Mechanistic Study on Carbon Fixation Rate and Global Environment Remediation by Oceanic Calcareous Algae

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Summary

Future increase in the atmospheric concentration of carbon dioxide as a result of the combustion of fossil fuels for energy is expected to result in substantial global-scale warming in future decades. Oceanic microalgae are playing an important role in the global carbon cycle. In this study, we investigated effects of environmental conditions such as nutrients, light, and carbondioxide concentration on carbon fixation rate of oceanic algae.

Organic and inorganic carbon fixation rates of a typical calcareous alga *Pleurochrysis carterae* (*Cricosphaera* aff. *carterae*), which plays an important role in global carbon cycle, were measured *in vitro* culture system. *P.carterae* was grown in a semi-continuous system until a steady-state cell concentration was reached at 18°C in enriched seawater medium (GUI medium). The cultures were exposed to a repeating photo-cycle of 12 hr of light followed by 12 hr of darkness. Air with 350 ppm and 2000 ppm carbondioxide were supplied through a sparger into the culture medium.

Specific growth rate of *P.carterae* was changed with a nutrient (nitrate) content in the cells. This relation is explained using an intracellular nutritional regulation model (Droop's equation).

Organic carbon fixation rate of *P.carterae* increased with increasing extracellular nitrate concentration and had no difference between the culture with 350 ppm and 2000 ppm CO_2 supply. Inorganic carbon fixation rate of *P.carterae* with 350 ppm CO_2 also increased with increasing extracellular nitrate concentration, whereas the inorganic carbon fixation rate in the culture with 2000 ppm CO_2 kept almost constant with changing extracellular nitrate concentration.