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Sedimentation at different time scales in Yellow River delta in response to course shift and water-sediment regulation

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The fluvial sediment to the sea is the base of coastal geomorphology and biogeochemical processes, and its transport is an important pathway to the global biogeochemical cycle. The Yellow River is one of globally well-known large rivers because of high sediment load and Chinese Mother River. Its channel shifts frequently because of high sediment load and steep river-channel gradient in the lower reaches . The terminal channel has shifted more than 50 times since 1855 and the last two changes in 1976 and 1996. Furthermore, Yellow River Conservancy Commission has began to implement Water-Sediment Regulation Scheme (WSRS) since 2002, to increase the main channel discharge capacity and to reduce deposition in the reservoirs and river channel. Surface sediment, multi-core and gravity sediment cores, remote sensing images and bathymetric data near the Yellow River delta were collected to study the impact of WSRS and river terminal change together with the water and sediment discharge at the gauging station. Especially, ^{7}Be, ^{210}Pb and ^{137}Cs, grain size, sediment color and TOC/TN was measured to show sedimentary record of WSRS and channel shift on inter-and intra-annual time scale. The results show that the fresh sediment from Yellow River during 2014 WSRS period can be transported eastward more than 80 km off the rivermouth, while cannot pass 38° easily. Meanwhile the sediment can penetrate as deep as 12 cm. The subaerial delta area is mostly stable after 2002, and its balance is mainly controlled by the surrounding artificial coastline. The subaqueous delta changed from trapping about 4.6×10^{8} t to being eroded ~ 3.1×10^{8} t and 1.1×10^{8} t each year during the three stages of 1976-1996, 1996-2002 and 2002-2014. It is proposed that the subaerial delta area will change little except for the Q8 outlet area, while the subaqueous delta evolution mostly depend on the Huanghe material besides the hydrodynamic conditions. In addition, the aim of WSRS to scour the lower riverbed will recede in future. This study deepens our understanding of the fluvial sediment disperse pattern and sedimentation under the influence of human activities and hydrodynamic conditions.

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