Transport of trace metals (Mn, Fe, Ni, Zn and Cd) in the western Arctic Ocean in late summer 2012

YOSHIKO KONDO[1]*, HAJIME OBATA[2], NANAKO HIOKI[3], ATSUSHI OOKI[3], SHIGETO NISHINO[4], TAKASHI KIKUCHI[4], KENSHI KUMA[3]

[1]Nagasaki University, 1-14 Bunkyo-machi, Nagasaki, Japan (*correspondence: yoshikondo@nagasaki-u.ac.jp)
[2]Atmosphere and Ocean Research Institute
[3]Hokkaido University
[4]Japan Agency for Marine-Earth Science and Technology

Distributions of dissolved and total dissolvable trace metals (Mn, Fe, Ni, Zn and Cd) were investigated in the western Arctic (Chukchi Sea and Canada Basin) in 2012 September to elucidate the mechanism of the transport of these metals. We found concentration maxima not only of Fe, but also of the other trace metals in the halocline and/or near bottom waters for both dissolved and total dissolvable fractions. Judging from 2D sections of trace metals concentration, the distribution patterns were similar between dissolved and total dissolvable fractions for all trace metals. Ni, Zn and Cd mainly existed as dissolved form. While total dissolvable Fe and Mn concentrations were generally higher than dissolved fractions, especially high concentrations were found in the near bottom water in the Chukchi Sea shelf. The relationship between the distance from sea-shelf and concentrations of dissolved trace metals showed that dissolved Fe and Mn in the halocline waters tended to decrease with distance logarithmically. These results suggest that distributions of dissolved Fe and Mn were controlled by input from shelf sediment and removal by scavenging and mixing processes. Distributions of dissolved Cd and Zn were correlated well with phosphate concentration, suggesting that Zn and Cd were also transported to offshore via halocline water as nutrients and dissolved organic matter. Since dissolved Ni concentration tended to be high in the surface mixed layer in this study area, its correlation with phosphate was poor. These results suggest the importance of the halocline water for the transport of Mn, Ni, Zn and Cd as well as Fe in the western Arctic during summer.