ASPECTS OF THE BIOGEOCHEMISTRY OF MANGANESE IN THE PHOTIC ZONE

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ABSTRACT

Two aspects of the role of manganese in oceanic surface waters are investigated. To date, literature on the subject fails to explain ubiquitous maxima of dissolved Mn(II) concentrations measured in the photic zone. In addition, although Mn is known to be an essential micronutrient for aquatic organisms, minimum levels toxic to marine microbial populations have not been determined. Results of radiotracer experiments using ^{54}Mn clearly show that light and natural marine dissolved organic carbon (DOC) can interact to inhibit adsorption of Mn(II) onto pelagic carbonate sediment suspensions. Affinity of dissolved Mn for such particles remains high in the dark, but much slower adsorption occurs with exposure to sunlight in the presence of DOC. It is proposed that sunlight and DOC shift the partitioning of Mn within the photic zone toward the divalent species and thereby allow relatively high Mn(II) concentrations to persist in the surface ocean.

Natural microplankton assemblages were incubated using clean techniques in 41 polycarbonate bottles with added Mn(II). Over eight hours, RNA and DNA synthesis, ATP concentrations and ^{14}C-uptake were monitored. The data do not delineate a discrete level at which Mn(II) limits growth. Additions less than 500 ppb had no effect. Additions between 500 and 2000 ppb gave erratic results, but above 5000 ppb, Mn(II) became inhibitory.