American Mineralogist, Volume 83, pages 1503–1509, 1998

Production of carbonate sediments by a unicellular green alga

KIMBERLY K. YATES* AND LISA L. ROBBINS†

Geology Department, University of South Florida, 4202 E. Fowler Avenue, SCA 203, Tampa, Florida 33620, U.S.A.

ABSTRACT

This study investigates the ability of the unicellular green alga *Nannochloris atomus* to precipitate $CaCO_3$, quantifies mineral precipitation rates, estimates sediment production in a *N. atomus* bloom, and discusses the implications of microbial calcification for carbonate sediment deposition. A series of *N. atomus* cultures, isolated from Lake Reeve, Australia, were incubated at various pH and calcium concentrations to determine environmental parameters for calcification. Rates of calcification were calculated from initial and post-incubation alkalinity, pH, and calcium measurements. Replicate experiments and controls consisting of non-calcifying cultures, uninoculated media, and dead cell cultures were performed using environmental culture parameters determined in series cultures. Average calcification rates from replicate experiments were used to predict daily sediment production rates in a small bloom of *N. atomus. N. atomus* precipitates 0.138 g/L of calcite in approximately 4 h when incubated at pH 8.5, 14.24 m*M* calcium concentration, 33 °C, 100 $\mu E/m^2/s$ light intensity, and a cell population density of 10^7 cells/mL. Assuming continuous precipitation, this corresponds to a maximum estimated sediment production rate of 1.6×10^6 kg of $CaCO_3$ per 12 h day in a single bloom of 3.2×10^9 L. Our results suggest that microbial calcification contributes significantly to the carbonate sediment budget.