



Intermediate to deep water hydrographic changes of the Japan Sea over the past 10 Myr, inferred from radiolarian data (IODP Exp. 346, Site U1425)

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The Japan Sea is a back-arc basin opened under a continental rifting during the Early to Middle Miocene (ca. 25–13 Ma). This area is characterized by active tectonism, which drastically modified the Japan Sea paleogeography such as the sill depth of its key straits. In modern condition, the Japan Sea is connected to adjacent marginal seas and the Pacific Ocean by four straits shallower than 130 m. These straits are the Tsushima Strait connecting to the East China Sea, the Tsugaru Strait connecting to the Pacific, and the Soya and Mamiya Straits connecting to the Sea of Okhotsk. Therefore, the intermediate and deep water of the Japan Sea is isolated, leading the formation of a unique and regional deep sea water, known as the Japan Sea Proper Water. However, past studies show that during the late Miocene and Pliocene, only the Tsugaru Strait connecting to the North Pacific was opened. This strait was deeper during Plio-Miocene and have likely enable inflow of deep to intermediate water of the North Pacific in the Japan Sea.

Radiolarians are one of the planktic micro-organisms group bearing siliceous skeletons. Their species comprise shallow to deep water dwellers, sensitive to changes in sea water physical/ecological properties forced by climate changes. Their fossils are known for be well preserved in the deep-sea sediments of the North Pacific. Therefore, in this study we propose to monitor changes in intermediate to deep water hydrography of the Japan Sea since the late Miocene, using radiolarian as an environmental proxy.

In 2013 the IODP Expedition 346 retrieved sediment cores at different sites in the Japan Sea. In this study, we have analyzed 139 core sediments samples collected at Site U1425. This site is situated in the middle of the Yamato Bank. We selected this site because the past 10 Myr could be recovered continuously without hiatuses. Changes in radiolarian assemblages reveal that the oceanographic setting of the Japan Sea changed drastically at ca. 2.7 Ma. For older interval (2.7- 10 Ma), deep water species of the North Pacific could be identified at site U1425, inferring influences of deep water from the North Pacific and consequently a deeper sill depths of the connecting strait. Radiolarian assemblages also show that the intermediate water of the Japan sea is characterized by taxa living in equatorial to mid latitude area of the Northwest Pacific during the time interval between 2.7-10 Ma. While between 4 and 5 Ma, taxa related to the Sea of Okhotsk show very high abundances, inferring also inflow of intermediate water from the Sea of Okhotsk in the Japan Sea.