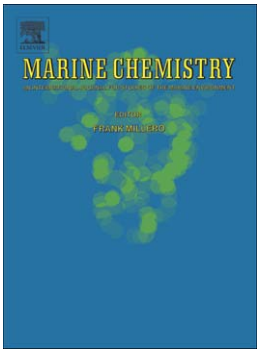

Bio-availability of iron derived from subarctic first-year sea ice

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Bio-availability of iron derived from subarctic first-year sea ice

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Abstract

Sea ice contains high concentrations of iron (Fe), and melting of sea ice is one of the possible processes that supplies Fe to surface waters (e.g., Lannuzel et al., 2007). To assess the biological availability (bio-availability) of Fe in sea ice, a shipboard bottle incubation experiment (Exp. I) was conducted with surface water from the western subarctic North Pacific and Fe derived from sea ice collected from the Sea of Okhotsk, as compared to Fe derived from inorganic Fe ($FeCl_3$). Addition of $FeCl_3$ solution stimulated the growth of phytoplankton relative to a control treatment. Addition of sea ice meltwater enhancing the particulate labile Fe (>0.22 μm) by 112 nM and 0.26 nM of dissolved Fe (<0.22 μm) in the incubated seawater allowed the phytoplankton to grow, especially large (>10 μm) phytoplankton, at their maximum growth rate in the incubated seawater. In contrast, addition of desferrioxamine B (DFB) plus sea ice meltwater, in which the strong ligand DFB reduced the bio-availability of Fe, significantly depressed the growth of the large and small (0.8– 10 μm) phytoplankton relative to the control. These results clearly demonstrated that Fe stored in the sea ice stimulates growth of the phytoplankton. We carried out another shipboard bottle incubation