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Clay mineral evolution in the central Yellow Sea mud deposits

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The Yellow Sea, a typical epicontinental shelf located between China and Korea, has attracted by many researchers for the study of late Quaternary land–ocean interaction and paleoenvironmental changes. There are four main mudbelt deposits such as North Yellow Sea Mud (NWMD), Central Yellow Sea Mud (CYSM), Southeastern Yellow Sea Mud (SWYSM), and Southwestern Cheju Island Mud (SWCIM). These mudbelt deposits are mostly composed of fine-grained sediments with detrital origin, which mainly come from several rivers in China and Korea. In this study we reconstruct the evolution of clay mineral assemblages in Core YS11-PCL14 (35o 47.07'N, 124 o 06.89' E) retrieved from the Central Yellow Sea Mud. Clay mineral compositions of 67 samples taken at ∼10 cm intervals from YS11-PLC14 core sediments and 31 river sediments flowed into the Yellow Sea were determined using the semi-quantitative X-ray diffraction analysis.

The clay-mineral assemblage of core sediments are composed of illite (60∼75%), chlorite (11∼23%), kaolinite (10∼15%), and smectite (1∼7%), in decreasing order. The ratio (smectite/illite)*100 is abruptly decreases at depth around 200 cm, and is corresponded to abrupt increase in clay fraction. The lower part of core sediments having higher (smectite/illite)*100 ratio are derived ultimately from the Huanghe, because Huanghe only discharges sediments containing the higher (smectite/illite)*100 ratio among the rivers flowed into the Yellow Sea. According to age-dating in the adjacent Core 06-2 (35o 00'N, 124 o 25' E), the depth at abrupt change in clay fraction corresponds to about 5,000 yr. Clay mineral evolution in Central Yellow Sea Mud is closely related to changes in sediment provenance and paleoenvironment. Sea level rise and the strength of the Kuroshio Current control the dispersal and deposition of clays on the Yellow Sea shelf, and thus, determine the clay mineral compositions in the core sediments.

Before 5,000 yr, sediments discharged from Huanghe have a wide influence on the sedimentology of the Yellow Sea. After 5,000 yr, influence from Huanghe decreased while Changjiang river and Korean river sediments became the dominant sediment source to the Central Yellow Sea Mud. The decreasing influence of the Huanghe-sourced sediments after 5,000 yr was probably related to the complex current regime, particularly associated with development and intrusion of Kuroshio Current into the Yellow Sea which would have considerably influenced dispersion and deposition of the Changjiang and Korean river sediments.