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The rare earth elements geochemistry for surface sediments from four transects in the South China Sea and its geological significance

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Seventy-five surface sediments were collected from four transects in the South China Sea (SCS), in order to analyze the rare earth elements (REE) geochemistry. REE total abundance (Σ REE) in the SCS vary from 45ppm to 195ppm, with an average of 128ppm lower than that of the upper continental crust (UCC). The spatial distribution of REE is strongly dependent upon the geographical location and depositional environment. Low ΣREE concentrations are observed in continental slopes (e.g. Xisha and Nansha islands), while high ΣREE concentrations exist in the deep basins. Sediments in the slope are also characterized by lower LREE/HREE, (La/Yb) n, Eu/Eu*, and Ce/Ce* ratios relative to deep basin sediments. There is a positive correlation between Al2O3 and ΣREE, while a negative correlation is presented between CaO and ΣREE. On the other hand, the relatively low degree of Fe-Mn oxides accumulation in the SCS suggest that manganese nodules do not make a great contribution to bulk REE composition in sediments. Therefore, the REE geochemistry for sediments is mainly controlled by terrigenous and biogenic sources. Biogenic carbonate exerts a dilute effect on ΣREE concentrations, but significant influence on LREE/HREE, Ce/Ce*, and (La/Yb) n values would be found only for sediments with especially high contents of biogenic carbonate. The REE geochemistry for surface sediments in the SCS indicate that the source rocks are mainly composed of post-Archean felsic rocks. In the Eastern Sub-basin (ESB), sediments receive significant terrigenous materials derived from young volcanic rocks (e.g. rocks in Luzon arc) according to their relatively low ratios of LREE/HREE and high values of Eu/Eu* .