

Highlights in Ocean Acidification Activities July 2008 – July 2009

The Ocean Carbon and Biogeochemistry Program has been involved in numerous ocean acidification activities this year. We provide a short summary of the highlights here, but thanks to Heather Benway (OCB Project Scientist), ocean acidification now has a dedicated website. This website is quite a resource for anyone interested in ocean acidification. It is still being populated with information, but its organization and the wealth of information already there will be a real asset to the research community and the public.

<http://www.whoi.edu/page/preview.do?pid=32356>

Formation of the OCB Subcommittee on Ocean Acidification

Ocean acidification is a top research priority identified by the Ocean Carbon and Biogeochemistry (OCB) Program. The far-reaching effects of ocean acidification on marine biogeochemical cycles and biology, combined with the increasing interest in the topic both nationally and internationally, prompted the OCB Scientific Steering Committee (OCB-SSC) to recommend the formation of an Ocean Acidification Subcommittee.

The subcommittee was officially formed in Fall, 2008. It currently consists of 10 members.

Richard Feely, NOAA/PMEL (co-chair)

Joan Kleypas, NCAR (co-chair)

Barney Balch, Bigelow Laboratory

Scott Doney, WHOI

Vicki Fabry, CSU-San Marco

Jean-Pierre Gattuso, CNRS, France
(International Representative)

David Hutchins, USC

Chris Langdon, U. Miami

Lisa Robbins, USGS

Richard Zeebe, U. Hawaii

The OA Subcommittee tasks are to:

1. Track current research and make recommendations regarding future research needs.
2. Collect information relevant to ocean acidification research, and organizing it within a centralized site (primarily via world

wide web) for the public and research community, and

3. Advocate for ocean acidification research in dialog with governmental, educational, informational, and philanthropic organizations. It also provides advice on issues related to such activities as the upcoming National Research Council Report on ocean acidification.

OCB OA Activities for the year

Workshop Report: Fabry, Langdon, et al. (2009) *Present and Future Impacts of Ocean Acidification on Marine Ecosystems and Biogeochemical Cycles*, report of the OCB Scoping Workshop on Ocean Acidification Research, 9-11 October 2007, La Jolla, CA, 59 pp.

http://www.us-ocb.org/publications/OCB_OA_rept.pdf

This OCB-sponsored workshop and report on ocean acidification focused on developing research strategies for four major ecosystems: warm-water coral reefs, coastal margins, subtropical/tropical pelagic regions, and high-latitude regions. Its recommendations set the stage for the OA Subcommittee White Paper outlining the need and basic structure of national research program.

White paper: *Ocean Acidification: Recommended Strategy for a U.S. National Research Program*

This white paper was targeted for U.S. policymakers and program managers of federal research institutions.

Response to EPA: EPA Notice of Data Availability Ocean Acidification and Marine pH Water Quality Criteria [EPA-HQ-OW-2009-0224; FRL-8892-5]

The EPA published a notice of data availability (NODA) regarding its “aquatic life criteria for pH of marine waters” under the Clean Water Act. The OA Subcommittee compiled a lengthy response to this call, which included numerous comments from the OCB community. The OCB community response can be downloaded from:

http://www.us-ocb.org/EPA_OCB_FINAL.pdf

Response to JSOST: The National Science and Technology Council's Joint Subcommittee on Ocean Science & Technology recently called for comments on its Ocean Research Priorities Plan. http://ocean.ceq.gov/about/sup_jsost_prioritiesplan.html. The OA Subcommittee responded to with a strong recommendation to elevate ocean acidification to a near-term priority, which will be available from the OCB OA website soon.

Contribution to CACC: Several members of the OA Subcommittee assisted in the National Academies Response to the Committee on America's Climate Choices Request for an Ocean Acidification White Paper.

Special Issue on Ocean Acidification in *Oceanography*: Dick Feely, Barney Balch, Scott Doney and Vicki Fabry are editing a special issue on ocean acidification in *Oceanography*, to be published near the end of 2009, with gratefully acknowledged support from NSF (OCE-BIO and OCE-CHEM), NASA, and NOAA.

OceanObs'09: Dick Feely spearheaded community input into a whitepaper entitled: "An International Observational Network for Ocean Acidification" for the OceanObs'09 conference to be held 21-25 September 2009 in Venice.

Short Course on Ocean Acidification

NSF is providing support to OCB to conduct a 2-week short course on Ocean Acidification (with supplemental support from the EPOCA: European Program on Ocean Acidification). This hands-on course is a timely follow-up to the "Workshop on Best Practices in Ocean Acidification Research and Data Reporting," held in Kiel in November 2008.

DATES: November 2-13, 2009

LOCATION: Marine Biological Laboratory (MBL) and Woods Hole Oceanographic Institution (WHOI)

NUMBER OF PARTICIPANTS: ~50-60 participants (including instructors) from the OCB community, primarily targeted for junior to mid-level faculty and postdoctoral scientists

FORMAT: Lecture, laboratory, and field components as appropriate

OTHER: Lectures will be videotaped and archived, with possible inclusion in the ASLO Web Lecture Series.

More information will be available on the OCB Ocean acidification website:

<http://www.whoi.edu/page/preview.do?pid=32356>

NATIONAL ACTIVITIES

National Research Council Report:

Development of an Integrated Science Strategy for Ocean Acidification Monitoring, Research, and Impacts Assessment. The reauthorization of the Magnuson-Stevens Fishery Conservation and Management Act in 2007 called for the Department of Commerce to conduct a National Research Council (NRC) study of the acidification of the oceans and how this process affects the United States. The NRC (with Dr. Susan Park as Study Director) assembled the study panel early this year consisting of:

François Morel (CHAIR) Princeton University
David Archer, University of Chicago
James Barry, Monterey Bay Aquar. Res. Inst.
Garry Brewer, Yale Univ. School Management
Jorge Corredor, Univ. Puerto Rico, Mayagüez
Scott Doney, Woods Hole Oceanographic Inst.
Victoria Fabry, Cal. State Univ., San Marcos
Gretchen Hofmann, UC, Santa Barbara
Daniel Holland, Gulf of Maine Res. Inst.
Joan Kleypas, NCAR
Frank Millero, Univ. Miami RSMAS
Ulf Riebesell, Leibniz Inst. Mar. Sci., Kiel

The report is on an abbreviated timeline. Two meetings have been completed, and the 3rd and final is scheduled for September. The draft report is due Sep/Oct 2009, and the final report is anticipated in Jan-Mar 2010.

FOARAM Act of 2009: After several years of hard work by scientists and politicians alike, a major bill advocating ocean acidification research – the Federal Ocean Acidification Research and Monitoring Act of 2009 (FOARAM Act of 2009) – passed both Houses of Congress. It was signed into law by President Obama in March, as part of the Omnibus Public Land Management Act of 2009. The following table summarizes the authorized funding for

NOAA and NSF. Note, however, that the funds have not yet been appropriated.

Year	NOAA \$ millions	NSF \$ millions
2009	8	6
2010	12	8
2011	15	12
2012	20	15

JSOST is the interagency subcommittee responsible for coordinating the activities between NOAA, NSF and other agencies. JSOST is in the currently developing the charter for an Interagency Working Group on Ocean Acidification (IWGOA).

NOAA: Dr. Libby Jewett is coordinating a team of scientists and policy specialists to develop NOAA's OA research plan, which includes 6 regional foci plus a national overview. This plan, which forms NOAA's effort within the interagency strategic plan required by the FOARAM act, should be ready by early October.

International Programs

Our EU partners are proceeding ahead with current and new research programs dedicated to ocean acidification research:

EPOCA has enjoyed a successful first year of a 4-year program, and is has just kicked off Year 2 with its second annual meeting in Plymouth in June, 2009. EPOCA funding includes > 100 PIs from 27 Institutes across 9 countries. Funding is a total of about € 6.5 M. Jean-Pierre Gattuso coordinates the program, which has goals to:

- document and model the changes in ocean chemistry and biogeography across space and time.
- determine the sensitivity of marine organisms, communities and ecosystems to ocean acidification.
- integrate results on the impact of ocean acidification on marine ecosystems in biogeochemical, sediment, and coupled ocean-climate models to better understand and predict the responses of the Earth system to ocean acidification.

- determine uncertainties, risks and thresholds ("tipping points") related to ocean acidification at scales ranging from subcellular to ecosystem and local to global.

Much more can be found on the EPOCA website at: <http://www.epoca-project.eu/>

BIOACID (Biological Impacts of Ocean ACIDification) is a new 3 to 6-year German-sponsored program on ocean acidification slated to begin in September 2009. It includes 62 PIs from 18 partner institutes, and is coordinated by Ulf Riebesell. Funding is some € 8.9 M for the first 3 years of the program. The program has 5 stated themes:

1. Primary production, microbial processes and biogeochemical feedbacks
2. Animal performance: reproduction, growth and behaviours
3. Calcification in organisms and ecosystems
4. Species interactions and community structure in a changing ocean
5. Integrated analyses: sensitivities and uncertainties

UK Ocean Acidification Research

Programme: NERC and Defra have granted £11M for a 5-year ocean acidification program in the UK, slated to begin in early 2010. Funding for this program is £11.7. Carol Turley is the coordinator of the programme, which has 7 expected outcomes:

1. Improved estimates of ocean CO₂ uptake and associated OA
2. Impact of OA on surface ocean biology, community structure, biogeochemistry and on feedbacks to the climate
3. Identification and improved understanding of potential impacts and implications of OA on key benthic ecosystems communities, habitats, species and life cycles.
4. Improved understanding of the potential population, community and ecosystem impacts on all life stages of commercially important species and their capacity to resist and adapt
5. Identification of evidence from the paleo-record of past changes in ocean acidity and resultant changes in marine species composition and Earth System function.
6. Improved understanding of the cumulative/ synergistic effects of OA and other global change pressures on ecosystems, biogeochemical cycles and feedbacks on climate.

7. A service for carbonate chemistry measurements

International Meetings on Ocean Acidification

Several important international meetings dedicated to ocean acidification were held in the past year. These include:

Oceans in a High CO₂ World, II – Monaco

Workshop on Best Practices in Ocean Acidification Research and Data Reporting – Kiel

Symposium on Rising CO₂, Ocean Acidification, and Their Impacts on Marine Microbes, Hawaii

2nd Annual EPOCA Workshop – Plymouth

In addition, MANY special sessions on ocean acidification were held at national and international meetings

July 20, 2009

Joanie Kleypas & Dick Feely