

## Distributions of organic Fe-binding ligands in the eastern and western subarctic North Pacific

\*Yoshiko Kondo<sup>1,2</sup>, Yudai Sunahara<sup>2</sup>, Jun Nishioka<sup>3</sup>, Hajime Obata<sup>4</sup>, Shigenobu Takeda<sup>1,2</sup>

1. Graduate School of Fisheries and Environmental Sciences, Nagasaki University, 2. Faculty of Fisheries, Nagasaki University, 3. Institute of Low Temperature Science, Hokkaido University, 4. Atmosphere and Ocean Research Institute, The University of Tokyo

Iron (Fe) is well known as a key parameter for primary productivity in the ocean. To understand the distributions and biogeochemical cycle of Fe in the ocean, we need to investigate the sources and sinks of Fe. A recent study has demonstrated a concentration gradient of dissolved Fe in the North Pacific Intermediate Water (NPIW) between western and eastern areas (Nishioka and Obata, 2017), suggesting that Fe-rich intermediate water was transported laterally across the western subarctic gyre. Moreover, it has been demonstrated that most dissolved Fe in seawater is complexed with natural organic ligands. Since bioavailability of Fe in seawater depends on its species, the chemical speciation of Fe is needed to evaluate the nutrient status for phytoplankton. However, the distribution of natural organic ligands has not been revealed yet in the subarctic North Pacific. In this study, vertical distributions of organic Fe-binding ligands were investigated in the eastern and western subarctic North Pacific to clarify its impact on Fe cycle. Seawater samples were obtained through the whole water column during GEOTRACES-Japan cruise KH-17-03 using trace metal clean technique to avoid metal contaminations. Filtered seawater samples ( $<0.2 \mu\text{m}$ ) for organic Fe-binding ligands analysis were collected in acid-washed bottles inside a laminar-flow clean booth, then they were stored at  $-20^\circ\text{C}$  until just before analysis. The organic Fe-binding ligands' concentration and their conditional stability constants were determined by competitive ligand equilibration-adsorptive cathodic stripping voltammetry (CLE-ACSV) method using salicylaldehyde (Abualhaija and van den Berg, 2014). The concentration and conditional stability constants of organic ligands ranged from 0.7 nM to 5.9 nM and from  $10^{10.1} \text{ M}^{-1}$  to  $10^{12.3} \text{ M}^{-1}$ , respectively. The concentrations of organic ligands exceeded those of dissolved Fe concentration more than 1 nM in all samples except for the surface (10-m) at the Oyashio-Kuroshio transition zone station; consequently  $>99\%$  of dissolved Fe was estimated to be complexed with these natural organic ligands. At the western station, high concentrations of organic ligands were observed in the intermediate layers (400–600 m), which hydrographic data ( $27.2 \sigma_\theta$ – $27.3 \sigma_\theta$ ) were corresponding to the lower NPIW (Yasuda et al., 2004), suggesting that organic Fe-binding ligands might be transported within the lower NPIW.

Keywords: iron, organic ligand, subarctic North Pacific, GEOTRACES