チャクチ海、ベーリング海北部陸棚域における鉄のスペシエーション

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Iron speciation in the northern Bering Sea Shelf and Chukchi Sea

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Iron (Fe) plays a substantial role in the biochemistry and physiology of oceanic phytoplankton which is primarily responsible for productivity in the world's ocean. Fe has two redox status; Fe(II) and Fe(III). In oxygenated seawater, Fe(III) is the thermodynamically favored oxidation state. It is strongly hydrolyzed, and its removal is mainly constrained by the formation of strong complexes with natural organic ligands such as humic substances and siderophores. These organic ligands control not only the solubility of dissolved Fe in seawater, but also influence on the bioavailability of Fe(III) for phytoplankton. Fe(III) in seawater can be reduced to Fe(II), which is more soluble and kinetically labile. Fe(II) is rapidly oxidized in seawater; previous laboratory experiments have revealed that the half-life of Fe(II) ranges from several minutes to several hours. However, recent studies have suggested that dissolved Fe(II) substantially exists in surface seawater, suboxic layers in oxygen minimum zones, hydrothermal vents, hypoxic shelf waters and sediments. Because Fe(II) is more bioavailable than Fe(III), the existence of Fe(II) could provide a big advantage for the organisms in these environments even though it is ephemeral. These results suggest the importance to investigate chemical and redox speciations of Fe to elucidate carbon and nitrogen cycles in the ocean.

As a part of GRENE project, seawater samples for Fe speciation (total and dissolved Fe concentrations, concentration and conditional stability constants of organic Fe(III)-binding ligands, and dissolved Fe(II) concentration) were obtained from the northern Bering Sea Shelf, Bering Strait and Chukchi Sea including ice edge area during the T/S *Oshoro-Maru* cruise from June to August 2013. The speciation of Fe is expected to be dynamic and complicated in these areas. For example, in the northern Bering Sea Shelf area, high freshwater discharge is expected via the Alaskan Coastal Water, especially from the Yukon River. The Bering Strait is the only Pacific gateway to the Arctic Ocean; three water masses (Anadyr Water, Bering Shelf Water and Alaskan Coastal Water) constitute the northward flow from the Bering Sea to the Chukchi Sea. Previous studies have reported the distributions of dissolved and total dissolvable Fe in these areas (Nakayama et al., 2011; Nishimura et al., 2012), but not the Fe speciation. During this research cruise, we have completed the clean seawater samplings and determined dissolved Fe(II) in seawater onboard the ship. In this presentation, we will introduce our preliminary data of dissolved Fe(II) from T/S *Oshoro-Maru* cruise during this summer.

References

Nakayama *et al*. (2011), Iron and humic-type fluorescent dissolved organic matter in the Chukchi Sea and Canada Basin of the western Arctic Ocean. *J. Geophys. Res.*, 116, C07031, doi:10.1029/2010JC006779.

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