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History of surface and intermediate depth environmental change in the Japan Sea, Scientific objectives in IODP Exp.346

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The Japan Sea is a semi-closed marginal sea that connected to North Pacific and other marginal seas by shallow straits. It has been experienced dramatic environmental change caused by glacio eustasy and monsoon variation. Today, the Tsushima Warm current (TWC), formed by mixing of subtropical water and coastal water in the East China Sea, flows into the Japan Sea and has sustained climate and ecosystem by supply of heat and salt. The past variations of the volume transport of TWC associated with sea level change induced surface water salinity change in the Japan Sea, resulting in dramatic change of the deep water oxygen level via ventilation. It is essential to reveal the onset timing and history of such environmental change for understanding the evolution of climate and ecosystems in the Japan Sea and Japanese islands. The millennial-scale change in the deep water ventilation during the last glacial period is attributed to the East Asian monsoon. The major cause is thought to be due to influence of the low salinity coastal water related to the summer monsoon. Given that the winter cooling plays a major role in modern ventilation, the winter monsoon should be more taken into consideration to the millennial-scale ventilation change. However, it is still obscure that the relationship of the winter monsoon variation to the ventilation. Further, the millennial-scale changes of the winter monsoon during the penultimate and much earlier glacial periods are rarely understood.

I propose the paleoenvironmental reconstruction of surface and intermediate depth of the Japan Sea using the chemical analysis of the benthic and planktonic foraminiferal shells at the YB-1 site (water depth 330 m), off Tottori in the southern Japan Sea. The proposed penetration depth at this site is 500 m, which is equivalent to the last 2 Myr sediments. Owing to shallow water depth, the continuous occurrence of carbonate microfossil is expected. It is expected that the history of TWC and the relationship between the millennial-scale winter monsoon variability and ventilation will be revealed by oxygen isotope stratigraphy and temperature reconstructions for surface and intermediate depth. I will introduce the research progress of ongoing project and scientific objectives in IODP Exp.346.

Keywords: IODP Exp. 346, Japan Sea, East Asian monsoon, Tsushima Warm Current, intermediate water circulation, winter monsoon