Distribution of scavenged-type trace metals (Al, Mn, Co, and Pb) and Fe in the North Pacific Ocean

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Aluminum (Al), manganese (Mn), cobalt (Co), lead (Pb), and iron (Fe) are key trace elements in seawater and thus significant in chemical oceanography research. Pariticularly, Fe is a critical trace metal that influences the productivity of marine ecosystems and the biogeochemical cycles of other elements in the modern ocean. We used an off-line automated solid-phase extraction system [1] to preconcentrate the trace metals from the seawater samples without using UV irradiation. In this presentation, we will report the basin-scale and full-depth sectional distributions of these elements in dissolved (d), total dissolvable (td), and labile particulate (lp) fractions during three GEOTRACES Japan cruises in the North Pacific [2,3]. The concentrations of lpMs were operationally defined as the difference between those of tdMs and dMs.

In general, Al, Mn, Co, and Pb are thought to be a scavenged-type and Fe to be a hybrid of scavenged and recycled-types based on their dissolved fraction distribution. Our data, however, show that the scavenged-type metals have different speciations and are uniquely related to ocean circulation. We found that lpMs represent major fractions of total particulate matals. The lpFe dominates tdFe and is srongly correlated with lpAl. These results hence indicate a major lithogenic contribution to the distribution of particulate Fe. In addition, we propose that the enrichment factor $EF(\mathrm{dM}) = (\mathrm{dM}/\mathrm{dAl})_{\mathrm{seawater}}/(\mathrm{M}/\mathrm{Al})_{\mathrm{upper\ crust}}$, can be a indicator for the sources. The *EF*(dMn) and *EF*(dCo) in seawater are ten to hundred times higher than the *EF* for aerosols and suggest the importance of sources other than the aerosol deposition. The *EF*(dPb) is on the same order with the *EF* for aerosols, indicating the importance of anthropogenic aerosol sources. The *EF*(dFe) are close to unity, indicating the importance of lithogenic sources for Fe.

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[3] Zheng, L. *et al.* (submitted), *Geochim. Cosmochim. Acta*