

## NUMERICAL MODELING OF SEDIMENT TRANSPORT IN THE GULF OF KACHCHH, WEST COAST OF INDIA

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The gulf of Kachchh is a semi-enclosed water body, located between the Rann of Kachchh, an embayment, and the Saurashtra peninsula in the central west coast of India. The gulf is the northeastern arm of the Arabian Sea, reaching eastward for approximately 170 km. Its width varies between approximately 20 km to 80 km. The maximum depth of the gulf is 60m and numerous small islands are found in its water. The gulf is located in an arid zone with a mean annual precipitation of about 0.4 m/year but with a mean evaporation of about 1.4 m/year. The gulf has an average tidal range of 4 m. Because of the high tidal range, low river runoff from land and the irregular topography, the waters of the gulf are homogeneous in term of salinity and temperature (Varkey et al., 1977). The density is nearly uniform from surface to bottom. Therefore, density driven currents in the gulf are negligible (Srivastava and John, 1977).

A depth-averaged numerical model has been developed to study the tidal flow and suspended sediment transport in the gulf of Kachchh, west coast of India. The model is fully non-linear and uses a semi-explicit finite difference scheme to solve the basic hydrodynamic equations on a staggered grid. The erosion and deposition has been computed by an empirically developed source and sink term in the suspended sediment equation. In the present study the length is taken as 150 km at 68° 51' E from the seaward end. The breadth at this location is taken as 89.28 km. The analysis region is represented using a mesh of 201x120 grid points, with a constant grid spacing of 750m. A time step of 30 seconds is found to be consistent with the computational stability.

The model reached steady state after 8<sup>th</sup> tidal cycle and the results of 9<sup>th</sup> tidal cycle was analysed. In the major portion of the gulf the tidal current during flood varies from 0.12 ms<sup>-1</sup> to 2.23 ms<sup>-1</sup>. The resultant current during ebb is found to vary from 0.1 ms<sup>-1</sup> to 2.18 ms<sup>-1</sup>. During flood the suspended sediment concentration varies from 18 mg/l to 240 mg/l in the gulf. Sediment concentrations are higher at the northern part of the gulf due to the propagation of sediments from Indus delta. At Salaya, Navalakhi and Kandla the sediment concentrations are 25.3 mg/l, 225.1 mg/l and 181.4 mg/l, respectively. During ebb concentration varies from 15 mg/l to 226 mg/l. The model computed velocity components and sediment concentrations are found to be in good agreement with the available observations (Unnikrishnan et al., 1999 and Kunte et al., 2003).

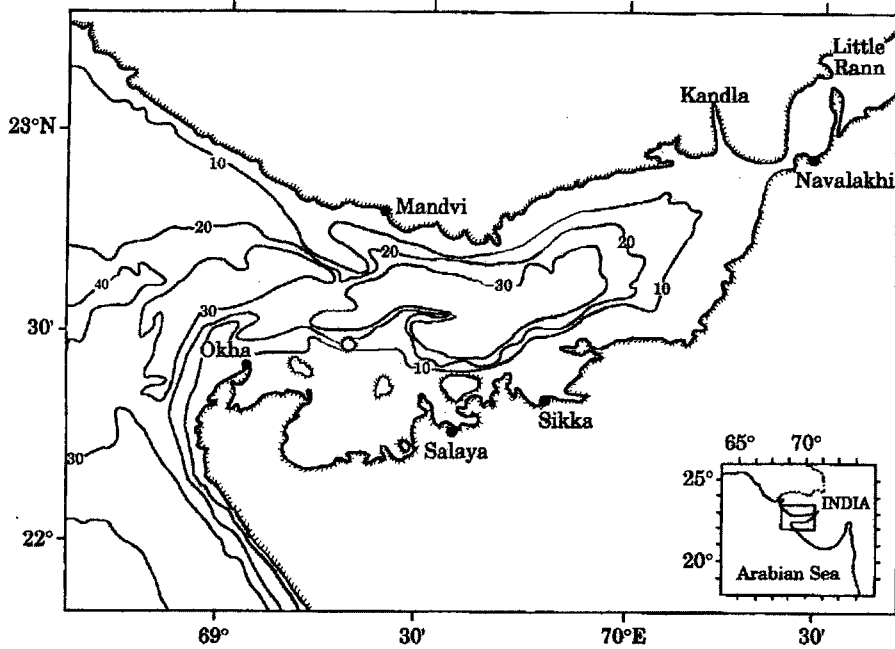


Fig. 1 Map of the gulf of Kachchh

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