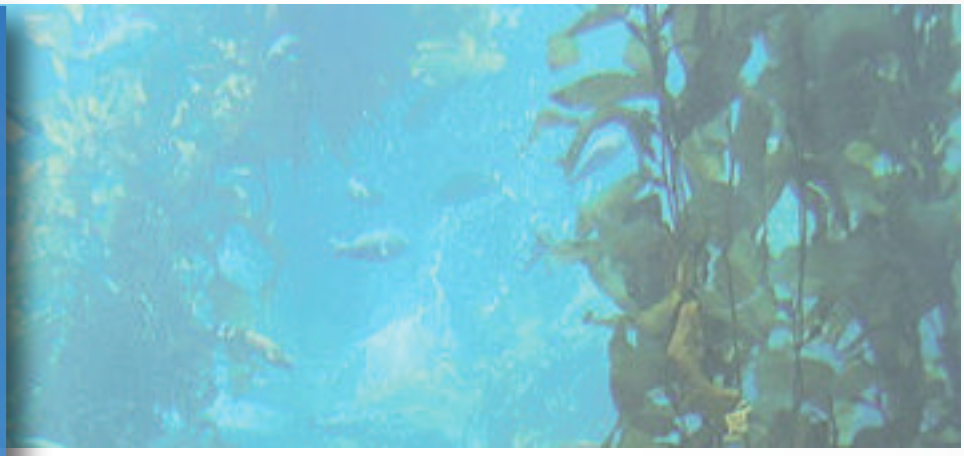
Precedents for algal adaptation to atmospheric CO2: New indicators for eukaryotic algal response to the last 60 million years of CO2 variation



PROJECT DETAILS

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PROJECT DESCRIPTION

Evolution of marine algae over the last 60 million years has resulted in a fundamental change in the efficiency of biological carbon pump and shift from communities dominated by calcifying algae (like coccolithophorids) to siliceous diatoms and major size class changes among these groups. The inferred shift in atmospheric CO2 over this time period has been suggested as an important selective pressure on some of these responses, including diatom adaptation to lower atmospheric CO2 concentrations via use of the C4 photosynthetic pathway, and trends towards smaller coccolithophorid cell sizes in response to greater C limitation. If current trends continue, future changes in atmospheric CO2 from anthropogenic activities are likely to reach levels last seen in the Eocene by the end of the next century; such changes will also be accompanied by ocean acidification and changes in stratification. Evidence suggests that modern calcifying algae and diatoms may employ a range of carbon acquisition strategies (such as active carbon concentrating mechanisms) according to the pH and carbon speciation of the seawater in which they live. However calcifying populations from 60 million years ago apparently had a single or less diverse array of carbon acquisition strategies. In this project we thus seek to 1) to identify and calibrate novel fossil indicators for adaptation and evolution in carbon acquisition strategies in eukaryotic algae in response to past changes in the carbon cycle and atmospheric CO2, and 2) apply these indicators to establish the nature and timing of changes in carbon acquisition strategies by algae over the past 60 million years.

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