

## Reconstruction for water-mass structure of the Okhotsk Sea for the past 1.5 million years based on radiolarian assemblages

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The North Pacific Intermediate Water (NPIW) play an important role in transporting heat and freshwater. NPIW originates from the Okhotsk Sea where is the southernmost seasonal ice area in the northern hemisphere. Sea-ice in the Okhotsk Sea is formed mainly in the northwestern shelf area and moved south by the seasonal wind. Brine water rejected during sea-ice formation sinks to the intermediate layer and forms the Okhotsk Sea Intermediate Water (OSIW) characterized by abundant particulate organic carbon, low temperature, and rich in oxygen. OSIW is a source water of NPIW. Radiolarians are zooplankton with biogenic opal skeletons, and various species distribute from sea-surface to deep-sea. *Cycladophora davisiana* is a radiolarian species that favors well-ventilated intermediate water masses, therefore, *C. davisiana* is used as indicator of OSIW. In this study, we conducted radiolarian assemblage analysis for a giant piston core sample (MD01-2414, water depth 1123 m) to reconstruct the water-mass structure change for the past 1.5 million years. Size fraction greater 45 micrometers were used for slide preparation for light microscope observation. In general, total radiolarian skeletons during interglacials were 10 to 100 times greater than that during the glacial periods. *Cycladophora davisiana* was abundant during interglacials, suggesting enhanced OSIW formation. However, during MIS 11 and 31 known as the super interglacials, much less *C. davisiana* abundances were observed, suggesting weaken OSIW formation due to significant sea-ice retreat. Four radiolarian biostratigraphic markers in the North Pacific region were identified: *Amphimelissa setosa*, *Lychnocanomma sakaii*, and *Spongodiscidae* sp. In addition, two radiolarian species *Ceratospyrus borealis* and *Zygocircus productus* indicated high productivity during interglacials.

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