

Seasonal variability of water hydrogen and oxygen isotopes of the Yangtze and East China Sea

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The control mechanism of a long-term variability of the East China Sea (ECS) surface water properties in relation to the East Asian Monsoon variation has been eagerly investigated through the reconstruction of the sea surface temperature (SST) and oxygen isotope of ECS water in the past using assemblage and geochemical proxies of calcareous fossils such as foraminifers and corals. It is generally believed that the past oxygen isotope value of the East China Sea surface water could be a good indicator of the salinity which is strongly affected by the fresh water discharge of the Yangtze originated from the summer monsoon precipitation. Therefore, appropriate interpretation of the relationship between SST and oxygen isotope of ECS surface water reconstructed from calcareous fossils is crucial to understand the East Asian Summer monsoon variability as well as oceanographic changes there. Temperature and salinity as well as oxygen isotope of ECS surface water in modern times are determined by complex mixture of various water mass such as the Kuroshio, the Taiwan Warm Current, and the Chanjiang Diluted Water and their seasonal variability are large. This fact has introduced some uncertainty in the paleoceanographic interpretation of the reconstructed surface water properties of ECS.

In order to establish more precise interpretation scheme for oxygen isotope information reconstructed from sediment archive in this region, it is necessary to summarize the seasonal and spatial differences of the isotopes in the Yangtze drainage and the ECS water columns and clarify the basic controlling factors. For this purpose, we collected river waters from main stream and major tributaries of the Yangtze and multi-layer water samples from five stations across the Kuroshio in both summer and winter.

The oxygen isotope of the Yangtze main stream increases from -15 permil VPDB at upper reaches to -8 permil VPDB at lower reaches, being diluted by tributary waters higher in isotope values, and summer value is ~1 permil higher than in winter. Although the salinity-oxygen isotope relationship looks simple mixing from the Yangtze river mouth to the ECS shelf water, the relationship among temperature, salinity, and oxygen isotope of the seasonally variable Taiwan Warm Current, Kuroshio, and their subsurface water is complex, which makes the detection of the influence from the Yangtze fresh water to the ECS.

Keywords: Yangtze, East China Sea, Hydrogen isotope, Oxygen isotope