

Role of the ocean circulation in controlling the zinc-silicon decoupling in the North Pacific

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Zinc is considered to be a biogeochemically important element because it plays an important role in biological activities. In the global ocean, zinc has a coupling relationship with silicon in which the concentration ratio is almost constant, but this coupling relationship is observed to be broken in the North Pacific Ocean. In our previous study, model experiments suggested that zinc supply from the continental shelf could explain it. However, this was a suggestion based on a single circulation field, and given the uncertainties in the Pacific circulation, it could depend on the circulation field. In this study, we attempt to clarify the role of the North Pacific circulation in controlling the decoupling of zinc and silicon by using a circulation field that could more realistically reproduce tracers in addition to the previous one. Experiments with different circulation fields suggest that in addition to the continental shelf supply, which is the same result as before, the zinc regeneration process could also affect the decoupling of zinc and silicon. Therefore, it was found that the interpretation depends on the circulation fields.

Circulation fields with older age of water and higher export production overestimated regenerated zinc and vice versa in the North Pacific. Both of two circulation fields in this study were insufficient to estimate appropriate the regeneration of organic matter in the North Pacific. It is concluded that a more realistic circulation field in the North Pacific is needed to understand the real zinc circulation process.

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