High-resolution continuous reconstruction of Carbonate Compensation Depth in the Japan Sea during the last 700kys

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Carbonate minerals are one of the main constituents of the marine sediments. The content of calcium carbonate in the marine sediments decreases as the water depth increase, and reach 0% below Carbonate Compensation Depth (CCD) (Berger et al., 1976). Because this variation is controlled by carbonate ion system in the seawater, quantitative estimate of calcium carbonate dissolution in the sea is expected to be useful for understanding carbon cycle. For evaluation of the amount of dissolved carbonate minerals which changes CCD, it is necessary to compare each core samples recovered from near sites which form depth transect, with high-resolution. However, in most case, it is difficult to compare each core samples with high-resolution.
Quaternary sediments in the Japan Sea have millennial-scale alternations in the patterns of dark and light layers. It is said that each dark and light layers were deposited synchronously throughout the deeper part of the Japan Sea (Tada et al., 2018 in press). In this study, using these dark and light layers, we reconstructed the fluctuation of CCD in the Japan Sea during the last 700kys, with high-resolution. The Japan Sea is a semi-closed marginal sea located in the northwest Pacific. Because it has own deep-water ventilation system (Gamo et al., 2014), the fluctuation of CCD in the Japan Sea is expected to have been different from that in the North Pacific.
In 2013, hemipelagic sediment core samples of the Japan Sea were recovered by IODP Expedition 346. We used sediment cores from 3 sites (U1426, U1425, U1424) that form a depth transect. Sediment core samples were continuously measured by ITRAX (XRF core scanner) in Kochi University with high resolution. The fluctuation of CCD was classified in four levels (<903 m, 903-1909 m, 1909-2808 m, 2808 m<) based on content of carbonate minerals estimated from Ca concentration.
Reconstructed CCD shows that it has fluctuated with large amplitude (above 903 m to below 2808 m) and high-frequencies during the last 700 kys in the Japan Sea. These fluctuations have shorter timescale than Glacial-Interglacial cycle. Therefore, it is suggested that CCD was controlled by some factor that has short timescale variations.

Keywords: the Japan Sea, the Quaternary, IODP Exp. 346, calcium (Ca), Carbonate Compensation Depth (CCD)

