

Texture Characteristics and Depositional Environment of the Lower Mahi River Sediment, Mainland Gujarat, India

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Abstract : The Mahi River (~600km long) is an important west flowing the river of Central India. It originates in Madhya Pradesh and starts flowing in NW direction and enters into the state of Rajasthan. It flows across southern Rajasthan and then enters into Gujarat and finally debouches in the Gulf of Cambay. In Gujarat state, it flows through all four geomorphic zones i.e. eastern upland zone, shallow buried piedmont zone, alluvial zone and coastal zone. In lower reaches and particularly when it is flowing under the coastal regime, it provides an opportunity to study - 1. Land-Sea interaction and role of relative sea level changes, 2. Coastal/estuarine geological process, 3. Landscape evolution in marginal areas and so on. The Late Quaternary deposits of Mainland Gujarat is appreciably studied by Chamyal and his group of MS University of Baroda, and they have established that the 30-35m thick sediment package of the Mainland Gujarat is comprised of marine, fluvial and aeolian sediments. It is also established that in the estuarine zone, the upper few meter thick sediments package is of marine nature. However, its thickness, characters and the depositional environment including the role of climate and tectonics is still not clearly defined. To understand few aspects of the above mentioned, in the present study, a 17m subsurface sediment core has been retrieved from the estuarine zone of Mahi river basin. The Multiproxy studies which include the textural analysis (grain size), Loss on ignition (LOI), Bulk and clay mineralogy and geochemical studies have been carried out. In the entire sedimentary sequence, the grain size largely varies from coarse sand to clay; however, a solitary gravel bed is also noticed. The lower part (depth 9-17m), is mainly comprised of sub equal proportion of sand and silt. The sediments mainly have bimodal and leptokurtic distribution and deposited in alternate sand-silt package, probably indicating flood deposits. Relatively low moisture (1.8%) and organic carbon (2.4%) with increased carbonate values (12%) indicate that conditions must have to remain oxidizing. The middle part (depth 9-6m) has a 1m thick gravel bed at the bottom and overlain by coarse sand to very fine sand showing fining upward sequence. The presence of gravel bed suggests some kind of tectonic activity resulting into change in base level or enhanced precipitation in the catchment region. The upper part (depth 6-0m; top part of sequence) mainly comprised of fine sand to silt size grains (with appreciable clay content). The sediment of this part is Unimodal and very leptokurtic in nature suggesting wave and winnowing process and deposited in low energy suspension environment. This part has relatively high moisture (2.1%) and organic carbon (2.7%) with decreased carbonate content (4.2%) indicating change in the depositional environment probably under estuarine conditions. The presence of chlorite along with smectite clay mineral further supports the significant marine contribution in the formation of upper part of the sequence.

Keywords : grain size, statistical analysis, clay minerals, late quaternary, LOI

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