

Distinctive distribution of dissolved oxygen and its oxygen isotopic composition at the bottom layer of the Ulleung Basin, East/Japan Sea

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There have been many attempts to interpret the appearance of a remarkable decrease of dissolved oxygen (DO) in the bottom layer of the Ulleung Basin (UB), East/Japan Sea, but it is still unclear. Particularly, in the oxygen-enriched bottom waters of the UB (>53% DO saturation), it is complicated to address the decrease of DO because the multiple processes including (1) the decomposition of organic matter resuspended into the water column, (2) diffusion from the water column to the surface sediments, and (3) isotopic exchange between oxides and DO after oxidation of dissolved minerals released from the surface sediments (i.e., dissolved Fe and Mn) can sufficiently co-occur. In this study, to better understand the distinctive distribution of DO in the bottom layer (deeper than 1,800 m), measurements of oxygen isotopic composition of DO ($\delta^{18}\text{O}_{\text{DO}}$) were collected at the UB of the ES in 2020, 2021, and 2022 field campaigns. As a result, we discovered the intriguing decrease of $\delta^{18}\text{O}_{\text{DO}}$ at the depth layer that DO depletion was presented. While the processes above (1) and (2) support the increasing $\delta^{18}\text{O}_{\text{DO}}$ (^{18}O -enriched), the observed isotopic behavior can be suggested as the evidence of the oxidation of trace elements due to isotopic exchange between Fe/Mn oxides and oxygen molecule (^{18}O -depleted). Although this study is impracticable to quantify an exact contribution of mineral oxidation to DO depletion in the bottom layer of the UB, we suggested new insight into DO consumption through the distinct shifts of $\delta^{18}\text{O}_{\text{DO}}$ caused by mineral oxidation.