

# 2016 Ocean Carbon and Biogeochemistry (OCB) Workshop

July 25-28, 2016

Woods Hole Oceanographic Institution

## **OCB Project Office (WHOI)**

Executive Officer: Heather Benway

Administrative Associate: Mary Zawoysky

Executive Scientist: Scott Doney

## **OCB Scientific Steering Committee**

Chair: Matt Church (Univ. Hawaii)

Vice Chair: Bethany Jenkins (URI)



Thank you to our host and sponsors!

# DEMOLITION DERBY AN OCB TRADITION



# WHAT IS OCB?



OCB is a **network of scientists** working across disciplines to understand the ocean's role in the global carbon cycle and how marine ecosystems and biogeochemical cycles are responding to environmental change.



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[www.us-ocb.org](http://www.us-ocb.org)

# OCB SUPPORT ROLES

## How can we help YOU?

- ✧ **Coordinate** workshops, PI meetings, short courses, working groups, and synthesis activities
- ✧ Contribute to relevant US and international **science planning** initiatives
- ✧ Serve as **central information hub** (websites, email list, social media, newsletter) for its network
- ✧ Develop and disseminate **education and outreach** materials
- ✧ **Train the next generation of ocean scientists** and engage early career scientists in OCB activities



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# OCB LEADERSHIP

- ✧ **OCB Project Office** funded by NSF and NASA, based at WHOI
- ✧ **OCB Scientific Steering Committee (SSC)**
- ✧ **OCB Subcommittees** on Ocean Acidification, Ocean Time-Series, and Ocean Fertilization

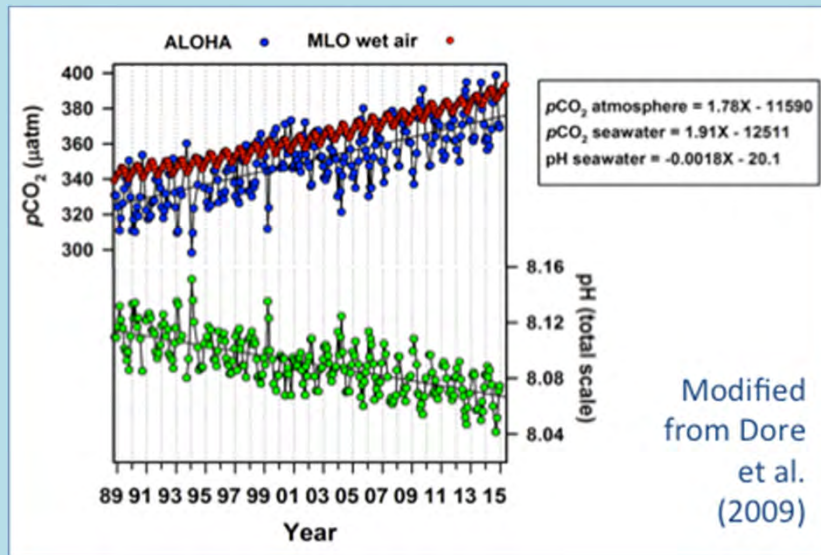


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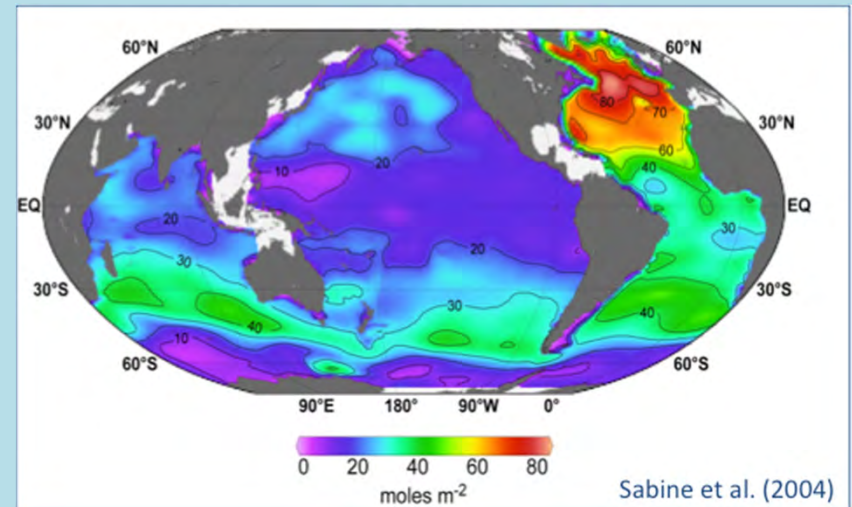
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# OCB SCIENCE

## Changing ocean chemistry

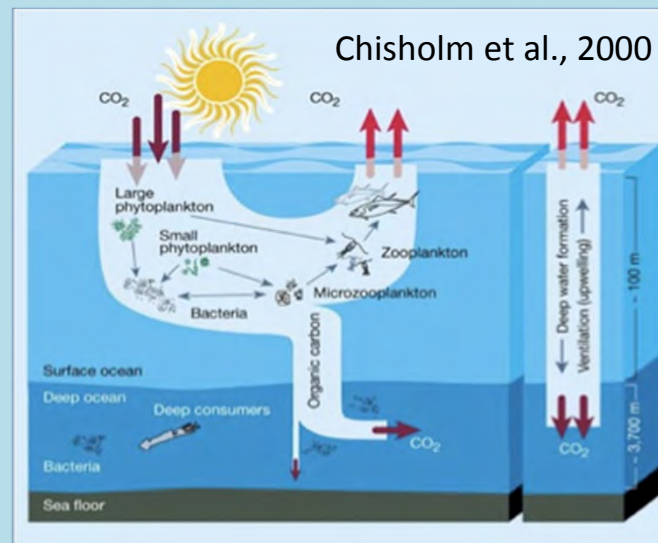


## Ocean carbon uptake and storage



Chisholm et al., 2000

## Biological pump

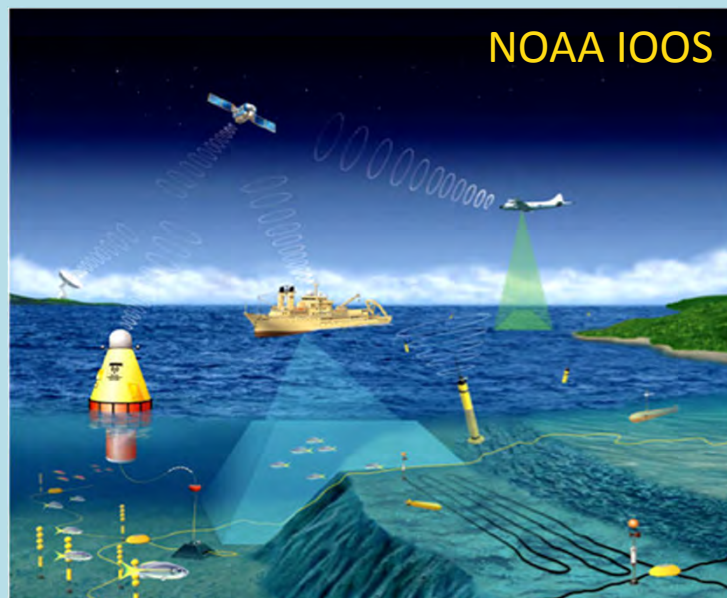


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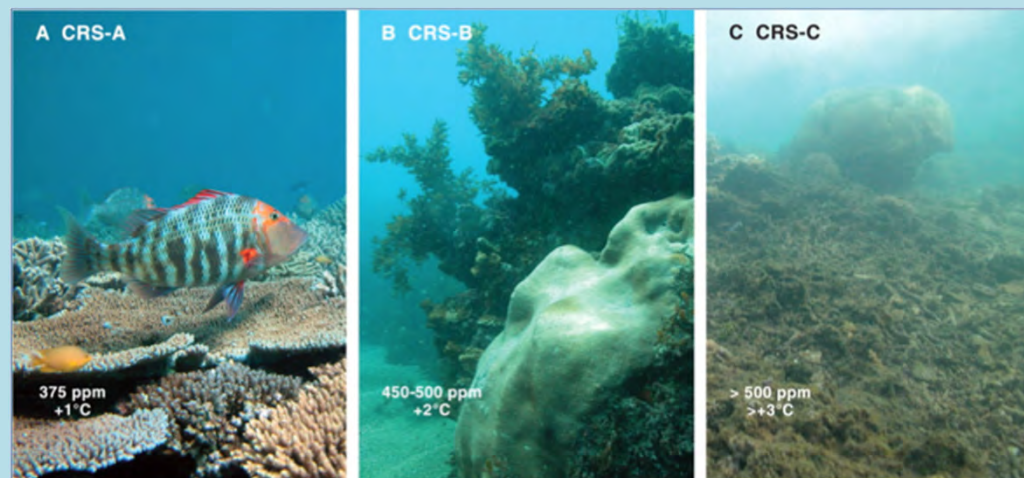
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# OCB SCIENCE

## Ocean observing

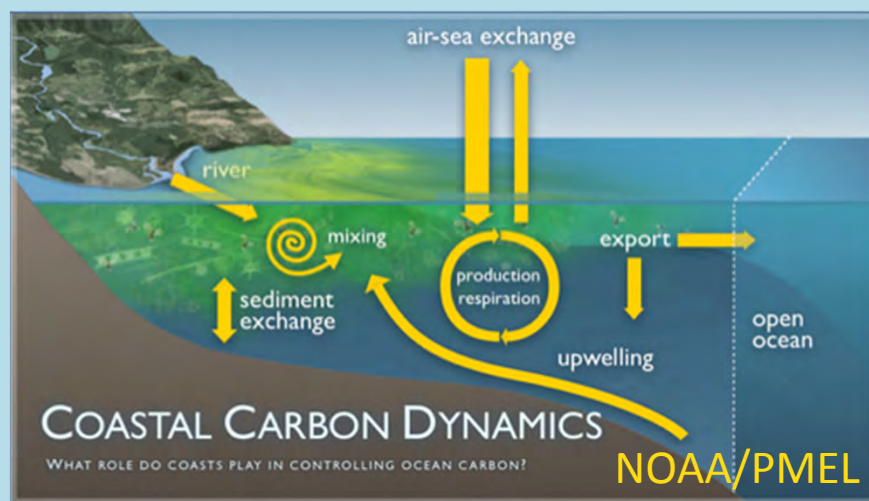


## Changing marine ecosystems



Hoegh-Guldberg et al. (2007)

## Coastal carbon cycle



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# OCB DATA



<http://www.bco-dmo.org/>

## CONNECT WITH BCO-DMO THIS WEEK

- Talk to Danie Kinkade
- Sign up for BCO-DMO tutorial via workshop logistics page
- Visit poster garden during poster sessions



# OCB DATA

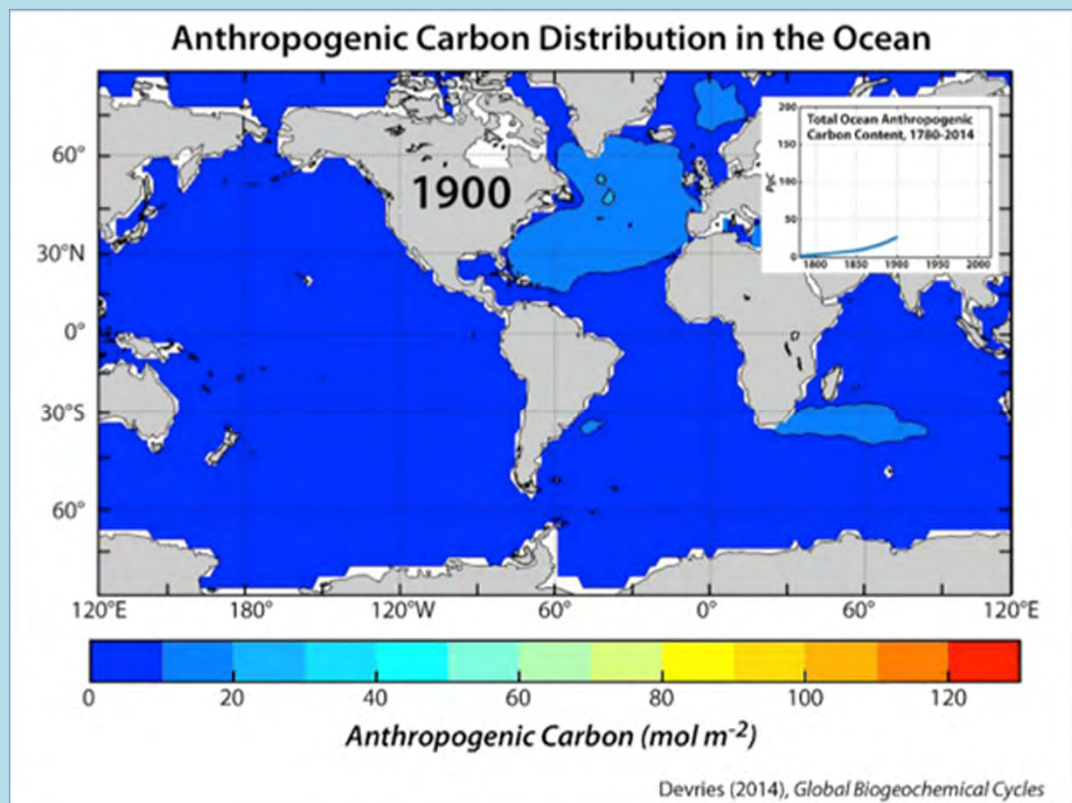


<http://cdiac.ornl.gov/>

## CONNECT WITH CDIAC THIS WEEK

- Talk to Alex Kozyr

# OCB OUTREACH MATERIALS



## 20 FACTS about Ocean Acidification

November 2013

This document presents the highlights of the *Frequently Asked Questions* about Ocean Acidification (2010, 2012; [www.whoi.edu/OCB-OA/FAQs](http://www.whoi.edu/OCB-OA/FAQs)), a detailed summary of the state of ocean acidification research and understanding. The *FAQs* and this fact sheet are intended to aid scientists, science communicators, and science policy advisors asked to comment on details about ocean acidification. In all, 63 scientists from 47 institutions and 12 countries participated in writing the *FAQ*, which was produced by the Ocean Carbon and Biogeochemistry Project ([www.us-ocb.org](http://www.us-ocb.org)), the United Kingdom Ocean Acidification Programme ([www.oceanacidification.org.uk](http://www.oceanacidification.org.uk)), and the European Project on Ocean Acidification (EPOCA). More information and contacts can be found at any of these websites or at the Ocean Acidification International Coordination Centre's website ([www.iaiaa.org/ocean-acidification](http://www.iaiaa.org/ocean-acidification)). The Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report findings on ocean acidification can be viewed at [www.ipcc.ch](http://www.ipcc.ch).

- Ocean acidification (OA) is a progressive increase in the acidity of the ocean over an extended period, typically decades or longer, which is caused primarily by uptake of carbon dioxide ( $\text{CO}_2$ ) from the atmosphere. It can also be caused or enhanced by other chemical additions or subtractions from the ocean. Acidification can be more severe in areas where human activities and impacts, such as acid rain and nutrient runoff, further increase acidity.
- OA has been well documented with global observations conducted over several decades by hundreds of researchers. It has been definitively attributed to human-generated  $\text{CO}_2$  in the atmosphere that has been released primarily by fossil fuel combustion and land use changes.
- Acidity may be thought of as simply the hydrogen ion concentration ( $\text{H}^+$ ) in a liquid, and pH is the logarithmic scale on which this concentration is measured. It is important to note that acidity increases as the pH decreases.
- Average global surface ocean pH has already fallen from a pre-industrial value of 8.2 to 8.1, corresponding to an increase in acidity of about 30%. Values of 7.8-7.9 are expected by 2100, representing a doubling of acidity.
- The pH of the open-ocean surface layer is unlikely to ever become acidic (i.e. drop below pH 7.0), because seawater is buffered by dissolved salts. The term "acidification" refers to a pH shift towards the acidic end of the pH scale, similar to the way we describe an increase in temperature from  $-20^\circ\text{C}$  to  $0^\circ\text{C}$  ( $-4^\circ\text{F}$  to  $32^\circ\text{F}$ ): it's still cold, but we say it's "warming."
- OA is also changing seawater carbonate chemistry. The concentrations of dissolved  $\text{CO}_2$ , hydrogen ions, and bicarbonate ions are increasing, and the concentration of carbonate ions is decreasing.
- Changes in pH and carbonate chemistry force marine organisms to spend more energy regulating chemistry in their cells. For some organisms, this may leave less energy for other biological processes like growing, reproducing or responding to other stresses.

*Parapods, also called sea butterflys, are one type of shelled organism at risk from ocean acidification. Photo by Nina Seldanow (NOAA/PMEL).*

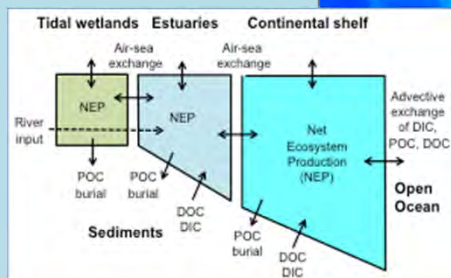
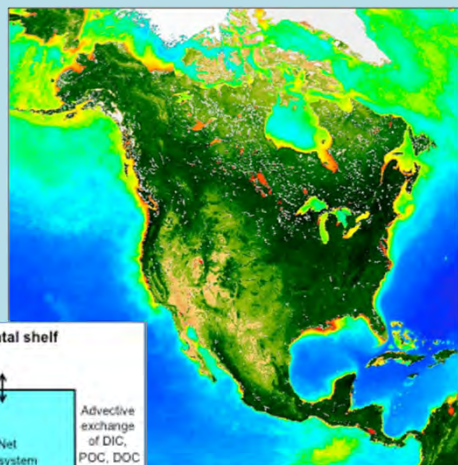


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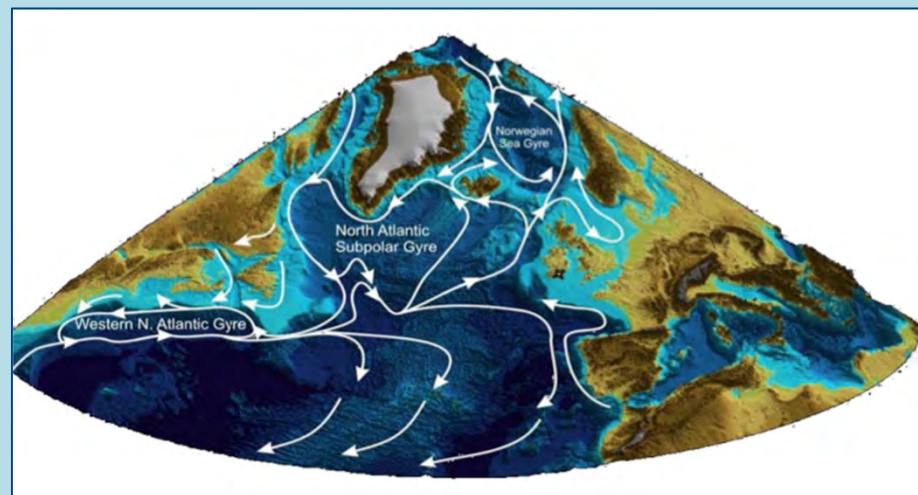
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# RECENT SCIENCE PLANNING EFFORTS

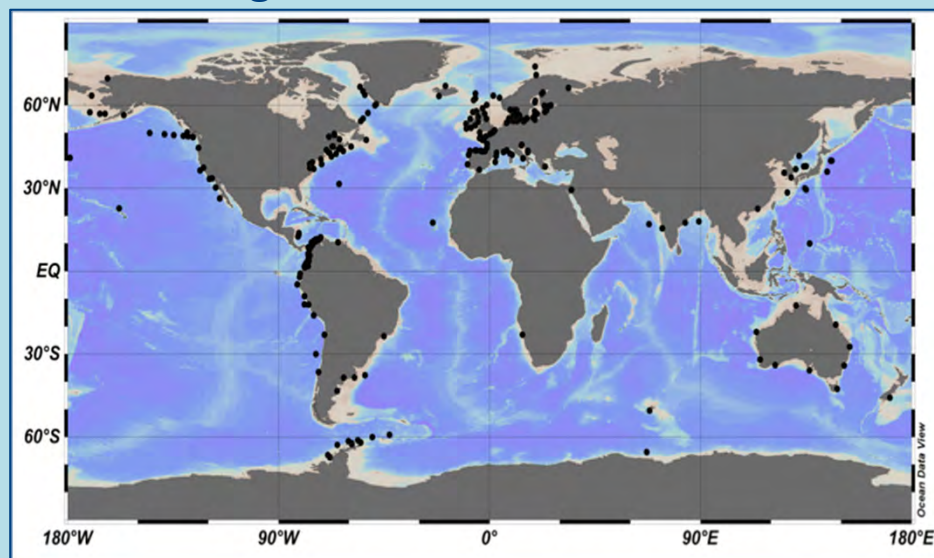
## North American Coastal Carbon Science Plan



## International North Atlantic-Arctic Science Plan



## Global biogeochemical time-series network



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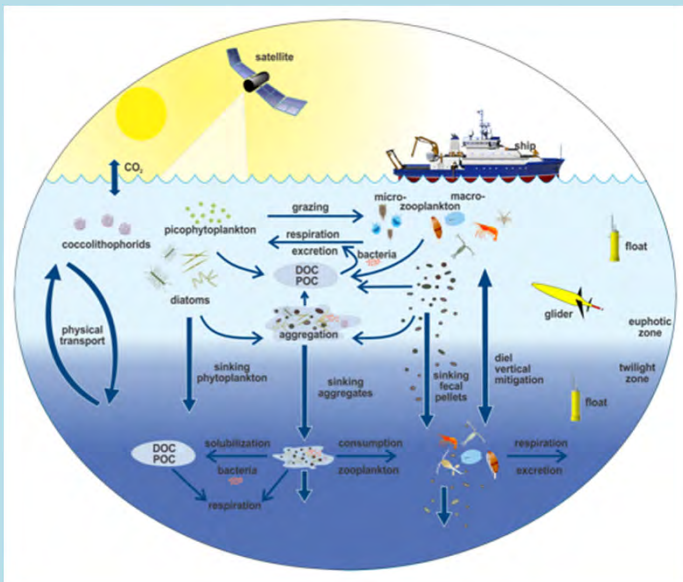


# BIG SCIENCE IN THE 2016 OCB AGENDA

## Arctic - COLORS

*Coastal Land Ocean Interactions in the Arctic*

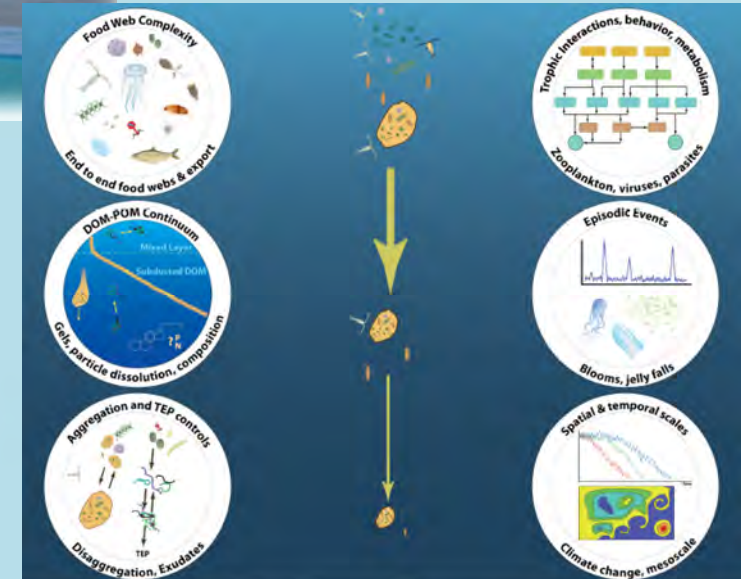
## Biology of BioPump



EXPORTS



SOCCOM



Plankton, Aerosol, Cloud, ocean Ecosystem



2nd International  
Indian Ocean  
Expedition





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committee**

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**Join OCB email list**

**Submit an activity proposal**

**Ocean Carbon  
& Biogeochemistry**



**Andrew Barton**



**Mark Brzezinski**



**Kristen Buck**



**Adrian Burd**



**Matt Church**



**Scott Doney**



**Bethany Jenkins**



**Laurie Juranek**



**Mike Lomas**



**Nikki Lovenduski**



**Jeremy Mathis**



**Dennis McGillicuddy**



**Susanne Neuer**



**Anton Post**



**Mike Roman**



**Dave Siegel**



**Debbie Steinberg**



**Ben Van Mooy**



**Angel White**

# Let's get charged for a great meeting!



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