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Bottom water oxygenation changes in the northern Okinawa Trough since the last 88ka: Controlled by local hydrology and climate

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Dissolved oxygen content in oceanic bottom water is closely related to the surface organic carbon export and subsurface water stratification, regulating the biogeochemical cycles of some key nutrients and trace elements in intermediate and deep water columns. Further, the rate of organic carbon flux to sediments and bottom water oxygen concentration together determine the intensity of reducing conditions in sediments. In this study, we obtain high-resolution geochemical elements (TOC, TN, TS, $CaCO_3$, Cd, U, Mn and Mo) in a radiocarbon (14C) and δ18O dated, sediment core CSH1 collected from the northern Okinawa Trough to reconstruct the history of bottom water redox conditions over 88 ka. Our data revealed the presence of hypoxic bottom water in the northern Okinawa Trough during late MIS5a-early MIS4, Last Glacial Maximum, and the early Last Deglacial intervals. During the Holocene and the early MIS5a, the dissolved oxygen content in bottom water has increased with decreasing water stratification, which was probably caused by the increased upwelling from the bottom in tandem with the climbing of Kuroshio Current and subdued freshwater effect in the northern Okinawa Trough. The reasons that caused the change of dissolved oxygen content in bottom water in the northern Okinawa Trough varied during different periods. The main factors are related to sea level, strengths of East Asian monsoon and the Kuroshio Current, and the shift of Westerly Jet Axis. The semi-closed topography in the northern Okinawa Trough provides a space framework for the presence of anoxia, while the sea level together with the Kuroshio Current, the East Asian monsoon and the Westerly Jet Axis seems to affect the strength of water stratification and the nutrient supply; thereby, regulating the dissolved oxygen exchange between surface and bottom waters.

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