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Distributions of clay minerals in surface sediments of the middle Bay of Bengal: source and transport pattern

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Abstract: The clay mineral contents in 110 surface sediment samples collected from the middle of the Bay of Bengal were analyzed by X-ray diffraction (XRD) to investigate the provenance and transport patterns. The illite content was highest, followed by chlorite, kaolinite and then smectite, with average weight percent distributions of 52%, 22%, 14% and 12%, respectively. Illite and chlorite had similar distribution pattern, with higher contents in the northern and central areas and lower contents in the southern area, whereas smectite showed the opposite distribution pattern. Kaolinite show no obvious higher or lower areas and the southern “belt” was one of the highest content areas. Based on the spatial distribution characteristics and cluster analysis results, the study area can be classified into two provinces. Province I covers the southwestern area and contains high concentrations of illite and smectite sediments. Province II covers most sites and is also characterized by high concentrations of illite, but the weight percent of smectite is only half of that of province I. According to a quantitative estimate using end-member clay minerals contents, the relative contributions from the Himalayan source and the Indian source are 63% and 37% on average, respectively. Integrative analysis indicates that the hydrodynamic environment in the study area, especially the turbidity and surface monsoonal circulation, plays an important role in the spatial distribution and dispersal of the clay fraction in the sediments. The sediments in province I are mainly from the Indian source transported by the East Indian Coastal Current (EICC) and the surface monsoon circulation with minor contributions from the Himalayan source while the sediments in province II are mainly from the Himalayan source transported by turbidity and surface monsoonal circulation with little contribution from Indian river materials.

Key words: Bay of Bengal, clay minerals, provenance, transport patterns, hydrodynamic environment

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