From micro to macro scale – the impact on the sediment discharge after construction of the Three Gorges Dam on Yangtze River (Chang Jiang)

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Introduction: Under the influence of natural and anthropogenic activities, fluvial systems have natural ability to adapt, therefore the river hydrology, channel morphology, and sediment movement are in dynamic equilibrium. The Yangtze River (Chang Jiang), the largest river on the Eurasian continent is an example of such adjustments. It measures 6,300 km long, having the average water discharge of $905.1 \times 3\ 10^9$ m^3/yr and the fifth-largest sediment discharge of any river in the world: in 1950–2000 estimated $0.43 \times 3\ 10^9$ ton/yr [1].

Methods: A thorough literature-based research was conducted in order to gather complex information about Yangtze River depositional system. Data in the latest reviews are incoherent to the former publications. Here we have reviewed the following techniques: study of the causal mechanisms of variations in sediment load and the impact on the river system. Usage of latest technologies and research should be preferred.

Results: The Three Gorges Dam (TGD) on the upper Yangtze River, China, disrupts the continuity of sediment delivery downstream to the dam and along the major sediment dispersal pathway into the East China Sea, via submerged delta and coastal areas over a total length of 2100 km.
This paper presents impact of the TGD on the sediment flux in the next decades. Results show that between 2003–2008 about 172 million tons (Mt) of sediment was trapped yearly by the TGD, and an averaged trapping efficiency comes to 75% [2].
In the first stages of operation of the TGD, the suspended sediment content (SSC) and fluxes in the middle and lower reaches of the river visibly decreased. Nowadays, they appear to keep a stable state for the next decades. Also, the riverbed has turned from depositional before the dam construction to erosional afterwards [3].

Discussion: Longitudinal changes in sediment grain size along the middle and lower Yangtze River, in the lower reaches of TGD, shows modification of the sediment structure from fining trend towards the river mouth that was exponential in form to abrupt gravel-sand transition straightaway downstream of the TGD. It is generally the consequence of hydraulic sorting and abrasion. The next transition zone, between sandy and muddy deposits is located in the main channel of the Yangtze Estuary and in the adjacent Hangzhou Bay. This is probably caused by the sudden deposition of suspended mud due to tidal activity and as an effect of mixing freshwater and seawater [4]. Even though the identification and interpretation of hydrological and sedimentological changes in the Yangtze basin, with all its complexity, seems almost unmanageable it is crucial to do deep research on the Yangtze River system to predict impact of the TGD in the coming decades.

References:

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