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Topic: Biogeochemistry

Ruifeng Zhang

ABSTRACT Subject :

Estimation of phytoplankton composition and uptake elemental stoichiometry ratios (N:P:trace metals) in the Ross and Amundsen Seas

Abstract 09/02/2023 09:07:59

The Southern Ocean contributes 40% of the ocean's absorption of anthropogenic CO2 emissions, 10% of which is sequestered in the deep ocean through biological carbon pump. Iron is an important influencing factor for biomass and phytoplankton composition in the Southern Ocean, and it has also been shown that in addition to iron, other trace metals such as zinc, cobalt and manganese are also limiting in the Southern Ocean. Therefore, it is important to understand the phytoplankton composition of the Southern Ocean, the relationship between phytoplankton distribution and environmental factors, and the elemental uptake stoichiometry of N, P and trace metals by phytoplankton. In this study, phytoplankton composition of the Ross and Amundsen Seas in January 2019 was obtained using pigments with chemical taxonomy, mainly diatoms and haptophytes. Redundancy analysis of environmental factors and phytoplankton composition showed that salinity was the main influencing factor and was negatively and positively correlated with haptophytes and diatoms, respectively; manganese, nickel, copper, zinc and silicon were negatively correlated with haptophytes; and cadmium, manganese, phosphorus and silicon were negatively correlated with diatoms. Meanwhile, based on the specificity of seasonal changes in the mixed layer of the Southern Ocean, this study used the difference in nutrient concentrations between the mixed layer and 300 m water depth in summer as the phytoplankton consumption, calculated the phytoplankton uptake elemental stoichiometry ratio, and explored the relationship between uptake ratio and phytoplankton composition. The results showed that N/P, P/Fe and P/Mn decreased with increasing diatom abundance. The elemental uptake stoichiometry ratios of the mixed layer were used to construct functions with phytoplankton composition to derive partial elemental uptake stoichiometry ratios of haptophytes, diatoms and cryptophytes.