Geophysical Research Abstracts
Vol. 20, EGU2018-5823, 2018
EGU General Assembly 2018

Role of tidal-river dynamics on the transfer of sediment from source to sink: Mekong Delta distributary channels

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The tidal river and estuarine reaches of large rivers form a region where significant sediment transformation and trapping occur. Thus the fluvial sediment source signal upstream of the tidal river is not the same as that transmitted to the coastal ocean. From 2014 to 2015, collaborative studies within the tidal river and estuary of the Mekong River delta's largest distributary, the Song Hau, investigated processes that control fine- and sand-sized sediment transport and deposition. Results showed that tidal-river transport processes vary along-channel according to the local ratio of fluvial to marine influences. As sediments progress down the tidal river, sands in suspension have the increasingly greater opportunity to settle at reduced or slack flows as river discharge becomes progressively more affected by the tides in the seaward direction. As a result, a connection develops between deposits on the channel bed and sand transport in the channel. In contrast, mud mostly remains in suspension until it reaches an interface zone, where flows are impacted by the downstream estuary waters but waters are not at all saline. In this zone, as within the estuary, fine particles tend to settle, draping the sand bed facies with mud and limiting the connection between the bed and suspended sand. In the Mekong system, the interface and estuarine zones migrate along the distributary channels seasonally, resulting in seasonally variable trapping dynamics and channel bed texture. Therefore, sand transport is almost completely shut down during seasonal low flow conditions (November-March) despite sufficient tidal-current shear stress in the system. In general, the tidal river and estuarine conditions resulted in an export of mud from the river mouths during high river flow ($\sim$1 t/s from the Song Hau), while a lesser amount is imported ($\sim$0.2 t/s) back into the river mouth during low river flow. Thus, the signature of fluvial-sediment discharge is altered on its path to the coastal ocean, and the disconnected fine- and sand-sized supply functions at the river mouth should result in distinct offshore depositional signatures.