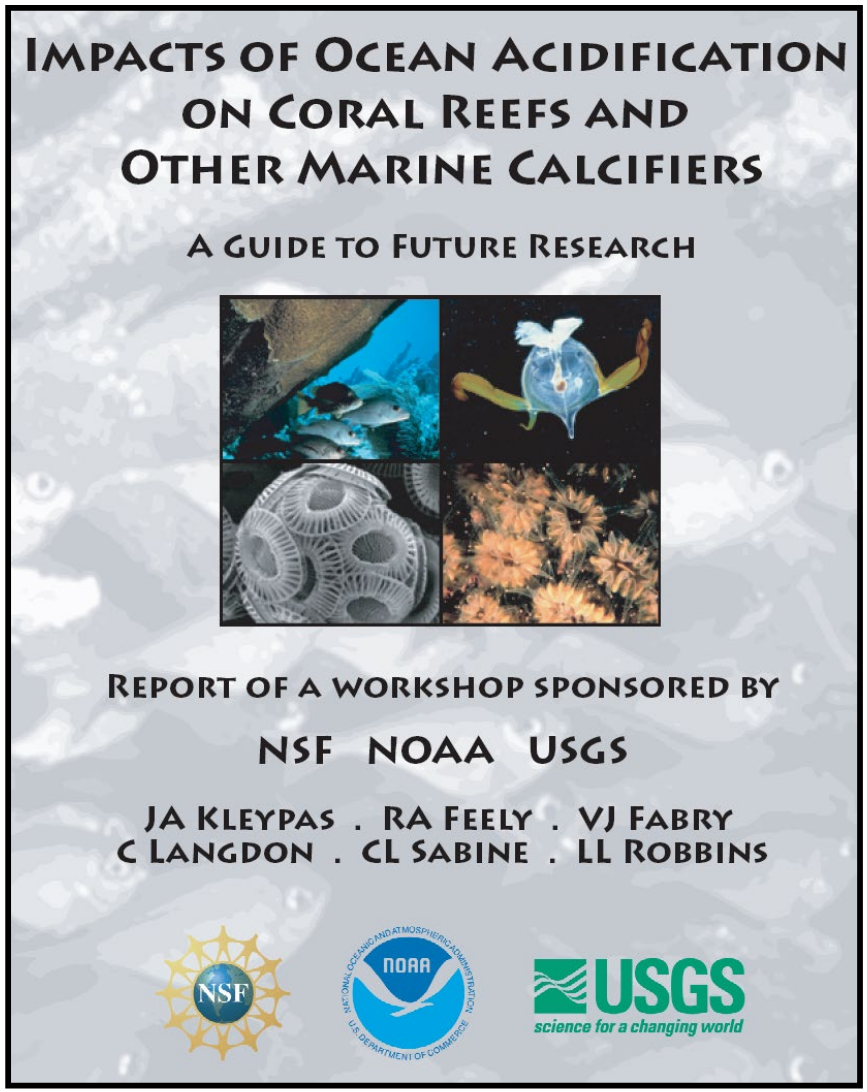
Putting workshop reports to use:

Workshop Recommendations:



- Biological research needs
  - Cross-taxa responses
  - Synergistic effects (Ω, T, light, nuts)
  - Long-term monitoring of community-scale response
  - Base-line surveys of calcification rates in the field
  - Biocalcification mechanisms

- Improved oceanic monitoring capability to establish base-lines and track rate and variability
  - Enhanced technologies
  - Observing platforms
  - Long-term time-series hydrographic stations (e.g. BATS, HOTS)
  - Satellite tool development (scale up ship and platform obs, PIC determination)

- Better characterization of carbonate chemistry in coastal systems
  - Base-line characterizations
  - Diurnal, seasonal, decadal variability
  - Much improved carbonate budgets
  - Community Feedback

Scoping Workshop on Ocean Acidification Research

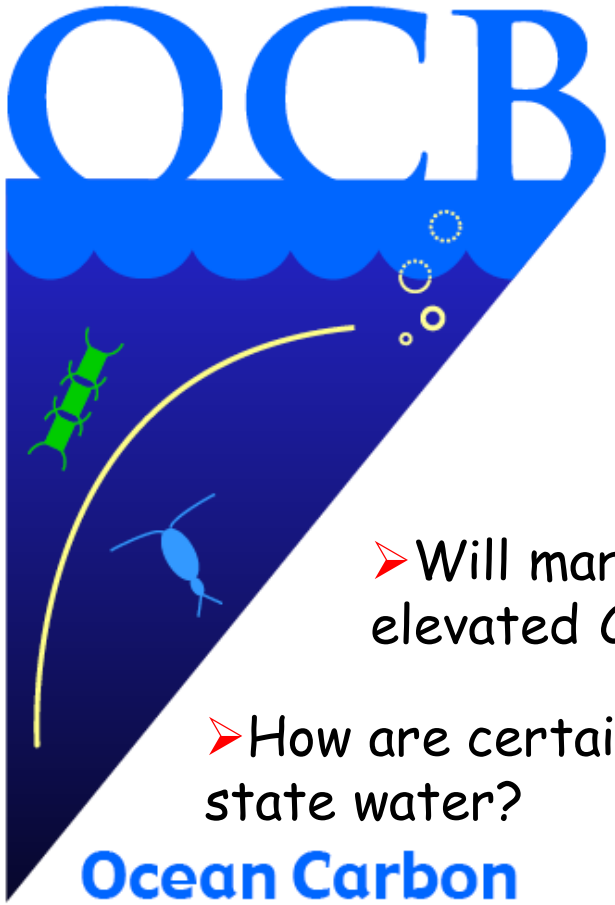
Ocean Carbon & Biogeochemistry

Workshop Steering Committee:

Victoria Fabry, California State University San Marcos (chair)
Chris Langdon, University of Miami (chair)
Barney Balch, Bigelow Laboratory for Ocean Sciences
Andrew Dickson, Scripps Institution of Oceanography
Richard Feely, NOAA/ Pacific Marine Environmental Laboratory
Burke Hales, Oregon State University
David Hutchins, University of Southern California
Joan Kleypas, National Center for Atmospheric Research
Chris Sabine, NOAA/ Pacific Marine Environmental Laboratory

9-11 October 2007
Scripps Institution of Oceanography

science for a changing world



Scientific Questions

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- What are the temporal and spatial changes of the carbon system in the global oceans and their impacts on biological communities and ecosystems?
- Will marine calcifying organisms be able to acclimate to elevated CO_2 and/or temperature if given sufficient time?
- How are certain species able to adapt to life in low saturation state water?
- What are the impacts of high CO_2 on calcification, respiration, reproduction, settlement and remineralization?
- What are the effects of high CO_2 on the processes that affect ecosystem responses and global feedbacks?

OCB

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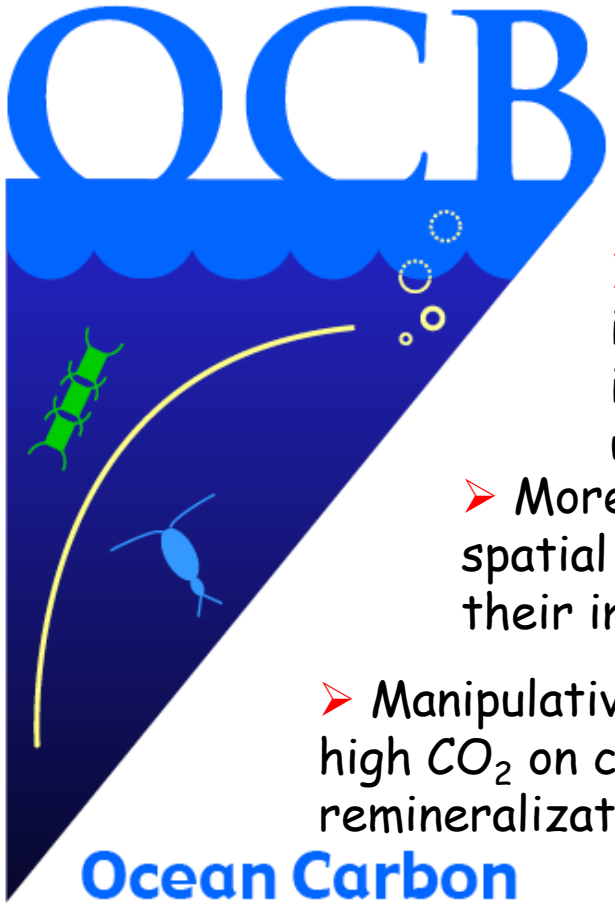
Workshop Outcomes

- Each of the four ecosystem focus groups (coral reefs, coastal regions, high-latitude pelagic, & low-latitude pelagic) devised research implementation strategies involving a mix of field observations and manipulative experiments to investigate potential impacts of ocean acidification on key ecosystem processes and organisms
- Timelines of research activities for the next 10 years were formulated by each ecosystem group
- Specific research implementation strategies will be vetted by the community and the final report will be posted on the OCB website

Conclusions



- Ocean acidification is a process that could be impacting present day and future marine ecosystems in ways that we are just beginning to recognize and understand.
- More research is needed to determine the temporal and spatial changes of the carbon system in the global oceans and their impacts on biological communities and ecosystems.
- Manipulative experiments will help us understand the impacts of high CO_2 on calcification, respiration, reproduction, settlement and remineralization.
- Long term experiments are necessary to observe if marine calcifying organisms will be able to acclimate to elevated CO_2 and/or temperature if given sufficient time.
- We need to discover how certain species are able to adapt to life in low saturation state water.
- We need to know the effects of high CO_2 on the processes that affect ecosystem responses and global carbon feedbacks.

Coral Reef Program
Preliminary Research Objectives

Ocean Carbon & Biogeochemistry

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- Improve our predictive capability of the geochemical response of reef systems to continued ocean acidification in combination with other variables
- Understand temperature/saturation state/nutrient interactions – (average changes as well as in variability)

- Dissolution at multiple levels (organism to reef) also in terms of possibility of local buffering in certain reef habitats – atoll-size scale
- What are the effects on community structure and their repercussions through the ecosystem - who are winners and losers in terms of ocean acidification?
- Retrospective analyses (paleostudies of the last few 1000 years) provide a baseline of reef accretion processes
- Resolve issues with solubility of mineral phases, kinetic issues
- Develop carbonate chemistry measurement protocols
- Improve remote sensing capabilities with high-spatial/high spectral resolution
- Explore molecular/genomic level of calcification (relative sensitivities of different species to saturation state – then identify the genetics of least and most sensitive)