

Mechanisms impacting transfer of Mekong sediment from its tidal river to the continental shelf

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Most terrestrial freshwater, dissolved substances, and suspended sediment pass through deltaic distributary channels on their way to the ocean. Transitions are complex as this river discharge transits the serial environments of delta systems: tidal river, estuary, shoreline, continental shelf. The Song Hau distributary channel is the target of this investigation and receives ~40% of the Mekong River sediment discharge. The majority of it is transferred to the adjacent shelf during high flow of the river (Jul-Nov). Some muddy sediment is resuspended during energetic ocean conditions (Dec-Apr) and returned landward to the channel and to the mangrove shoreline by estuarine processes, temporarily burying the channel bed and interrupting sand transfer to the coastal ocean. Sediment entrapment along the shoreline is enhanced by roughness from dense mangrove roots extending above the bed. Shoreline progradation is rapid with sediment accumulation reaching ~5 cm/y. About a third of the Mekong sediment discharge accumulates in the shelf clinoform near the mouths of the distributary channels, with the greatest accumulation rates (>10 cm/y) in the relatively steep foreset region. The other two thirds of the Mekong discharge are transported by intense landward and southwestward currents during energetic shelf conditions (Dec-Apr). These create a relatively shallow clinoform structure, and cause the delta to grow toward the southwest. In the future, mechanisms will operate under different terrestrial and oceanic conditions. Mekong River discharge will be significantly decreased by the construction of many dams, and sediment dispersal will be modified by the impacts of climate change. In addition, the delta land surface will be flooded due to acceleration of eustatic sea-level rise and of local land subsidence. Together, loss of river discharge, changes in marine conditions, and rise of local sea level will cause many secondary impacts.