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Study of Neotectonic effects in Saurashtra Peninsula using Remote Sensing and GIS

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This study points out the evidence of neotectonics and possible existence of an active fault in the northern part of Saurashtra Peninsula. The methodology used for the detection of neotectonic influences on Quaternary sediments and hard rocks are: a) analysis of numerical data obtained from the Digital Elevation Model (DEM) and its derivatives (morphometric indices), b) study of the behavior of geomorphic markers, in regional, macroscopic as well as in mesoscopic scale and c) correlation of seismic and palaeoseismic data and geomorphology with structural lineaments.

Conventional morphometric indices of the river basins, such as area and perimeter, drainage density, stream frequency, bifurcation ratio, basin length, basin relief, relief ratio, elongation ratio, stream gradient index, hypsometric index and sinuosity ratio have been used here to assess the tectonic signatures. These indices suggest that the Aji river basin is tectonically active (0.23 circulatory ratio, 0.43 elongation ratio, concavo-convex hypsometric curve and 0.41 hypsometric index), whereas the Und and Saso river basins show some of the parameters in active tectonic ranges.

Regional study of the area supported by remotely sensing data (Landsat OLI multispectral) has helped to decipher: a) the abrupt dextral rotation (about 100°) of the Aji river trunk channel near the Gulf coast and b) dextral deflection of both the Aji and Und rivers about 25 km from the coast.

Detailed study of a segment of the Aji river basin near Ranjitpura-Balamba shows that a portion of land segment (Figure 1) has been uplifted and tilted resulting in a) narrowing of trunk channel towards sea, b) development of new sets of channels over tilted river terraces, c) occurrence

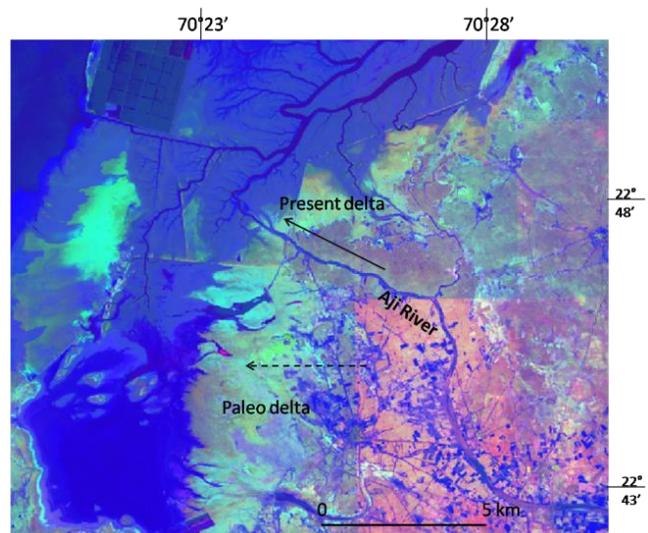


Figure 1: Band ratio FCC of OLI data showing abrupt dextral rotation of truck channel of Aji near the Gulf due to the upliftment and tilting of land towards east.

of several beheaded channels, d) presence of palaeo-channels and palaeo-delta in different direction than the present ones, e) formation of an estuary with definite geometric shape and sharp delta mouth. Occurrence of earthquake epicenters, in conformity with predicted lineaments and North Kathiwar Fault (Biswas, 2005) [1] in addition to paleo-seismic records (Rajendran et.al, 2003) [2] support the existence of the fault. Thus, on the basis of integrated evidence (morphometric indices, regional geomorphology and segmental study, regional seismic/palaeoseismic study), it has been established that the Saurashtra coast along the Gulf of Kachchh is tectonically active with the existence of a dextral strike slip fault (ENE-WSW trending) with a rotational component manifesting tilting of the northern block towards the east.

References:

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[2] Rajendran C.P, Rajendran, Kushala, Vora K.H and Gaur A.S; (2003) The odds of seismic source near Dwarka, NW Gujarat; An evaluation based on proxies. *Current Science*, pp55-59.

