# CHAPTER - VII

# D I S C U S S I O N

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The study area is unique in the sense that it marks the site of an important global tectonic feature, a post-Mesozoic rift, that initiated the plate tectonic mechanism, which in the course of Tertiary and Quaternary times, culminated in the uplift of Himalayas at the farther edge, and the formation of oil bearing Tertiary sequence on the western continental margin. Biswas (1988), has stated that the major Himalayan tectonic events and major unconformities within the offshore Tertiary sequences show a distinct synchroniety. Significantly the breaking up of the Gondwanaland coincided with the eruption of the Deccan Trap which are now seen as a thick pile of horizontal flows of basaltic rocks. This rifting of the western continental margin and the subsequent northeastward drift of the Indian subcontinent, have manifested themselves into a complex fracture pattern, which in turn has controlled the geological and geomorphological evolution of Gujarat region in general and the South Gujarat in particular.

It is however not possible to spell out the precise sequence of events that have affected the rocks of the study area, as there are few infallible evidences to arrange them chronologically. The landscape as seen to-day is the sum total of the structural features that developed during the protracted drift history of the this continental margin since its rifting at the beginning of the Cenozoic. This rifting brought into existence the Cambay Basin, i.e. N-S Cambay Graben and E-W

Narmada - Tapi Graben, each providing sites for the deposition of thick Tertiary and Quarternary sediments. Sympathetic fractures and joints which developed along the margins of these two basins, are manifested in the structural framework of the study area also.

Biswas (1982 & 1987), has attributed the evolution of the two grabens (Cambay basin) to the rifting of the eastern part of the Gondwanaland which took place as early as Late Triassic-Early Jurassic (Norton and Sclator 1979), and the subsequent spreading history of the Eastern Indian Ocean. While India together with Antarctica and Australia drifted away from Africa, the graben faulting along the western margin of India took place on account of reactivation of ancient faults sequentially from north to south. He has postulated four major stages of the basin evolution.

Stage I (Late Triassic /Early Jurassic)

Kutch rifting along the Delhi trend.

Stage II (Early Cretaceous)

Kutch basin was filled up; East Cambay faults bounding the eastern margin of the Cambay basin became active, and the entire region to the west of the east Cambay faults and north of the Narmada faults, subsided to form an extensive platform. Rifting along the Narmada geofracture was initiated during this time, with the opening up of a basin to its western end.

Stage III (Late Cretaceous)

This period was marked by extensive uplift on the western part of India along North Kathiawar Fault, Western Cambay Basin Margin Fault, Western extension of the Narmada fault. The Cambay graben came into existence as a rift valley by reactivation of its boundary faults. The Narmada rift opened up and received marine sediments. Foreland block north of the Narmada fault and the peninsular block south of it moved up as the Narmada graben subsided.

Stage IV (Early Tertiary)

The West Coast Fault was reactivated as the present western continental shelf subsided along it. The Cambay Graben extended southward. The Cambay and Narmada grabens crossed and initially displaced each other.

Deccan volcanism was also a part and parcel of this rifting phenomenon. Basaltic lava flows, poured out, following a period of igneous intrusion that accompanied the tectonism. Dietz et.al (1970) have attributed this volcanic activity along the western continental margin when it crossed the mantle hot spot. Melting of lithosphere and basalt formation, and consequent uparching (Thomson 1976), has been invoked to explain widespread uplift and faulting. Mackenzie (1984) has suggested that epierogenic

uplift could result from intrusion of large thicknesses of basalt magma into the lower part of continental crust.

The morphotectonic evolution of South Gujarat has to be viewed in the light of above facts. An important conclusion that has emerged from the present study is that the characteristic Trappean (step-like) topography of Deccan basalts, is not exclusively on account of different erosion and scarp-retreat of a horizontally layered lava flow sequence. Although, this mechanism is not to be entirely ruled out and the escarpment, plateau steep cliff assemblages do at several places point to the varying response of weathering agencies to the basaltic layers of differing lithologies. But by and large, the role of faulting and related vertical uplifts and subsidences, is not only more effective, but according to the present author, is a dominant factor. This tectonic control is very well reflected in the landscape. Unfortunately, the Deccan basalts of South Gujarat have not received adequate attention in the past, and except some very generalised observations made by some earlier workers (Radhakrishna, 1965; Power 1981; Rao, 1987; Ray & Das, 1977) and postulation of some deep seated sub Trappean basement lineaments on the basis of geophysical studies by Kaila, et.al (1981), none has endeavoured to establish relationship between the landscape and fracture systems.

The landscape evolution of South Gujarat has to be viewed in the light of the structural framework and the fracture pattern,

which in turn, reflects, the regional large scale tectonism. The various tectonic events recorded in the rocks of the study area typically comprise local responses to the major geotectonic events within the continental block. The present study has adequately brought out this morphotectonic relationship, and has also thrown considerable light on the deformational history of this part of Indian Western Continental Margin and has enabled to know at least, an outline of the various tectonic events of the Cenozoic Era.