

Synthesis of Projects: Biogeochemical Cycles & Feedbacks

Solubilities of CaCO₃ Minerals

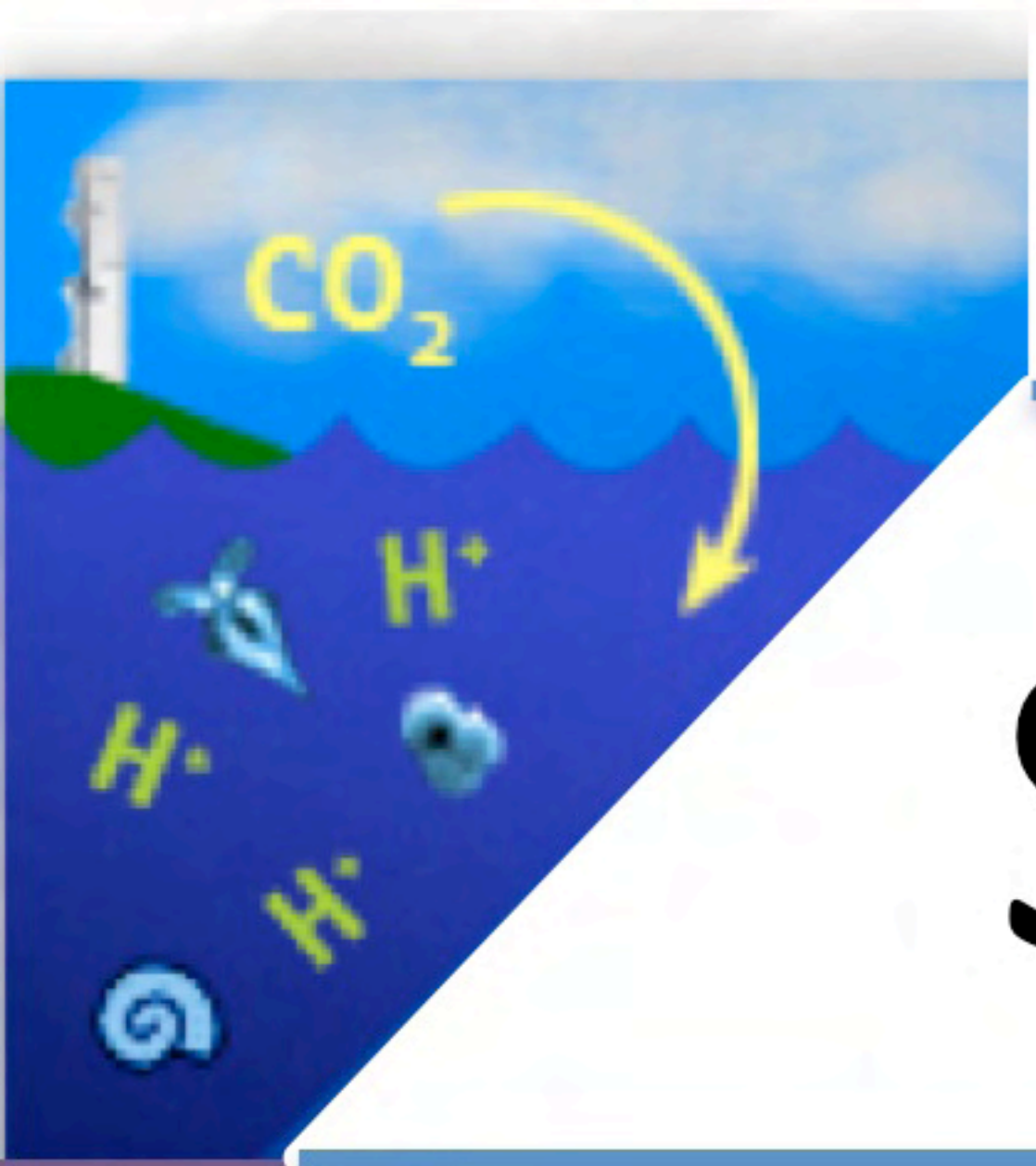
The Fate of Particles

Carbon Cycle Modeling

N-cycle

Regional (mostly coastal) Biogeochemical Studies

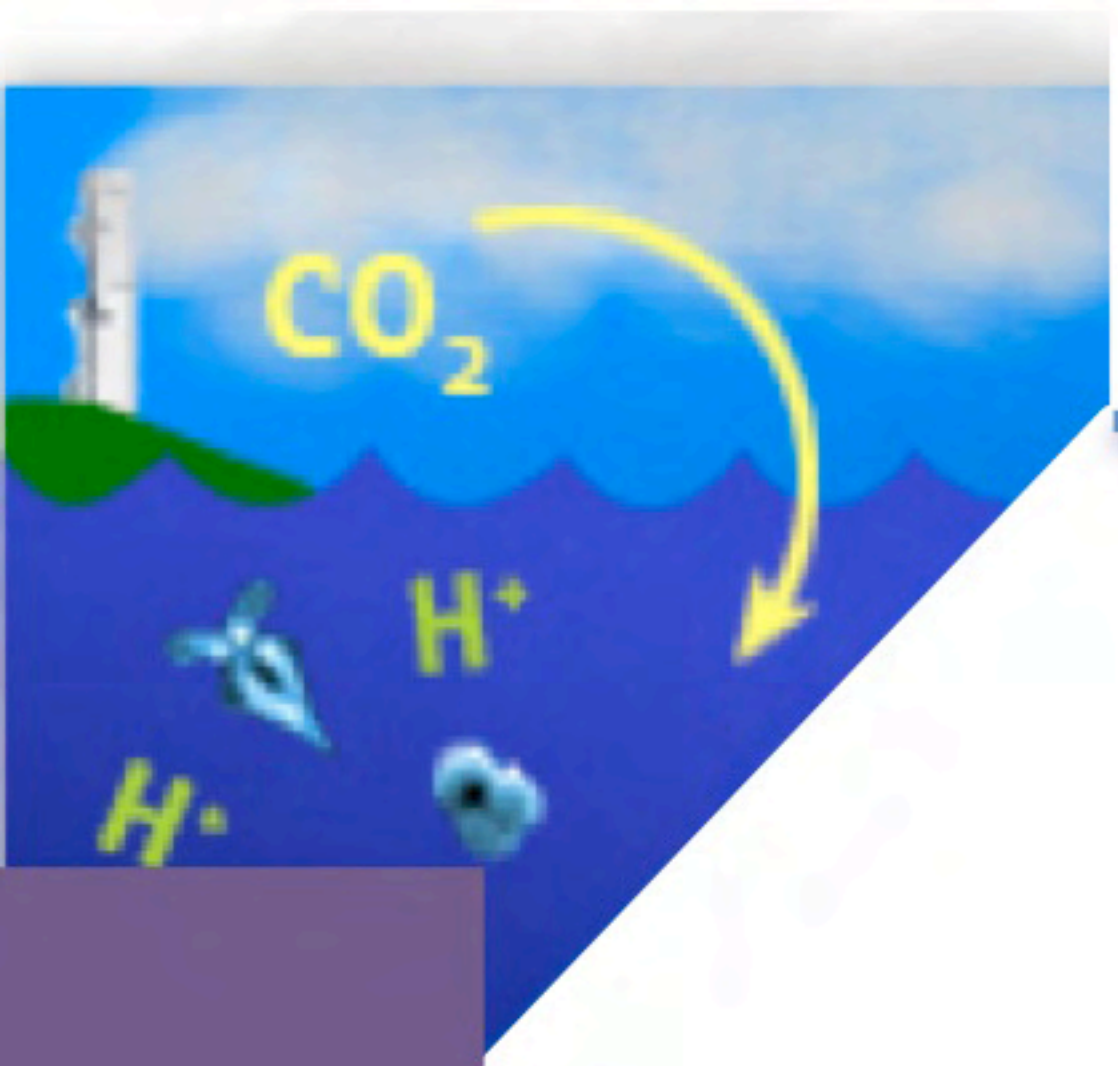
Reef Biogeochemistry



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*

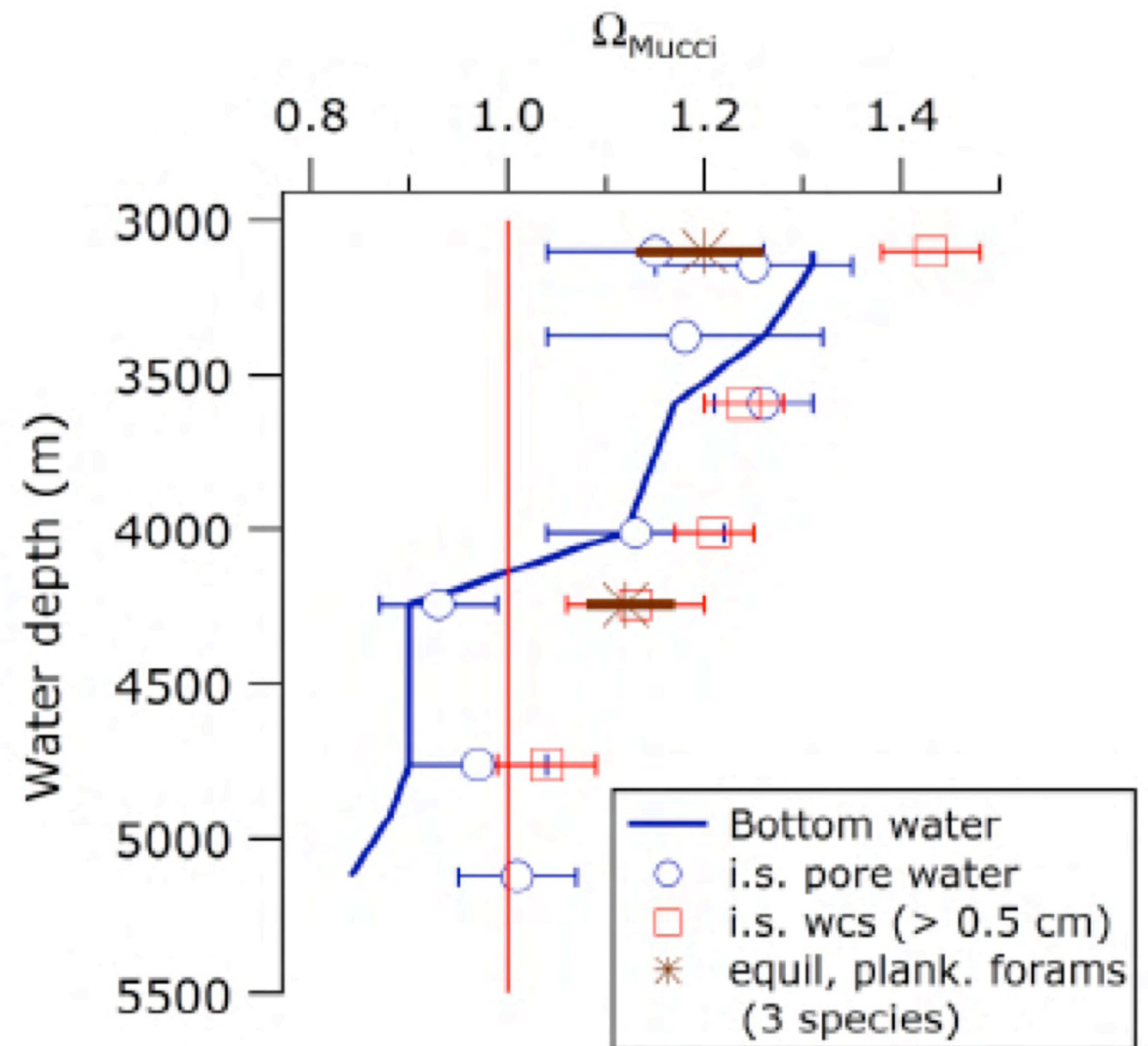


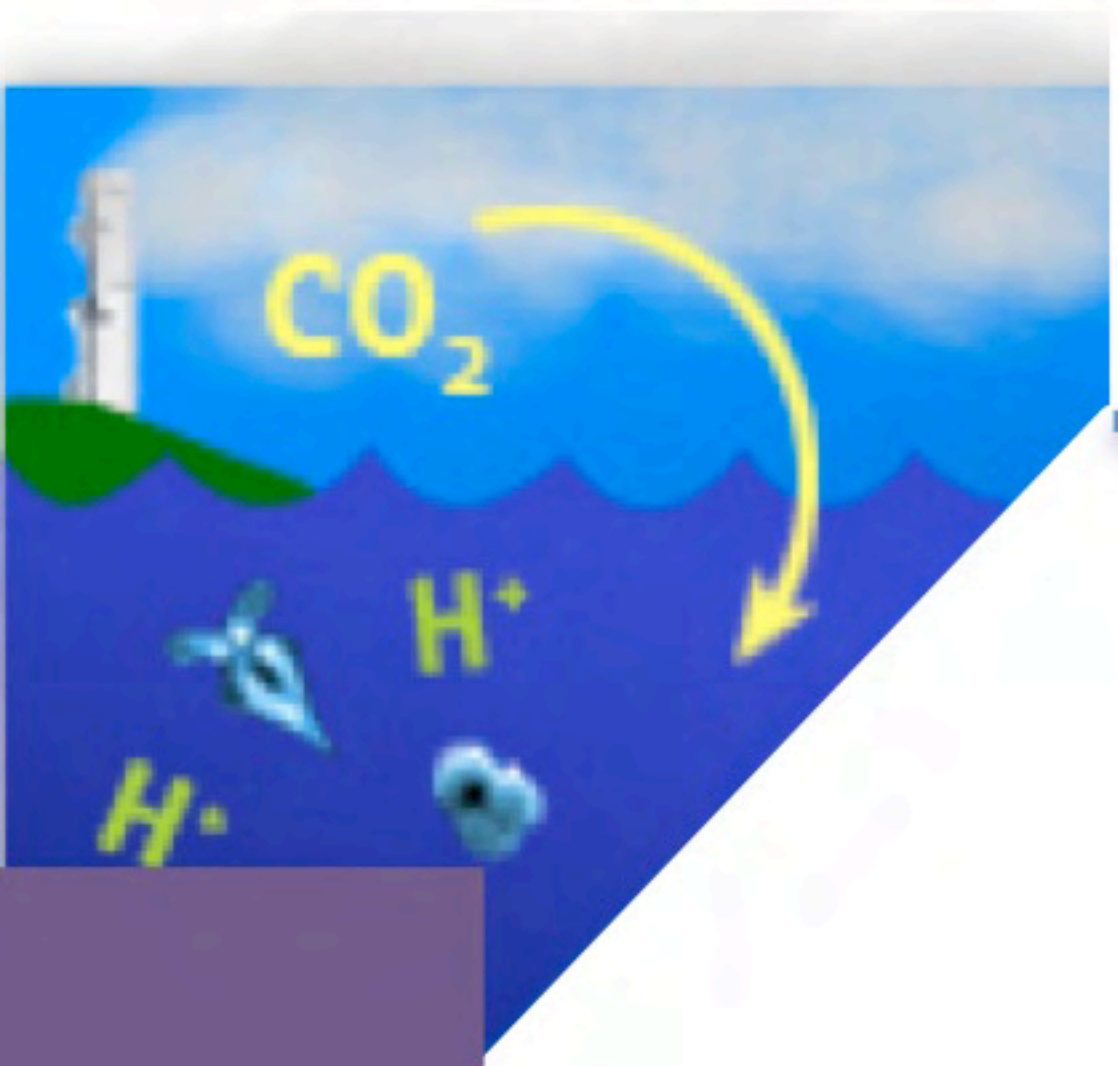
Calcite solubility

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).

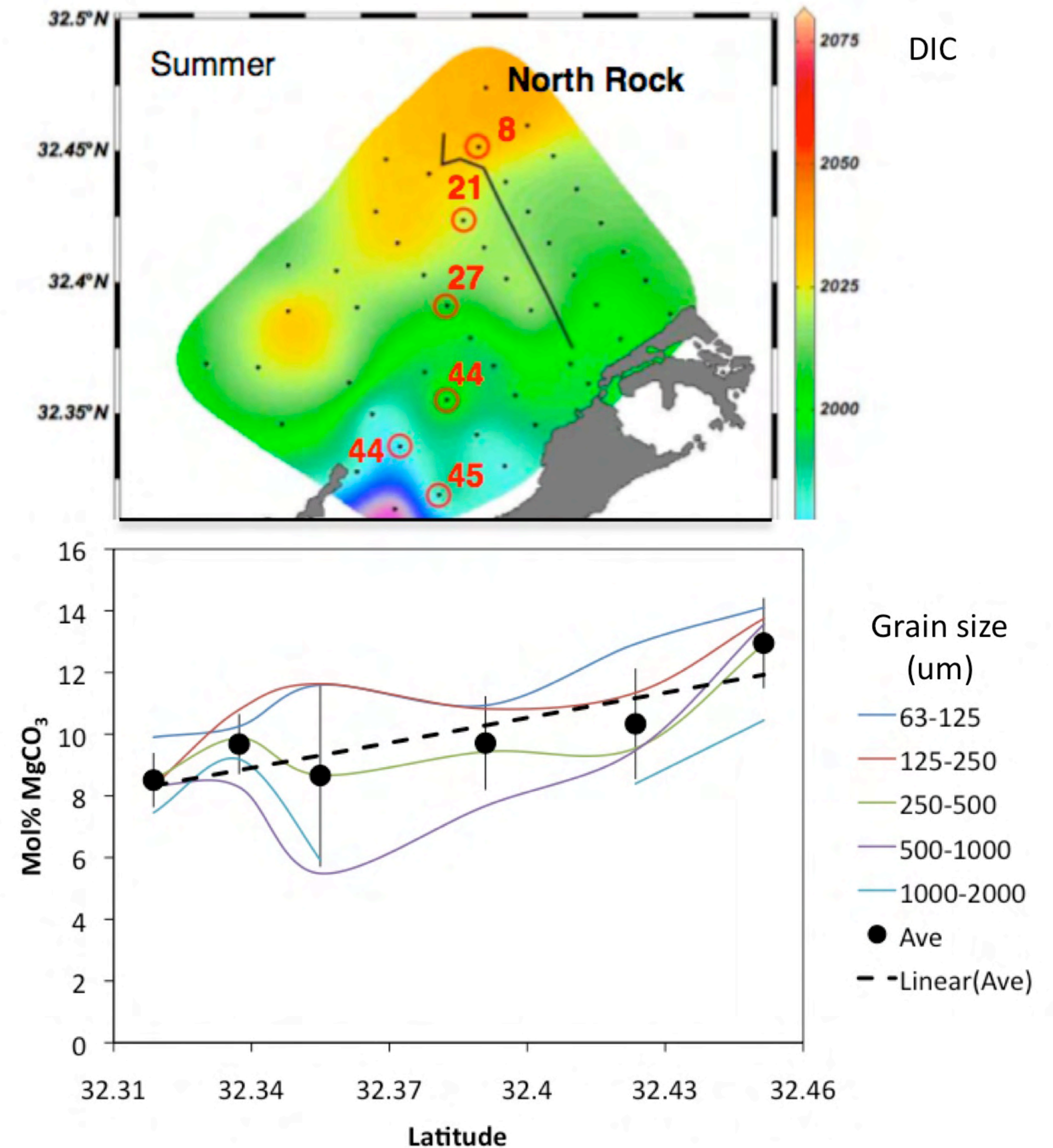


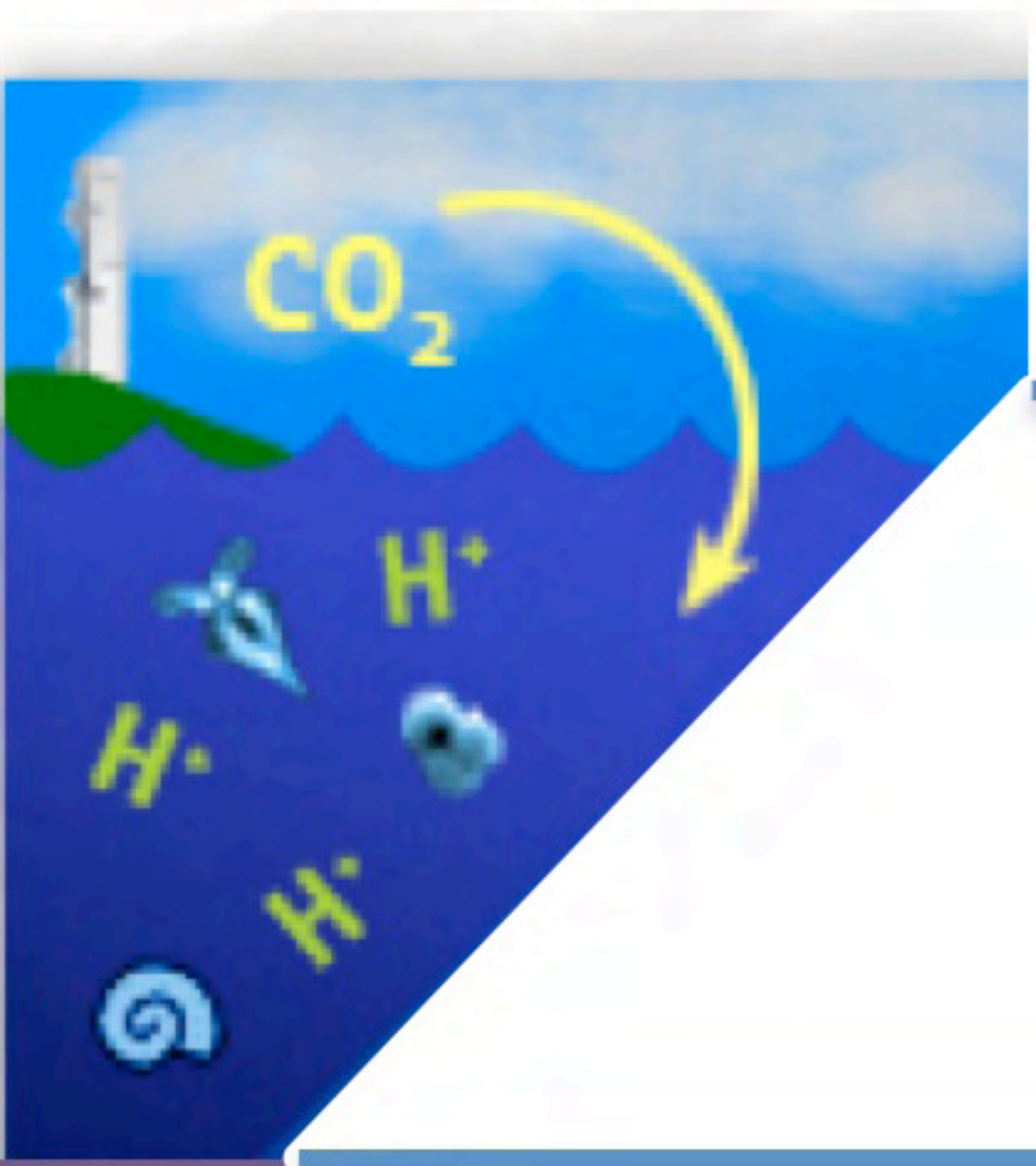


High-Mg Calcite solubility

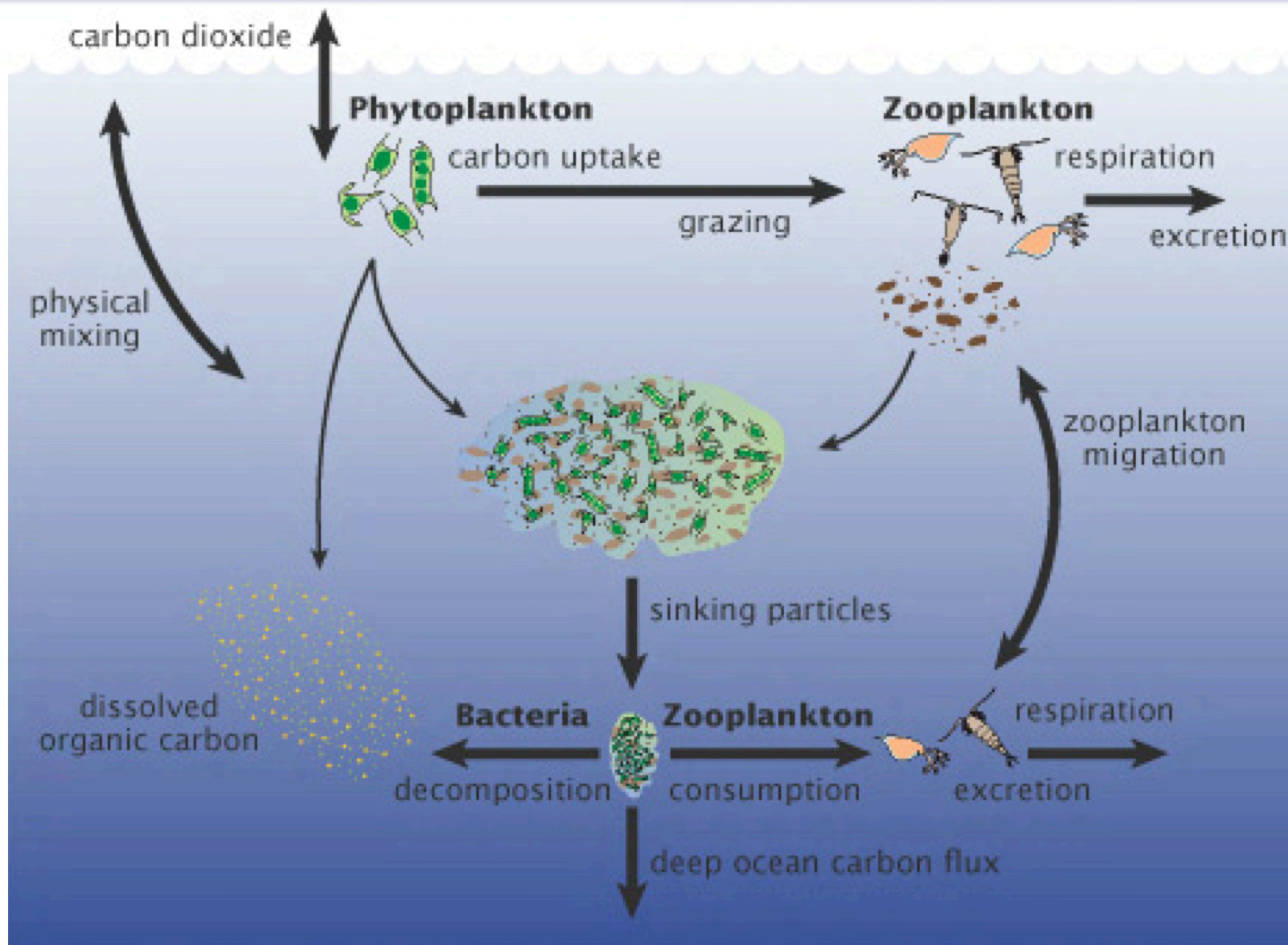
Andreas Andersson & Nick Bates:
Mg-calcite mineral dynamics in natural seawater systems: relevance to oceanic uptake of anthropogenic CO₂ and ocean acidification

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

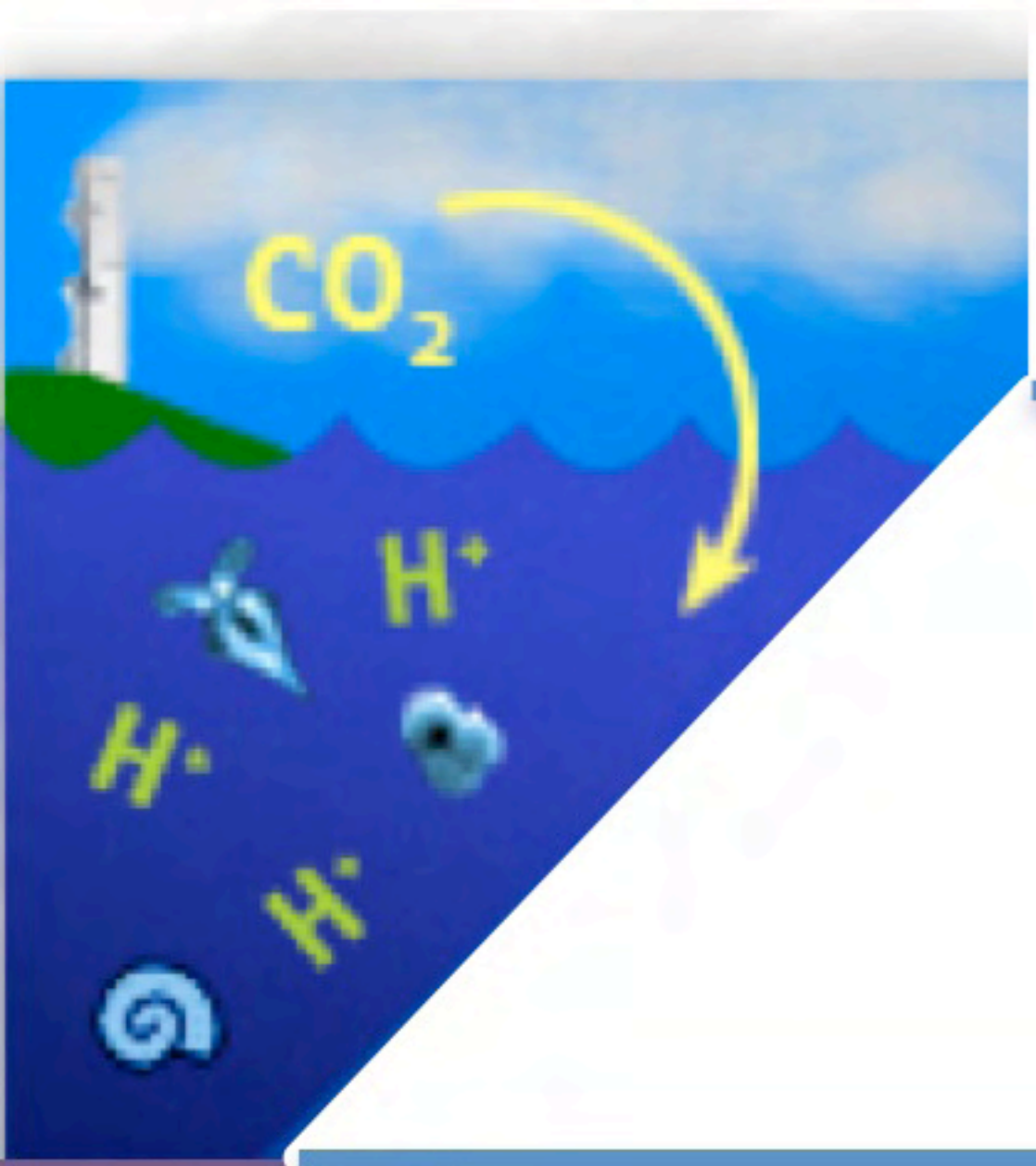




The Fate of Particles

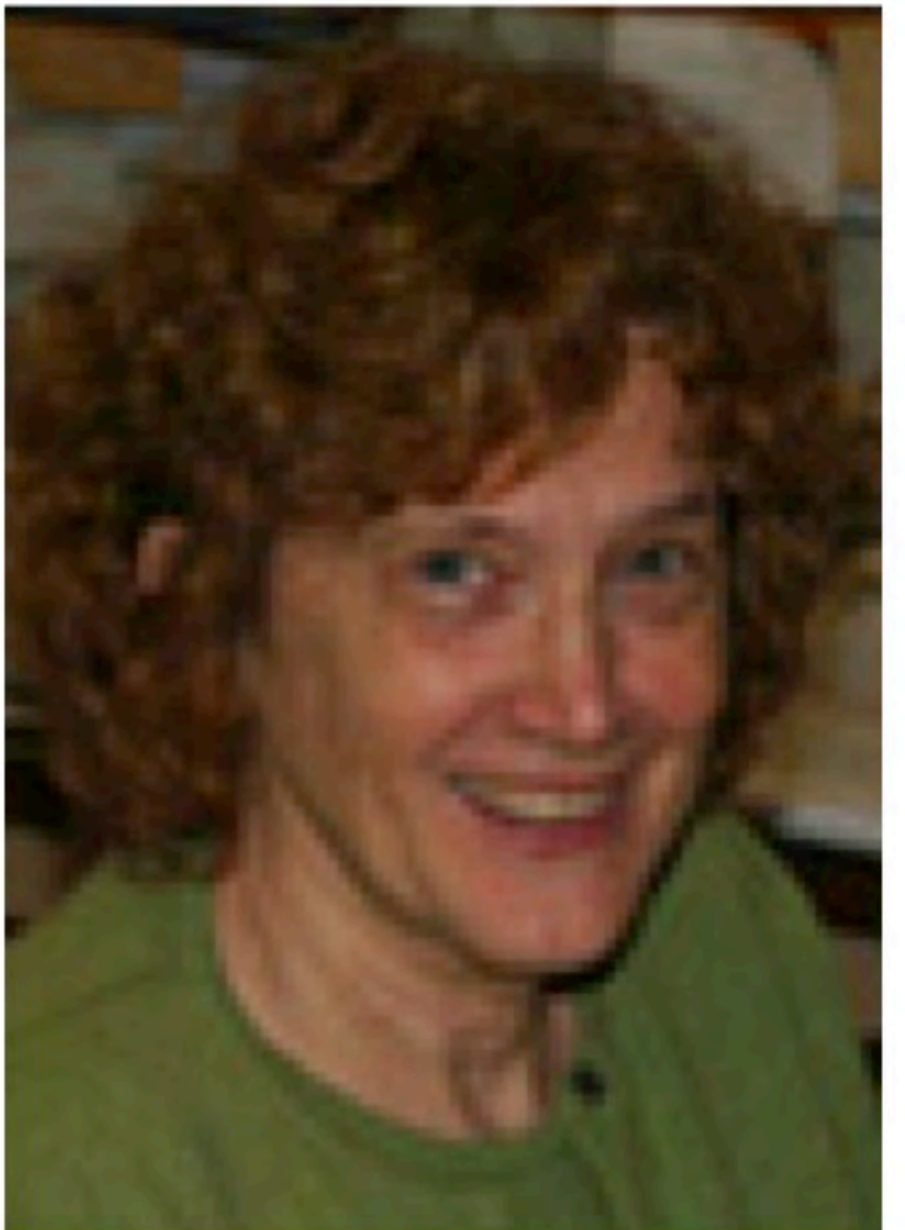


From U.S. JGOFS brochure: A New Wave of Ocean Science



The Fate of Particles

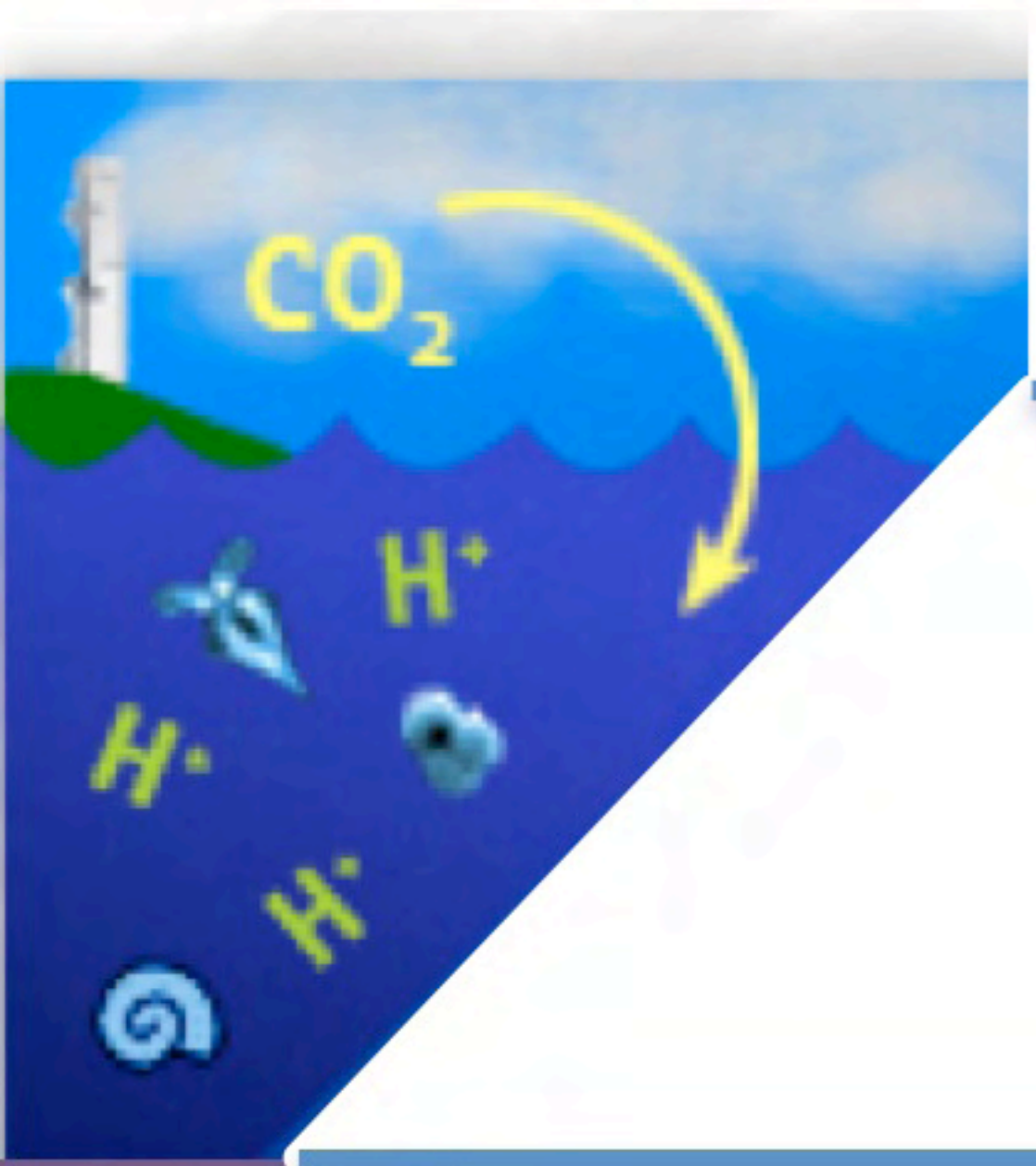
Cindy Lee & Anja Engel: *Effects of ocean acidification on the formation and sinking of particle aggregates*



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?*

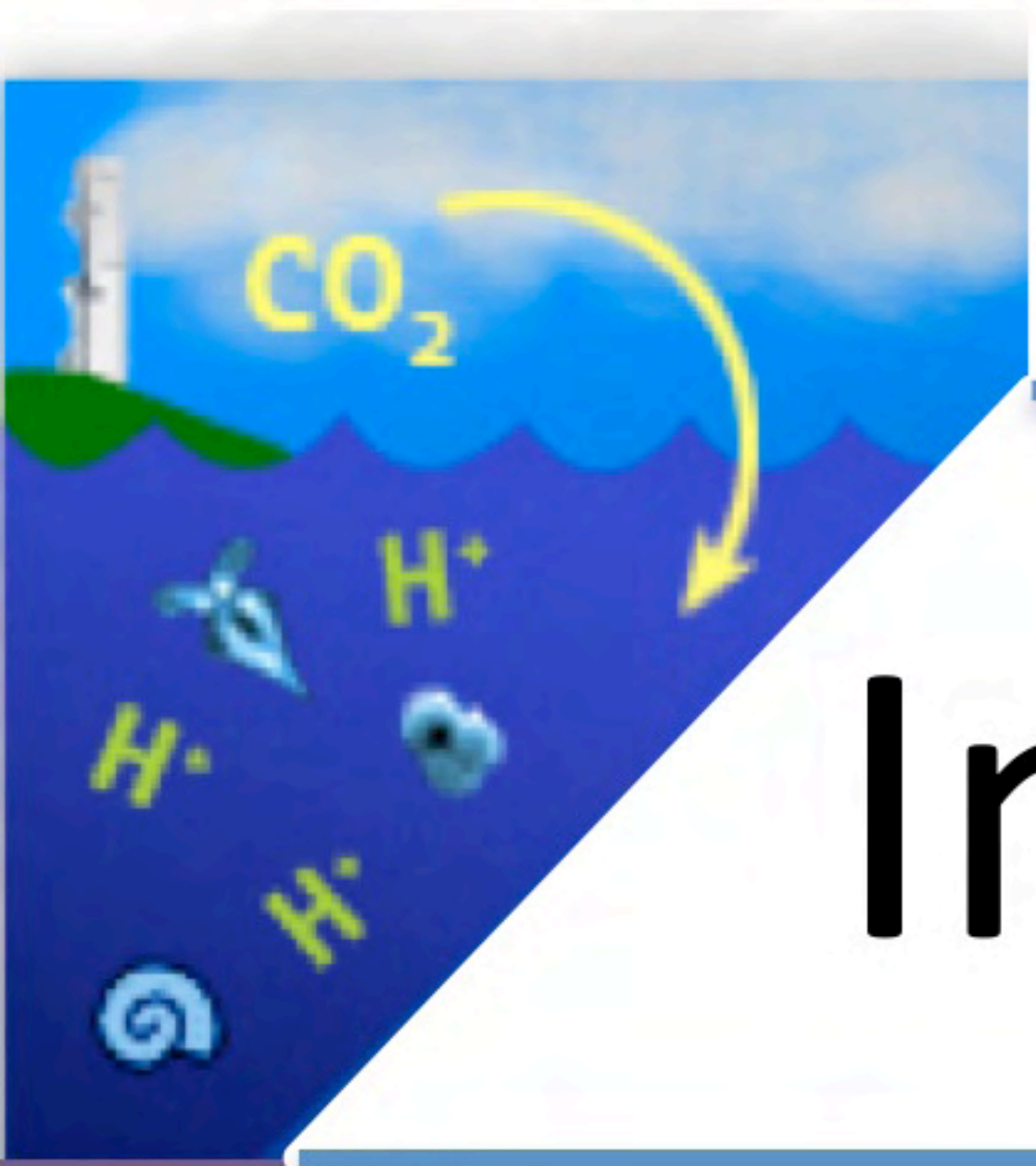


Carbon-Cycle Modeling

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*



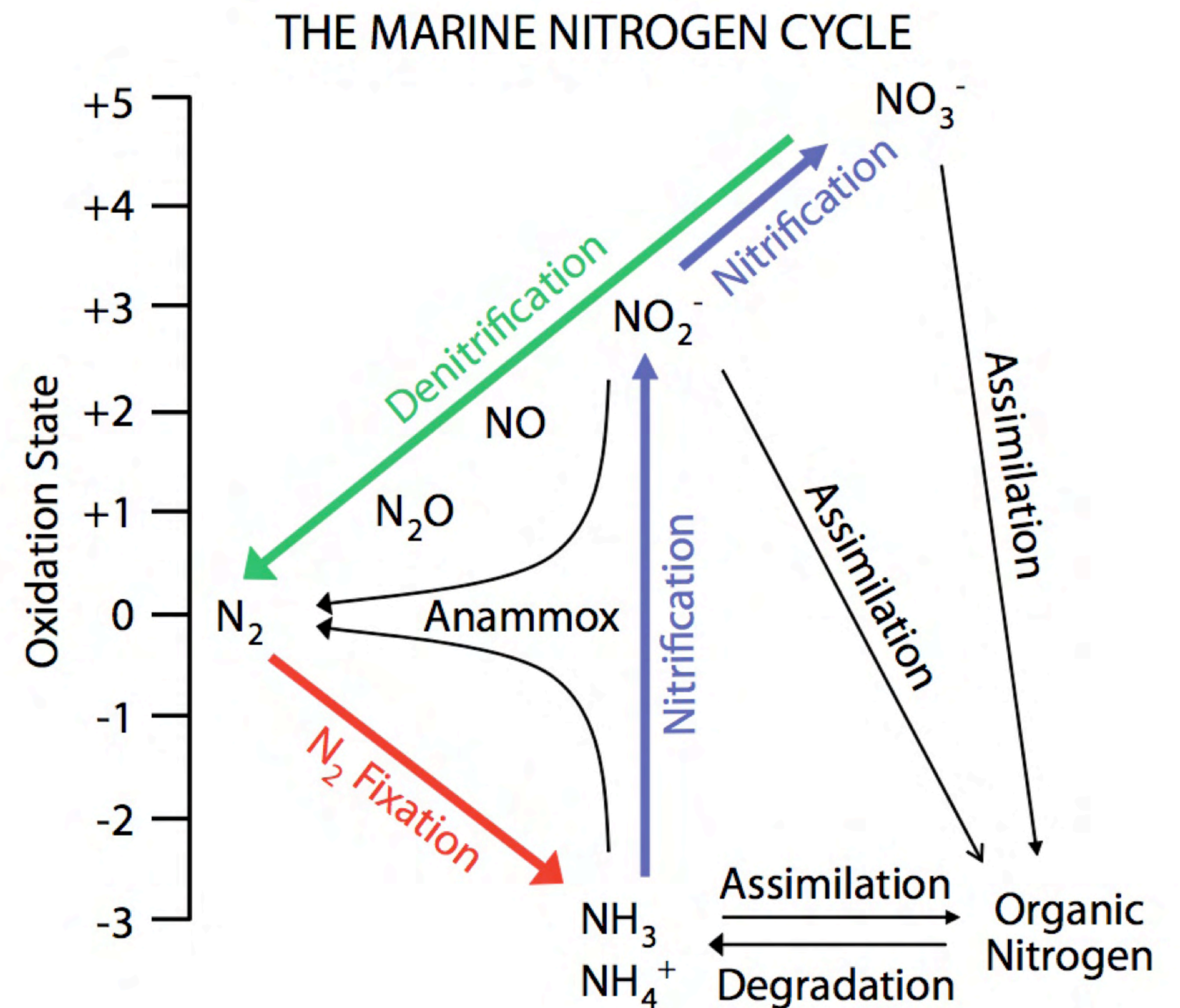
Impacts of OA on the Nitrogen Cycle

Nathan S. Garcia, Dave

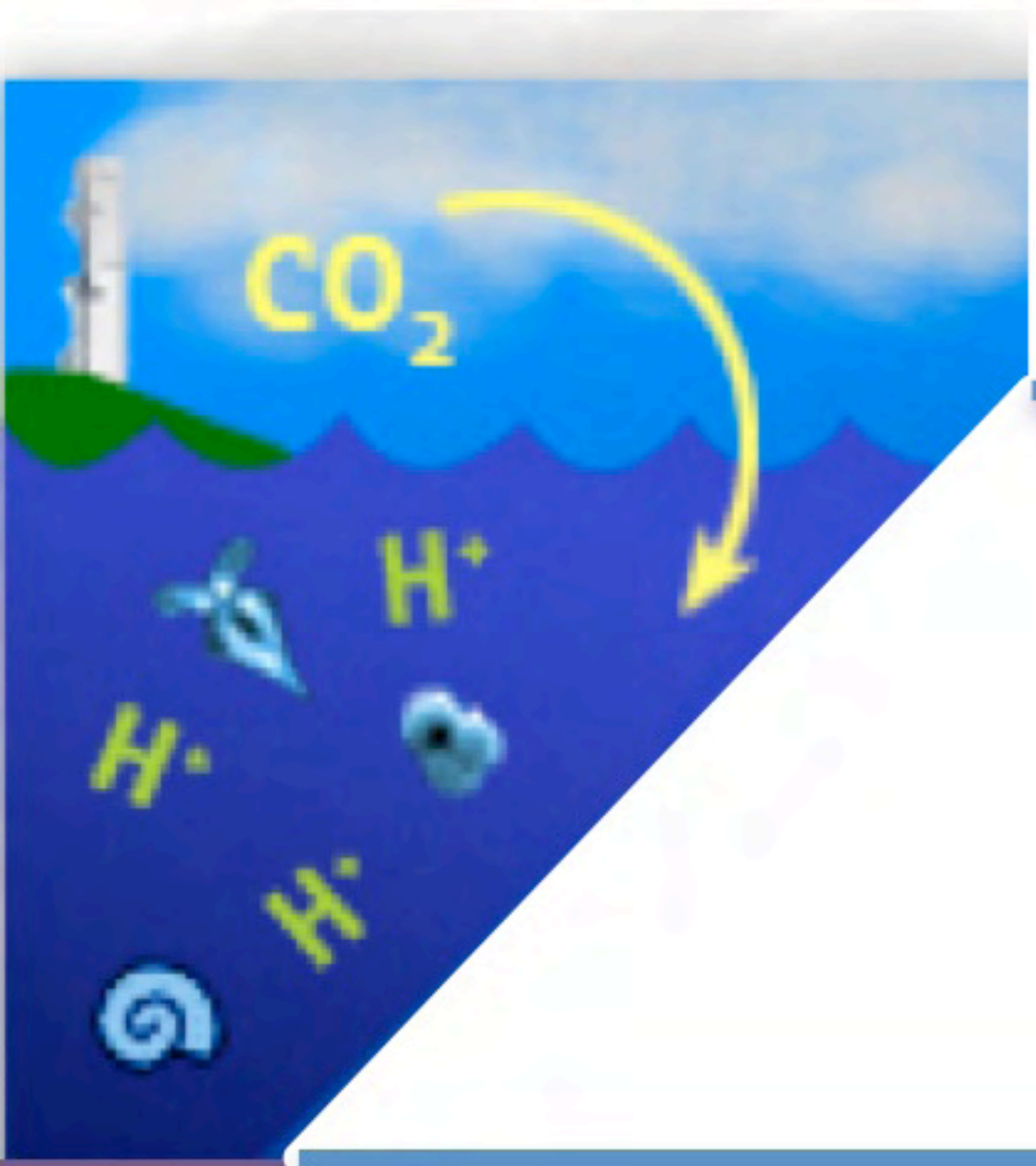
Hutchins: *CO₂ control of oceanic nitrogen fixation and carbon flow through diazotrophs*

Matt Church, Ricardo

Letelier: *Oceanic diazotroph community structure and activities in a high carbon dioxide world*

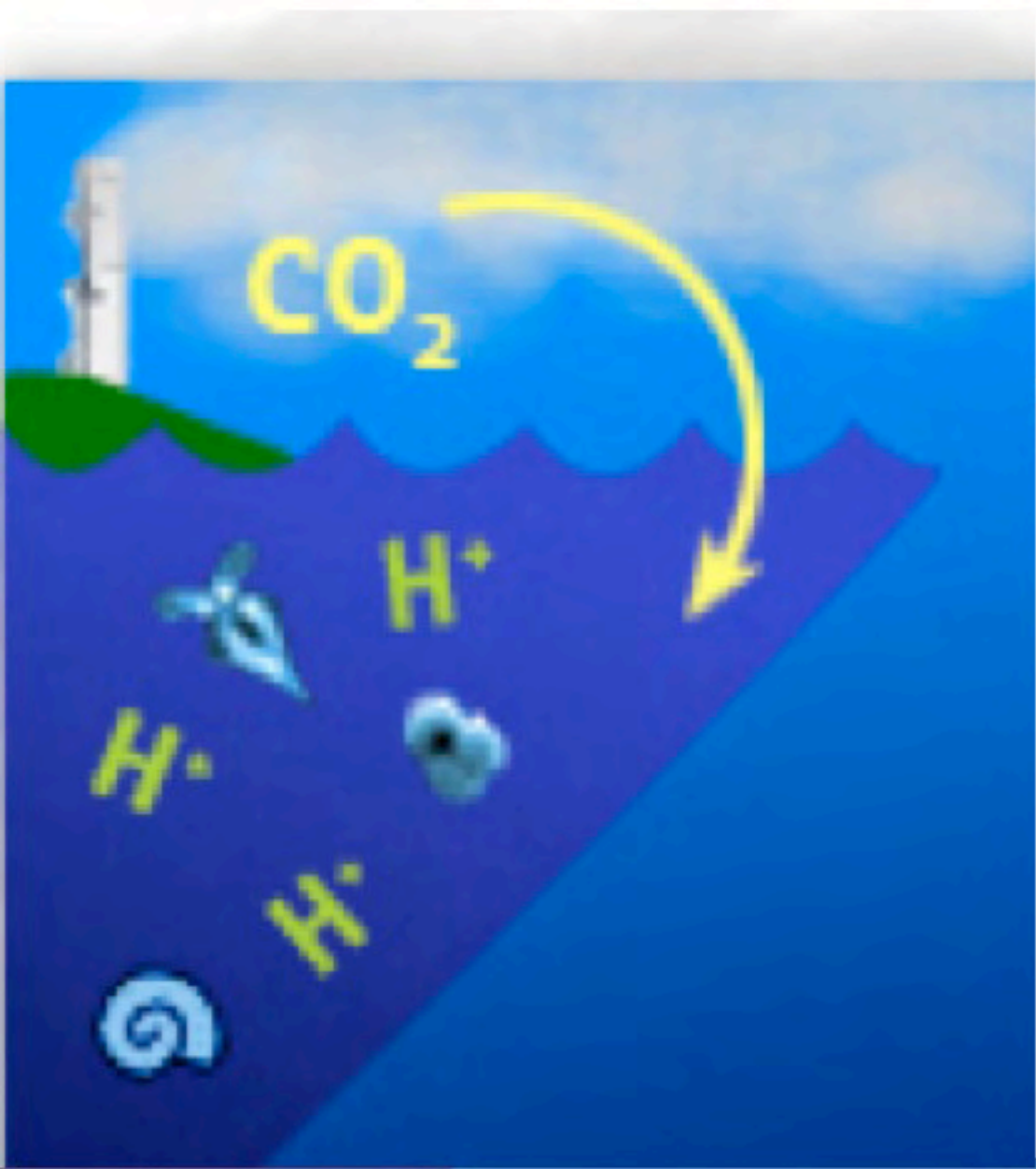


Hutchins et al. 2009 Oceanography

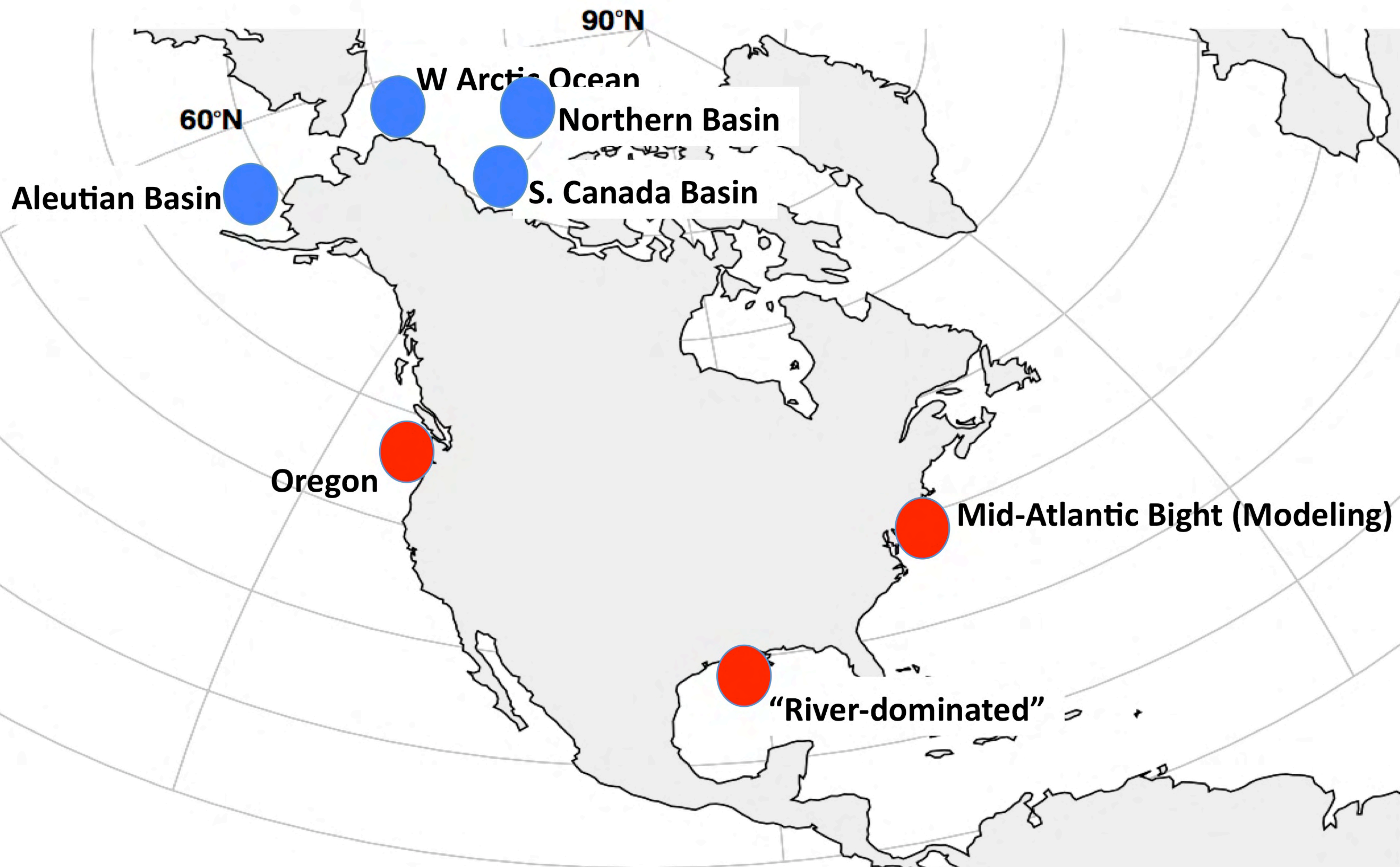


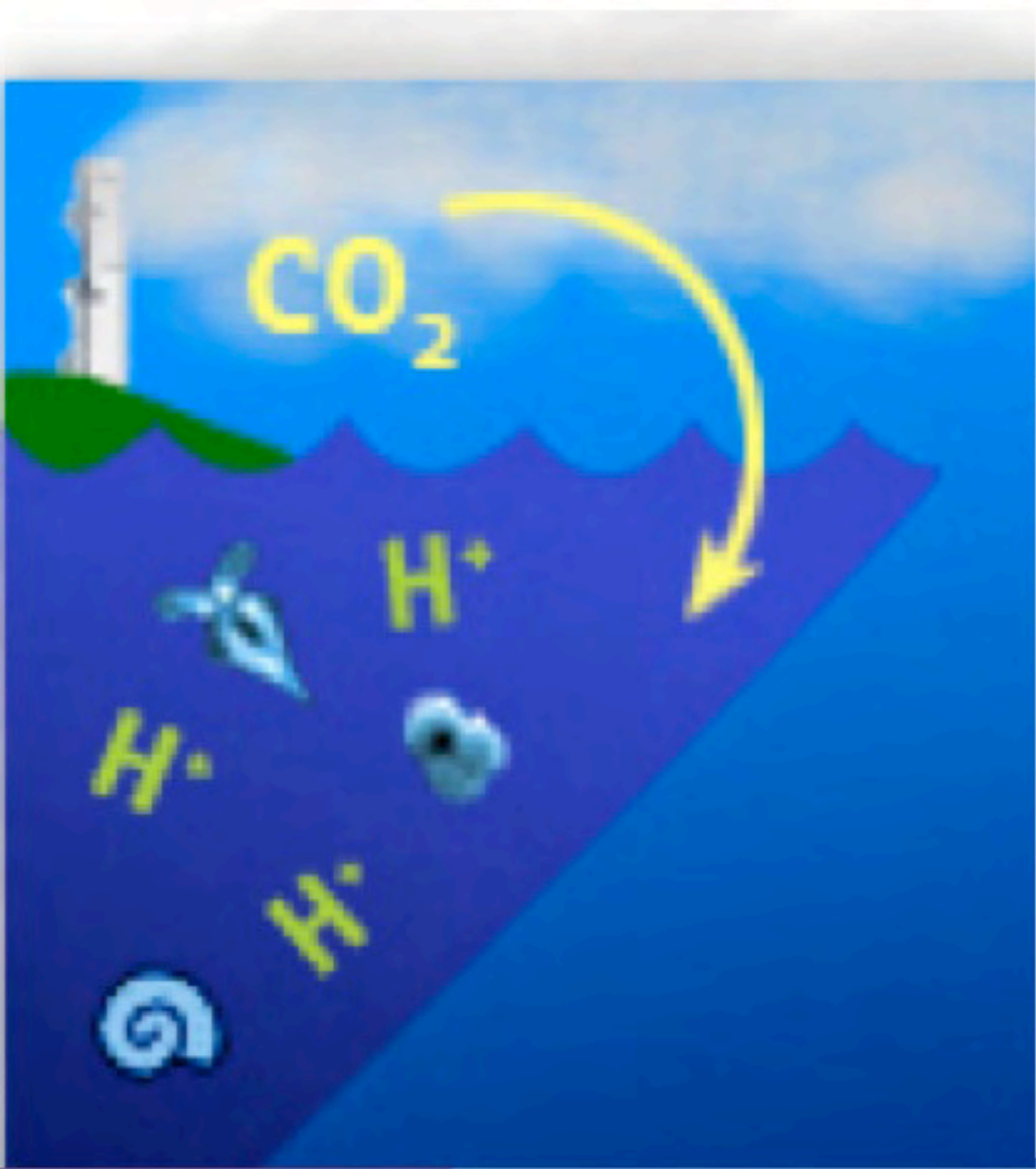
Regional BGC Studies

- 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 $p\text{CO}_2$ variability and CO_2 uptake in the Western Arctic Ocean Margins*
- Wei-Jun Cai** (S Lohrenz & K Gundersen): *Satellite assessment of CO_2 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 CO_2 on Antarctic plankton community structure and biogeochemical cycles*

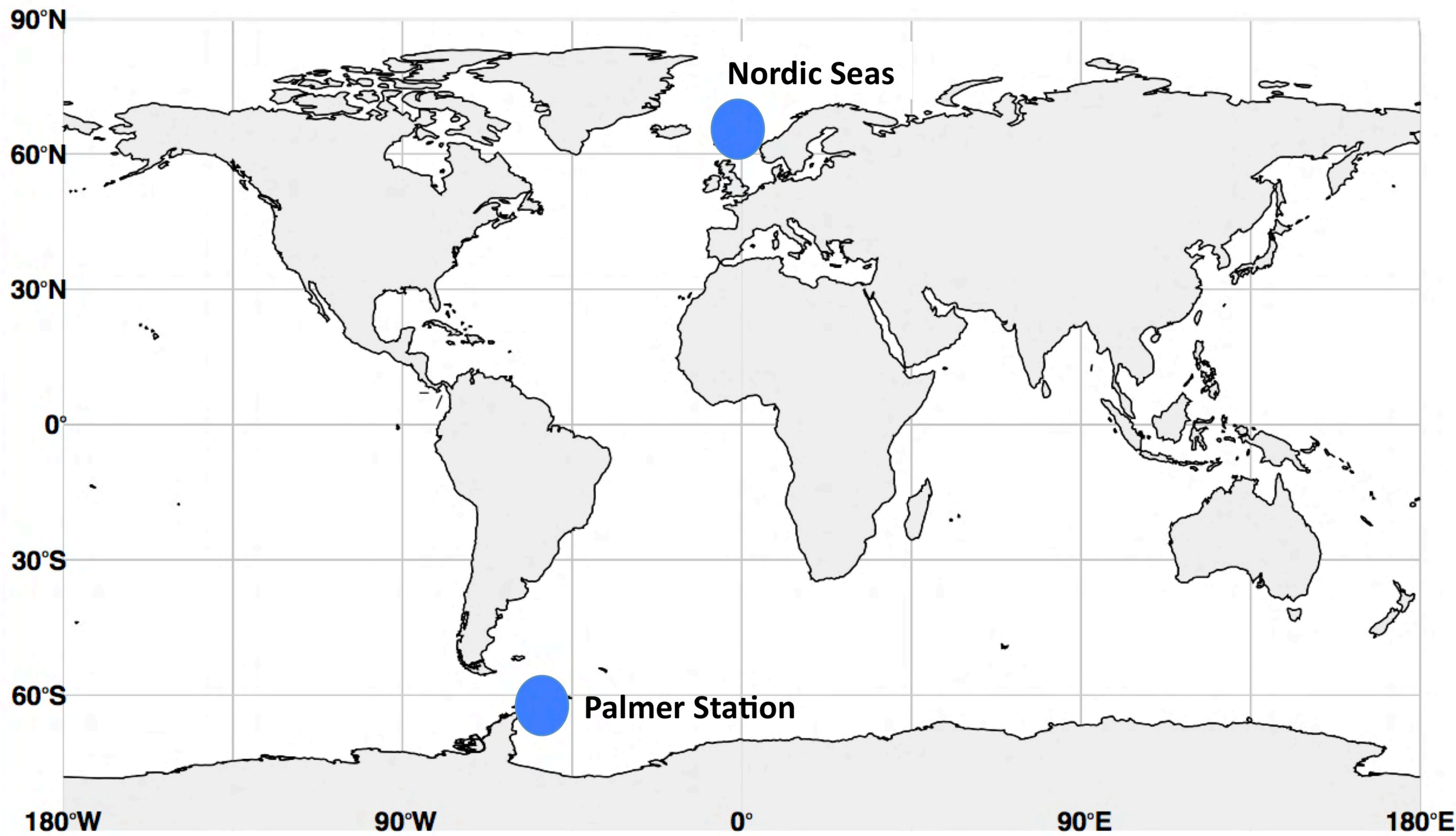


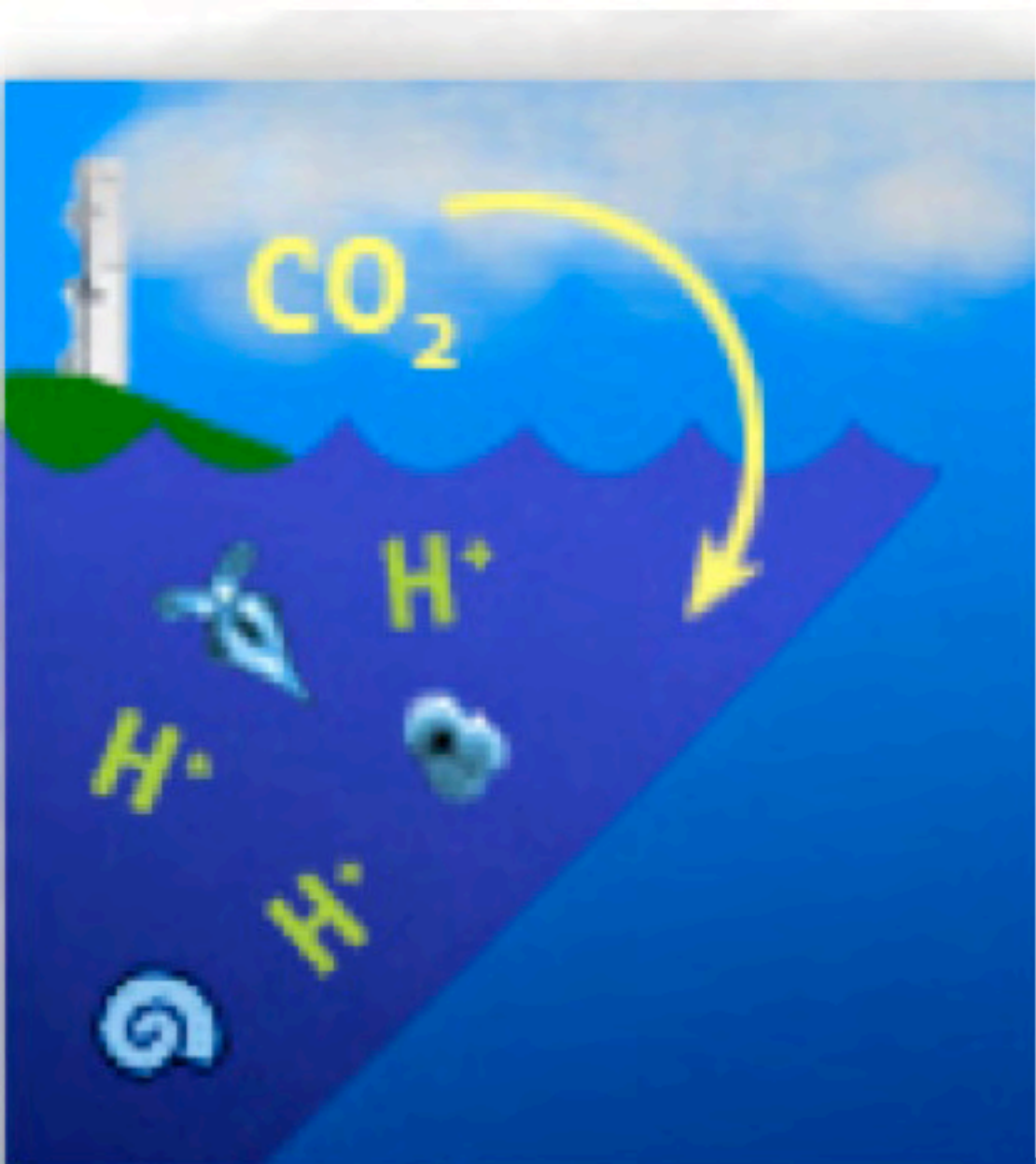
Regional BGC Studies



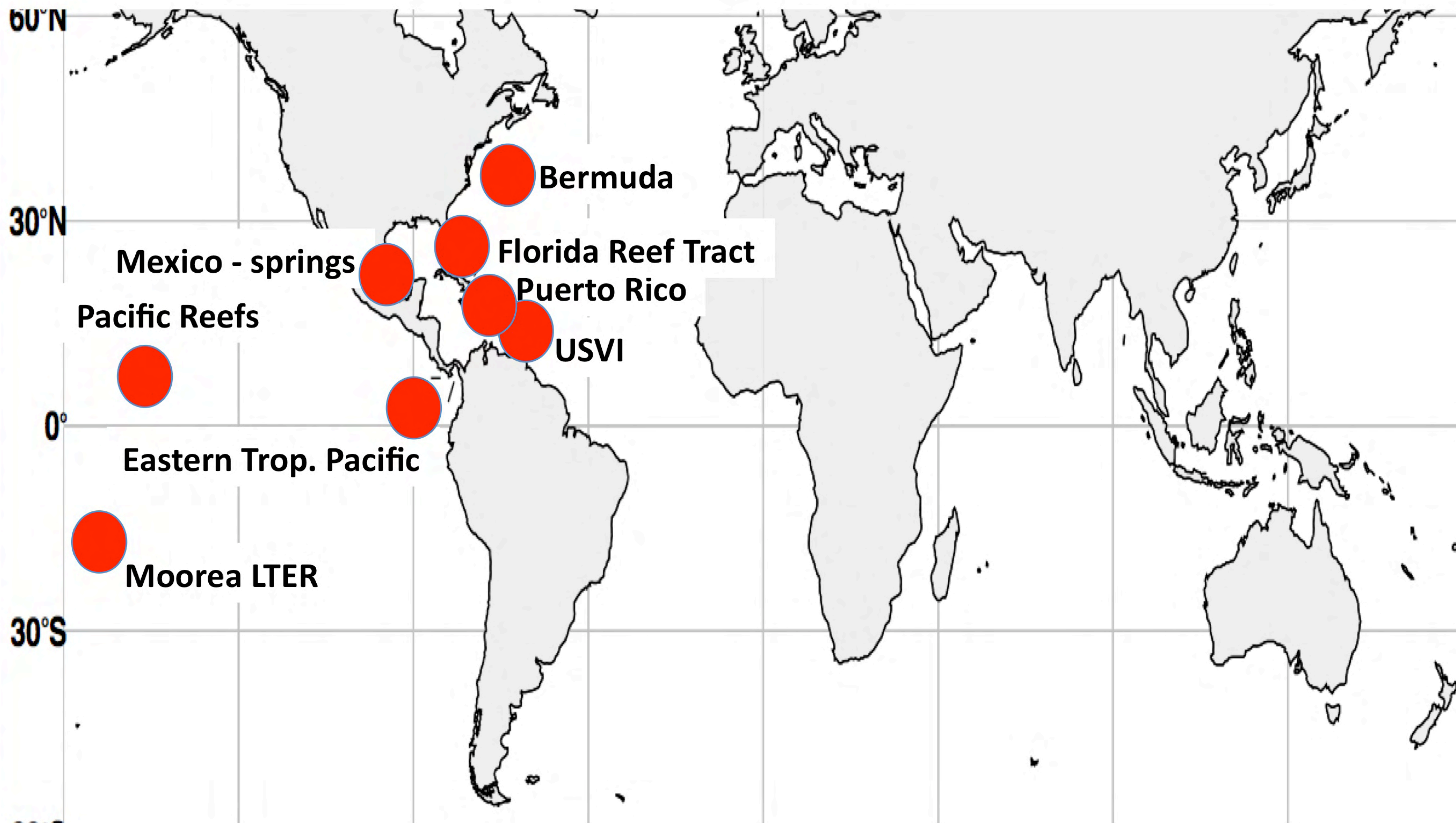


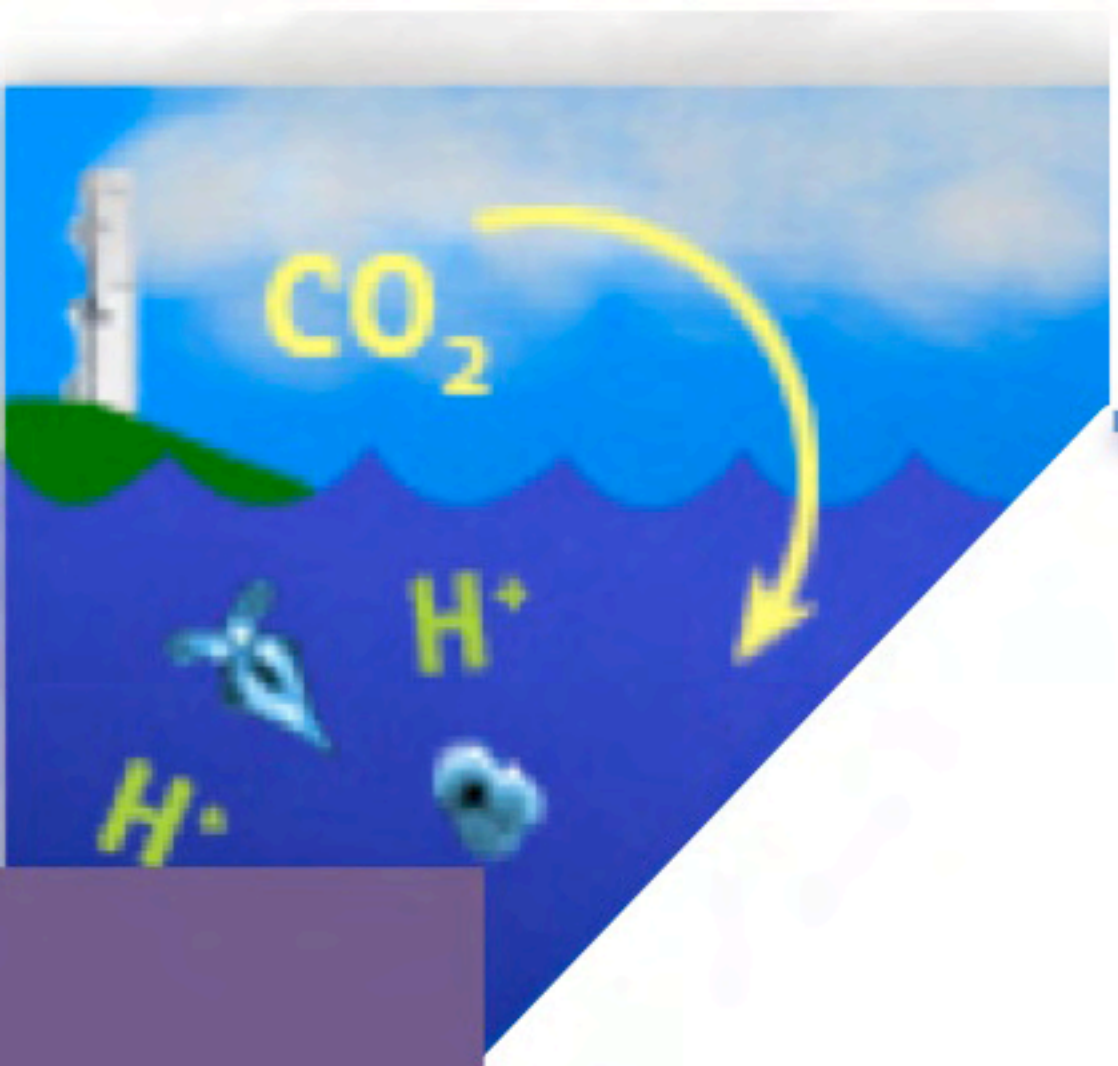
Regional BGC Studies





BGC of Reef Waters

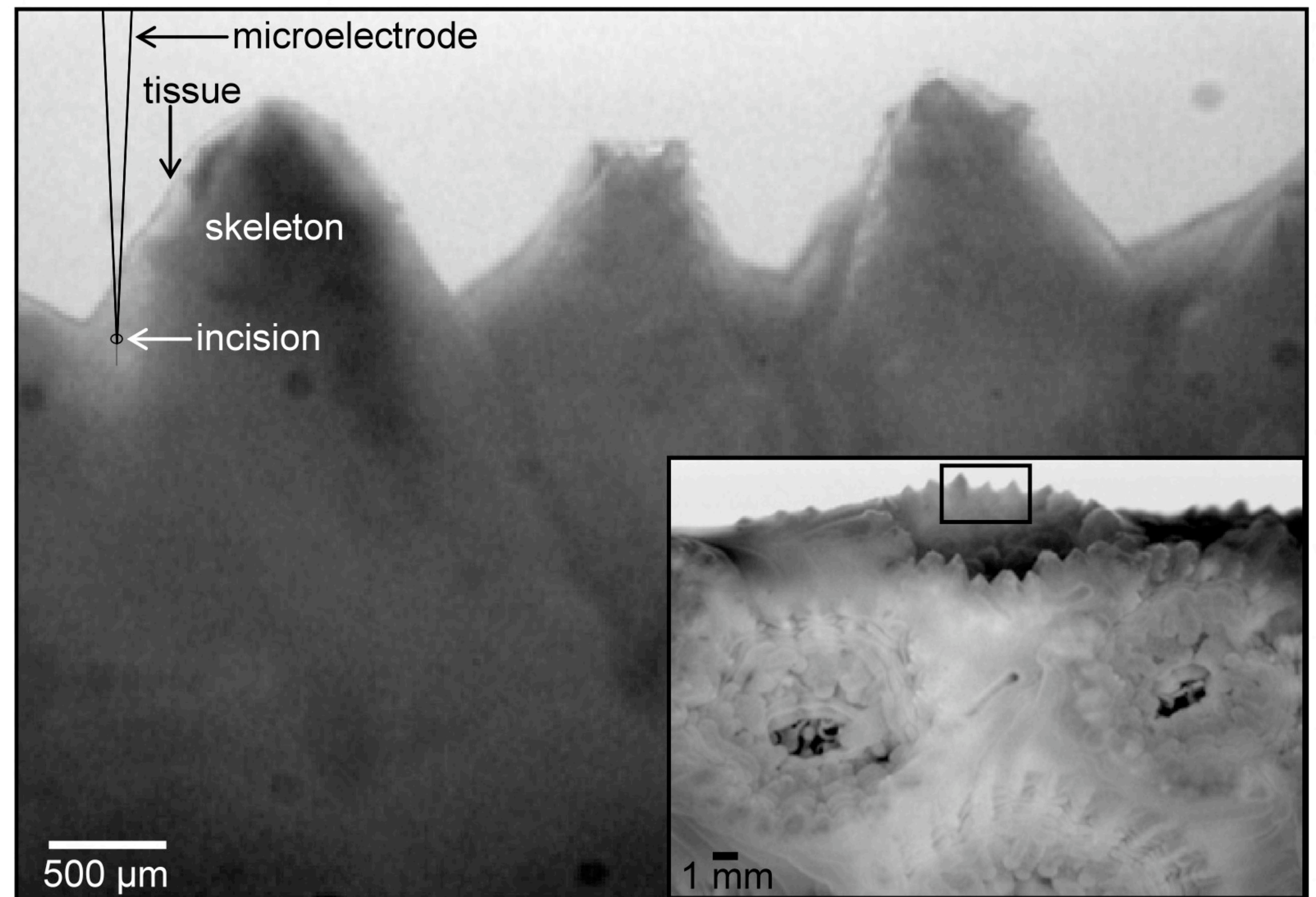


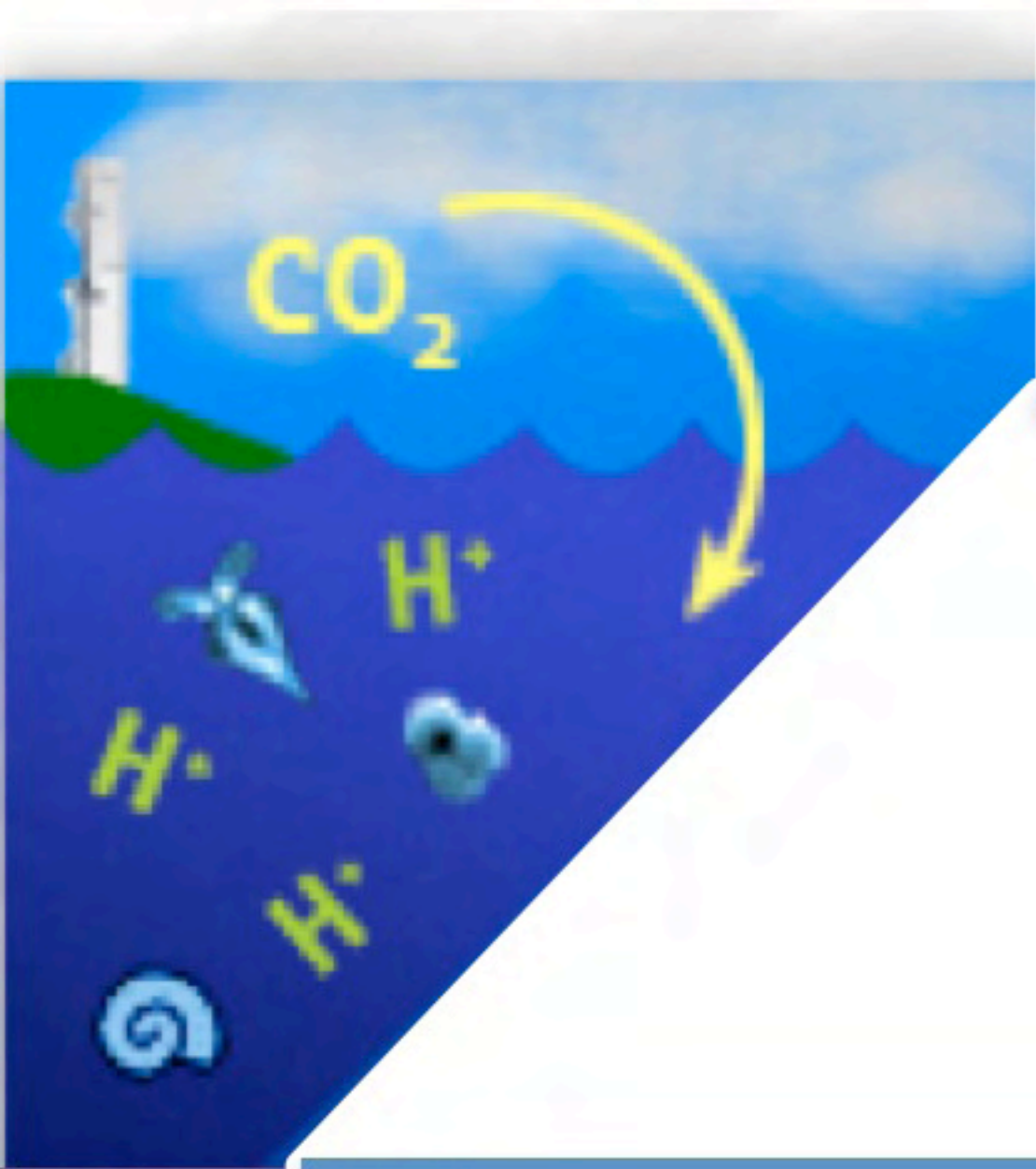


BGC of Calcifying Media

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.





BGC PANEL

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**University of Southern
California**

Francisco Chavez

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