Tracing seasonal variation of suspended sediment provenances in the South China Sea

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Observing the present is critical to understanding the past and predicting the future. There is a compelling need to directly observe sedimentary dynamic process in the modern deep-sea environment to advance our in-depth interpretation of sedimentary and paleoenvironmental records preserved in sediment sequences. The South China Sea offers an excellent case for the source-to-sink transport study, because fluvial sediments provided by various surrounding drainage systems contain characteristic mineralogical and chemical compositions (Liu et al., 2010; 2016). In order to trace sediment transport processes from surrounding fluvial sources to deep sea, time-series sediment trap samples are applied in this study to demonstrate the seasonal variation of sediment provenances in the northeastern South China Sea. Suspended detrital sediments from 10 sediment traps equipped on 5 deepwater moorings, located at water depths between 2000 and 3850 m, were analyzed for particle flux, clay minerals, major elements, and Nd-Sr isotopes. The temporal variation from May 2014 to May 2015 indicates that contour currents in water depths ranging from 1500 to 2500 m transported the majority of detrital sediments southwestward with increased intensity in summer and winter. Total particle flux in the down traps (2000-3800 m) is usually 10-100 times higher than that in the upper traps (500 m). These down-trap sediments were derived mainly from the fluvial input of Taiwan. While above 500 m, the seasonal variation of sediment provenances is not remarkable although the particle flux slightly increased in summer. Both Taiwan and Luzon contributed suspended particles to the upper sea throughout the year, suggesting westward sediment transport forced mainly by surface currents. This study highlights the significant lateral transport of detrital sediments from surrounding land sources to the deep sea that is characteristic in marginal seas.