Project'. Further right is the 'BONUS INTEGRAL' logo. Below these logos, the text reads: 'are pleased to **invite applications** from PhD students and early-career researchers for the international training course on:'. The main title of the course is 'INSTRUMENTING OUR OCEAN FOR BETTER OBSERVATION: A TRAINING COURSE ON A SUITE OF BIOGEOCHEMICAL SENSORS'. Below the title is the location 'Sven Lovén Center for Marine Sciences, Kristineberg, Sweden' and the dates 'JUNE 10 - 19, 2019'. At the bottom, under the heading 'Sponsors:', are logos for IOCCP, BONUS, the European Union flag, ICOS, RINGO, OCB, and AtlantOS.

Products & Reports

Reports

Dunne, John P., Romanou, Anastasia, McKinley, Galen A., Long, Matthew, Doney, Scott C., "Synthesis and Intercomparison of Ocean Carbon Uptake in CMIP6 Models workshop report, December 8-9, 2018 Washington, DC", 2019-04, doi:10.1575/1912/24038, <https://hdl.handle.net/1912/24038>

Fassbender, A. J., J. B. Palter, M. C. Long, T. Ito, S. P. Bishop, and M. F. Cronin, 2018: Ocean Carbon Hot Spots. A Joint US CLIVAR and OCB Workshop Report, 2018-3, 34pp., [doi:10.5065/D6Z036ZS](https://doi.org/10.5065/D6Z036ZS).

Hood, R. R., Beal, L. M., Benway, H. M., Chandler, C. L., Coles, V. J., Cutter, G. A., Dick, H. J. B., Gangopadhyay, A., Goes, J. I., Humphris, S. E., Landry, M. R., Lloyd, K. G., McPhaden, M. J., Murtugudde, R., Subrahmanyam, B., Susanto, R. D., Talley, L. D., Wiggert, J. D., Zhang, C. (2018), United States contributions to the Second International Indian Ocean Expedition (US IIOE-2), 2018-08-02, DOI:10.1575/1912/10510, <https://hdl.handle.net/1912/10510>, 65 pp.

Papers

Related to 2018 OA PI Meeting

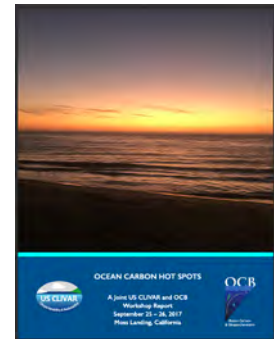
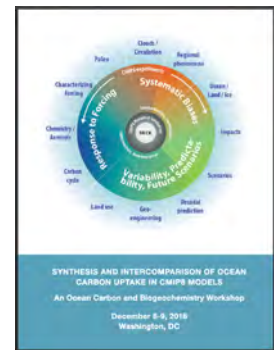
Carter, BR, NL Williams, W Evans, AJ Fassbender, L Barbero, C Hauri, et al. (2019). Time of detection as a metric for prioritizing between climate observation quality, frequency, and duration. *Geophysical Research Letters*, 46, 3853–3861. <https://doi.org/10.1029/2018GL080773>.

Turk D, H Wang, X Hu, DK Gledhill, ZA Wang, L Jiang, W-J and Cai (2019). Time of Emergence of Surface Ocean Carbon Dioxide Trends in the North American Coastal Margins in Support of Ocean Acidification Observing System Design. *Front. Mar. Sci.* 6:91. [doi:10.3389/fmars.2019.00091](https://doi.org/10.3389/fmars.2019.00091).

Related to 2018 Joint OCB-GEOTRACES Workshop

Hayes, C. T., R. F. Anderson, H. Cheng, T. M. Conway, R. L. Edwards, M. Q. Fleisher, P. Ho, K.-F. Huang, S. G. John, W. M. Landing, S. H. Little, Y. Lu, P. L. Morton, S. B. Moran, L. F. Robinson, R. U. Shelley, A. M. Shiller, and X.-Y. Zheng (2018), Replacement times of a spectrum of elements in the North Atlantic based on thorium supply, *Global Biogeochemical Cycles*, 32(9), 1294-1311, [doi:10.1029/2017GB005839](https://doi.org/10.1029/2017GB005839).

Hayes, C. T., E. E. Black, R. F. Anderson, M. Baskaran, K. O. Buesseler, M. A. Charette, H. Cheng, J. K. Cochran, R. L. Edwards, P. Fitzgerald, P. J. Lam, Y. Lu, S. O. Morris, D. C. Ohnemus, F. J. Pavia, G. Stewart, and Y. Tang (2018), Flux of particulate elements in the North Atlantic Ocean constrained by multiple radionuclides, *Global Biogeochemical Cycles*, 32(12), 1738-1758, [doi:10.1029/2018GB005994](https://doi.org/10.1029/2018GB005994).



Pavia, F. J., R. F. Anderson, P. J. Lam, B. B. Cael, S. M. Vivancos, M. Q. Fleisher, Y. Lu, P. Zhang, H. Cheng, R. L. Edwards (2019). Shallow particulate organic carbon regeneration in the South Pacific Ocean. *Proceedings of the National Academy of Sciences* 116 (20) 9753-9758; [doi:10.1073/pnas.1901863116](https://doi.org/10.1073/pnas.1901863116).

Media & Outreach

Short films available on the [OCB YouTube Channel](#)

OCB Short Film - highlighting science focus areas and scientists



https://youtu.be/EF_LHx9g3DA

2018 OCB Oceanic Methane and Nitrous Oxide Workshop short film



<https://youtu.be/0DyMyIVs4Qs>



<https://web.whoi.edu/ocb-fert/>

OCB developed this website as a clearinghouse for ocean fertilization news and informational resources to 1) increase public knowledge and awareness on this topic, and 2) advance scientific research to improve our understanding of the implications of ocean fertilization for marine ecosystems.

Learn more about [OCB and other organizations' stances](#) on ocean fertilization experiments.

Content overview (also organized on the site for non-scientists)

- Scientific Literature by topic, including synthesis papers, experiments, regional and related research papers
- Large-scale ocean fertilization experiments
- London Convention and other governance and policy documents
- Informational web resources for outreach and teaching
- Position statements
- Gray literature

The ocean fertilization infographic is available full-size and also in spanish on the website listed above.

