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Spatial and temporal distributions of rare earth elements in mud deposits on the inner shelf of the East China Sea: implications for Holocene paleoenvironmental changes

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We present a Holocene paleoenvironmental reconstruction for the inner continental shelf of the East China Sea (ECS) using rare earth element (REE) analysis of sediments from Core MZ02 from the shelf's mud area. The total REE levels vary between 137.76 μg/g and 231.53 μg/g with an average value of 187.69 μg/g. Provenance analysis suggests that the sediments were derived mainly from the river detrital outputs of the Changjiang, Minjiang and small rivers from western Taiwan Island. Our study indicates that the controlling factors of the dispersal and deposition of terrestrial materials on the inner shelf of ECS were the increase of sea level since the last glacial period, and the strength of the Taiwan Warm Current (TWC) and the Chinese Coastal Current (CCC). During the period of 13000–9800 a B.P., due to the lower sea level and shorter distance between the estuaries of the Changjiang, western Taiwanese rivers and Minjiang and Core MZ02, fine sediments in the inner shelf of ECS had a mixed provenance from the three river systems. During the early Holocene (9800–7300 a B.P.), stronger sediment reworking and erosion at the shelf edge was responsible for increased lateral transport of fine sediments in the ECS, which resulted in the main sediment source being the Minjiang, while the Changjiang and western Taiwanese rivers provided only a minor amount of detrital sediment to the shelf. The increased strength of TWC might have played an important role in sediment dispersal and deposition on the ECS inner shelf during the period 7300–3500 a B.P. Furthermore, the results imply that the East Asian monsoon and the weakening of TWC were linked to an abrupt increase in Changjiang-derived terrigenous detritus materials since 3500 a B.P.