**Phytoplankton Responses to Increased Atmospheric Carbon Dioxide**

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Recent studies examining the effects of increased atmospheric Carbon Dioxide ($pCO_2$) on species of cocolithophores (primarily *Emiliania huxleyi*) have produced contrasting results in terms of observed changes in their physiology. Moreover, these physiological shifts have not yet been studied in diatoms, another dominant group of phytoplankton found in the open ocean, which generally, like *Thalassiosira rotula*, have comparatively larger cell masses than cocolithophores as well as high division rates. Any changes that occur therefore present potential significant impacts to global biogeochemistry, especially in terms of carbon sequestration. To study these responses, steady-state cultures of *Emiliania huxleyi* and *Thalassiosira rotula* were grown at both present ambient $pCO_2$ levels (~375 ppm) and those predicted to be observed by the end of the $21^{st}$ century (~750 ppm), seperately under high and low light conditions simulating those of the upper and lower photic zone environments typically inhabited by phytoplankton. In addition, both species were cultured at temperatures $4^oC$ greater than ambient conditions (the change expected by year 2100) and cultures of *Thalssiosira rotula* were grown in a Nitrate limited environment (15 μM N), adding a stressing factor to the conditions. Of both the cocolithophores and diatoms, only very slight differences in growth rates and extracted chlorophyll a per cell were found and these were always less than variations seen between cultures in high light and low light environments. However, a significant increase in the mean cell size of *Thalassiosira rotula* was found at high light conditions and both $pCO_2$ treatments. Additional replicate cultures should be studied in order to confirm implications these results suggest.