

Association for the Sciences of Limnology and Oceanography





Home

Members

Libraries

Publications

Meetings

Employment

Activities

Search

Sources of inorganic carbon for phytoplankton in the eastern Subtropical and Equatorial Pacific Ocean

Tortell, Philippe D., François M. M. Morel

Limnol. Oceanogr., 47(4), 2002, 1012-1022 | DOI: 10.4319/lo.2002.47.4.1012

ABSTRACT: We present the results of a field study examining inorganic carbon utilization by phytoplankton assemblages in the eastern Subtropical and Equatorial Pacific Ocean. Data from isotope disequilibrium experiments demonstrate that HCO, was the principal form of inorganic carbon taken up by all of the in situ phytoplankton populations we sampled. In a cyanobacteriadominated assemblage, HCO, uptake occurred chiefly through a direct transmembrane transport mechanism. Diatom-dominated assemblages expressed extracellular carbonic anhydrase and transported CO, derived from the catalyzed dehydration of HCO,. Direct HCO, transport by the diatoms may have also occurred. In a 3-d incubation experiment, we observed the CO₃-dependent regulation of inorganic C uptake in diatom-dominated phytoplankton assemblages. Phytoplankton assemblages grown at 150 ppm CO, possessed external carbonic anhydrase activity and took up HCO, following its dehydration to CO,. In contrast, the assemblages cultured with 750 ppm CO, appeared to lack external carbonic anhydrase activity and rely solely on CO, as an exogenous source of carbon for photosynthesis. The CO, effect on inorganic C utilization occurred in the absence of a detectable difference in phytoplankton growth rates between the 150 and 750 ppm CO, treatments. Our field data provide compelling evidence that HCO, utilization is prevalent in natural marine phytoplankton communities and is regulated by ambient CO, concentrations. We discuss the ecological and biogeochemical implications of these results.

Article Links

Download Full-text PDF

Return to Table of Contents

Please Note

Articles in L&O appear in PDF format. Open access articles may be freely downloaded by anyone. Other articles are available for download to subscribers only, or may be purchased for \$10 per article. All L&O articles are moved into Open Access after three years.