Relationship between dissolved zinc and silicate in the western North Pacific from subarctic to subtropical regions

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Introduction

Zinc (Zn) is an essential trace nutrient for marine microorganisms and one of key parameters in international GEOTRACES project. Recent studies have revealed basin-scale distributions of dissolved Zn and the relationship between dissolved Zn and silicate (Roshan and Wu, 2015; Wyatt et al., 2014). In the subarctic North Pacific, the relationship between dissolved Zn and silicate is very different from that in other open oceans. The decoupling of dissolved Zn and silicate occurs in the subarctic North Pacific intermediate water (sigma-theta: 26.6 –27.5), whereas in both shallow and deep waters generally similar trends to those of the subtropical North Pacific were observed (Kim et al., submitted). In this study, we will present the extensive zonal section full depth transect data of dissolved Zn across the subarctic and subtropical western North Pacific to investigate the influences of the subarctic North Pacific intermediate water by using relationship between dissolved Zn and silicate.

Methods

Seawater samples were collected in the western North Pacific during the R/V Hakuho-maru KH-12-3 cruise (from July to August 2012), by using acid-cleaned Teflon-coated X-Niskin samplers deployed on CTD-CMS. Zn in seawater was determined with cathodic stripping voltammetry (CSV) with ammonium 1-pyrrolidinedithiocarbamate (APDC) after UV-digestion (Kim et al., 2015).

Result and Discussion

The section distributions of dissolved Zn in the western North Pacific are similar to those of silicate. However, the relationships between dissolved Zn and silicate clearly indicate a decoupling of dissolved Zn and silicate in subarctic regions. Based on the relationship between dissolved Zn and silicate in the eastern subtropical North Pacific (Bruland, 1980; Conway and John, 2015), we calculated Zn* as follows.

$Zn^* = [Zn] - 0.052 \times [silicate] + 0.305$

High Zn* values were observed in the intermediate water masses from subarctic to subtropical regions. Therefore, Zn* could be a very useful tracer to investigate the influence of the subarctic North Pacific intermediate water on the entire western North Pacific.

Reference

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