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The characteristics of detrital garnet compositions of Changjiang and Huanghe river sediments and their source identification in East China Sea

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The East China Sea (ECS) is a typical marginal sea of the West Pacific and has one of the widest shelves in the world. During the Quaternary the ECS shelf is characterized by the large accommodation space for thick sedimentation, with a mean depositional rate of 300 m/Ma. A large volume of detrital sediments derived from the Changjiang (Yangtze River) and Huanghe (Yellow River) accumulates on the shelf, which make the shelf an important sink for terrigenous sediment. During the last glacial and interglacial stages, monsoon climate, sea-level fluctuation and oceanic circulation primarily controlled the flux and fate of detrital sediments on the ECS shelf. Therefore, the ECS shelf witnessed the rapid changes of depositional environment during the late Quaternary, which makes it an ideal area to study the sea level change, land-sea interaction and paleoenvironmental evolution during the late Quaternary.
The core SFK-1, one of the deepest boreholes drilled on the outer shelf of the ECS. Sedimentary facies of core SFK-1 are established by the analyses of lithology, micropaleontology, chronology and seismology, which include neritic facies-prodelta and sand ridges (MIS5), estuarine tidal flat (MIS5∼MIS4), littoral tidal flat and sand deposits (MIS4), neritic facies (MIS3), nearshore facies (late MIS3), tidal fluvial-estuary (LGM), tidal flat (late MIS2) and tidal sand ridges (MIS1). The transgression-regression cycles and their relationship with sea level fluctuations are recognized, and no apparent whole depositional hiatus is found in this core.
Distinct elemental compositions of detrital garnets separated from the Changjiang and Huanghe sediments can be applied in provenance identification on the outer shelf of the ECS. The garnet composition of the Changjiang is characterized by high Mn and low Mg contents, which are mainly controlled by the rocks of young Yangtze-Cathaysian tectonic blocks. The garnets of the Huanghe sediments have high Mg and relative low Mn contents, primarily determined by the Archaean and Proterozoic rocks in the North China Craton. Some detrital garnets of the two rivers have similar compositions because of their similar source rock types. The typomorphic garnets of the Jinshajiang and the Kuyehe can be the source indicators as the Changjiang and Huanghe sediments, respectively.
The sources changes of core SFK-1 samples can be well revealed by garnet compositions. The garnets in the glacial sediments of core SFK-1 are considered to be primarily from the paleo-Changjiang, being high Mn and low Mg contents, and containing >10% spessartine and <20% pyrope on average. The garnets in MIS5 sediments with high Mg and low Mn contents and pyrope dominant, are mainly derived from the paleo-Huanghe. We conclude that the sediments on the outer shelf of the ECS were predominantly sourced from the paleo-Huanghe during MIS5, but the provenances changed to the paleo-Changjiang during last glacial period. Besides, the paleo-Huanghe might contribute some sediment to the deglacial tidal flat deposits.