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Determining Rates of Sediment Accumulation on the Mekong Shelf: Timescales, Steady-State Assumptions, and Radiochemical Tracers

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Abstract

Thirty-two kasten cores, collected from the proximal Mekong continental shelf, have been analyzed for their excess ^{210}Pb distributions in an effort to establish rates of sediment accumulation over the past 100 years. The length of the cores varied from 0.5 to 3 meters, and stations sampled topset, foreset, and bottomset beds (water depths 7-21 m). Apparent excess ^{210}Pb sediment accumulation rates ranged from >10 cm/y (no down-core decrease of excess activity over 300 cm core length) near the Song Hau river mouth, to 1-3 cm/y in topset and foreset beds within 20 to 50 km of the river mouth, to rates as low as 0.4 cm/y in cores from bottomset beds. The ^{210}Pb sediment accumulation rates yield an overall sediment burial rate of 6.1 x10^{13} g/y for the proximal deltaic deposits, which corresponds to 43% of the total modern Mekong sediment burial on the southern Vietnam shelf (1.4 x10^{14} g/y; based on our ^{210}Pb and seismic data and ^{210}Pb data from the literature). This shelf burial rate is in reasonable agreement with current long-term estimates of Mekong River sediment discharge (1.3-1.6 x10^{14} g/y) from the literature. The inventory of excess ^{210}Pb in the proximal Mekong deltaic deposits indicates that the shoreward flow of offshore water (entrained during river/ocean mixing) is approximately twice the flow of the Mekong freshwater discharge. Organic-carbon ^{14}C ages were measured on 10 cores from the proximal Mekong delta and compared to ^{210}Pb sediment accumulation rates in the same core. The ^{210}Pb accumulation rates in all 10 cores were considered to be more robust and accurate than the ^{14}C geochronologies, primarily because of down-core variations in the source of organic carbon deposited on the seafloor (old terrestrial carbon versus younger marine carbon). Variations in the source of organic carbon accumulating in the seabed were resolved by measuring the δ^{13}C value of the seabed organic carbon.

Keywords: Mekong delta; ^{210}Pb geochronology; ^{14}C geochronology; deltaic sediment accumulation rates; and Mekong sediment budget.