Synthesis of Projects:
Biogeochemical Cycles & Feedbacks

Solubilities of CaCO₃ Minerals

The Fate of Particles

Carbon Cycle Modeling

N-cycle

Regional (mostly coastal) Biogeochemical Studies

Reef Biogeochemistry
Solubilities of CaCO$_3$ Minerals

**Bill Martin:** *The Solubility of Biogenic Calcite*

**Andreas Andersson & Nick Bates:** *Mg-calcite mineral dynamics in natural seawater systems: relevance to oceanic uptake of anthropogenic CO$_2$ and ocean acidification*
Calcite solubility

**Bill Martin:** *The Solubility of Biogenic Calcite*

Solubility of planktonic foraminifera from sediment cores

Biogenic calcite (3 species of forams) were more soluble than abiogenic calcite (Iceland Spar).
High-Mg Calcite solubility

Andreas Andersson & Nick Bates: 
*Mg-calcite mineral dynamics in natural seawater systems: relevance to oceanic uptake of anthropogenic CO₂ and ocean acidification*

- Discrepancy in experimentally determined solubilities of biogenic Mg-calcite
- How these solubilities relate to the behavior of Mg-calcite phases in the natural environment.
The Fate of Particles

From U.S. JGOFS brochure: A New Wave of Ocean Science
The Fate of Particles

Cindy Lee & Anja Engel: *Effects of ocean acidification on the formation and sinking of particle aggregates*

Uta Passow: *Will high CO₂ conditions affect production, partitioning and fate of organic matter?*

Uta Passow (Alice Alldredge): *Will ocean acidification diminish particle aggregation and mineral scavenging, thus weakening the biological pump?*
Carbon-Cycle Modeling

Jorge Sarmiento (Eun Young Kwon, R Toggweiler, J Dunne): Does the strength of the carbonate pump change with ocean stratification and acidification and how?

David Glover (Scott Doney, Keith Lindsay): Assessing the impact of ocean acidification on marine planktonic calcification using satellite analysis and earth system modeling.

Richard Zeebe: Early Detection of Ocean Acidification Effects on Marine Calcification and Deep-Sea Carbonate Dissolution
Impacts of OA on the Nitrogen Cycle

Nathan S. Garcia, Dave Hutchins: CO$_2$ control of oceanic nitrogen fixation and carbon flow through diazotrophs

Matt Church, Ricardo Letelier: Oceanic diazotroph community structure and activities in a high carbon dioxide world

Hutchins et al. 2009 Oceanography
Regional BGC Studies

Jeremy Mathis: Biogeochemical Assessment of the North Aleutian Basin Ecosystem: Current Status and Vulnerability to Climate Change (funding from BOEM)

Laurie Juranek (Mathis, Feely): Observation and Prediction of Ocean Acidification in the Western Arctic Ocean – Impacts of Physical and Biogeochemical Processes on Carbonate Mineral States

Wei-Jun Cai: Controls on sea surface pCO₂ variability and CO₂ uptake in the Western Arctic Ocean Margins

Wei-Jun Cai (S Lohrenz & K Gundersen): Satellite assessment of CO₂ distribution, variability and flux and understanding of control mechanisms in a river dominated ocean margin

Francis Chan: Microbial Initiative in Low Oxygen areas off Concepción and Oregon

Cooley (K Fennel, S Doney): Consequences of river outflow and mesoscale circulation features in Middle Atlantic Bight

Sergio Signorini, Chuck McClain: Assessment and Impact of Carbon Variability in the Nordic Seas

Grace Saba, Oscar Schofield: Effects of enhanced CO₂ on Antarctic plankton community structure and biogeochemical cycles
Regional BGC Studies

- Aleutian Basin
- W Arctic Ocean
- Northern Basin
- S. Canada Basin
- 60°N
- Oregon
- "River-dominated"
- Mid-Atlantic Bight (Modeling)
Regional BGC Studies
BGC of Reef Waters

- Bermuda
- Florida Reef Tract
- Puerto Rico
- USVI
- Mexico - springs
- Pacific Reefs
- Eastern Trop. Pacific
- Moorea LTER
BGC of Calcifying Media

Justin B. Ries: *Direct and indirect chemical analysis of the calcifying media of marine calcifiers*

Using selective ion microelectrodes and chemical proxies within the shells/skeletons of marine calcifiers to estimate the composition of the media from which marine calcifiers precipitate their shells and skeletons.
<table>
<thead>
<tr>
<th>Name</th>
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<tbody>
<tr>
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