



Variation in iron(III) solubility and iron concentration in the northwestern North Pacific Ocean

Nakabayashi, Shigeto, Kenshi Kuma, Kohsei Sasaoka, Seiichi Saitoh, Mamiko Mochizuki, Naonobu Shiga, Masashi Kusakabe

Limnol. Oceanogr., 47(3), 2002, 885-892 | DOI: 10.4319/lo.2002.47.3.0885

ABSTRACT: Vertical distributions of Fe(III) hydroxide solubilities ($<0.025 \mu\text{m}$) and dissolved Fe ($<0.2 \mu\text{m}$) concentrations at 0-250 m depth were studied inside (HP) and outside (LP) a high-production (phytoplankton spring bloom) patch area in the northwestern North Pacific Ocean during May 1999. In the surface mixed layer, the Fe(III) solubility values at HP were much higher (2-4 nM) than those (0.3-0.9 nM) at LP and strongly correlated with chlorophyll a and nutrient concentrations. The high Fe(III) solubility observed in the surface mixed layer was probably due to a higher concentration or stronger affinity of natural organic Fe(III) chelators. In the surface waters, the dissolved Fe concentrations were generally lower than the Fe(III) solubility values, resulting from the active biological removal of dissolved Fe and excess concentration of Fe-binding organic ligands. The Fe(III) solubility minima (0.2-0.4 nM) were present in a narrow depth range (40-125 m) below the surface mixed layer at all stations. The subsequent Fe(III) solubility levels appeared to increase up to 0.6-0.8 nM with depth at 100-250 m, in association with the increase in nutrient concentrations. The strong linear correlations between Fe(III) solubility values and nutrient concentrations in middepth waters suggest that the formation of organic Fe(III) chelators may be related to microbial decomposition of sinking biogenic organic matter. In middepth waters, the dissolved Fe concentrations were generally higher than the Fe(III) solubility values, which suggests that the small colloidal iron phases may be present in the dissolved Fe ($<0.2 \mu\text{m}$) fraction.

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.

