Distribution of copper and its speciation in the Subarctic North Pacific

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Introduction

Organic complexation of Cu plays a major role in controlling the availability and toxicity of Cu for microorganisms. In this study, we reveal the distribution and speciation of Cu in the Subarctic North Pacific, which is known for the high primary productivity.

Sampling and Method

Samples were collected from Station K2 (47°N, 160°E) in the Subarctic Northwest Pacific Ocean during cruises KH-12-4 (BD7, Aug – Oct 2012) and KH-11-7 (TR11, Jul – Aug 2011) onboard R/V Hakuho Maru. Total dissolved Cu concentrations were measured using cathodic stripping voltammetry and ICP-MS (Sander et al., 2007; Sohrin et al., 2008). Cu-complexing ligand concentrations were also determined by competitive ligand exchange – adsorptive stripping voltammetry (CLE-AdCSV)

Results and Discussion

Total dissolved Cu concentrations collected in 2012 ranged between 1.5 and 4 nM, while those in 2011 ranged from 1.5 to 3.5 nM. The Cu concentrations determined in this study were found to be higher than that from previous studies by around 10-20% (GEOTRACES Intermediate Data Product 2014). The main difference between this study and previous studies is the use of UV-irradiation to destroy organic ligands prior to measurement. Posacka et al. (2017) also reported simlar differences between the measrements of UV-irradiated and non UV-irradiated samples.

Two classes of organic ligands were found in seawater collected at BD7 down to a depth of 1250m, beyond which only one class of ligand was detected. The concentrations of the stronger ligand ranged from 1.5 to 4.8 nM with a conditional stability constant of around 14.5. This result agrees well with a previous study (Moffett and Dupont, 2007).