CHAPTER - V

LINEAMENT ANALYSIS

Lineament analysis for the entire Gujarat alluvial plains was carried out by visual interpretation of IRS FCC images in conjunction with the Survey of India toposheets. As the area consists of thick alluvial deposits, the lineament density is considerably lower as compared to the adjoining upland areas in the east and the west. However, the lineaments are more persistent presumably because they represent dislocation of appreciable magnitude in the more compact rock units deep down in the surface (Krishnaunni, 1976). Thus the lineaments in the alluvium perhaps offer more useful clues in understanding the structural setting of the underlying formations than the much more closely spaced lineament patterns in the

exposed hard rocks. The lineaments of the alluvial plains are thus presumed to reflect the subsurface structural patterns of the sediments. The major ones are found to be more or less correlatable with the major tectonic features of the Cambay basin.

The lineaments have been picked up on the basis of trends of morphological features, structural alignments, textural contrasts and tonal differences. The drainage courses have also been considered as lineaments because of their preferrred orientations and meander patterns. The lineaments correspond to the three major structural trends of the area. The NE-SW, ENE-WSW and NNW-SSE trending lineaments are parallel to the regional Aravalli, Satpura and Dharwad trends respectively (Fig. 5.1). The N-S and E-W lineaments seem to reflect the basin configuration. Drainage courses of the area indicate NE-SW and NNE-SSW lineaments. Other lineaments trend in NE-SW, NNE-SSW and a few show an E-W trend. It is also observed that the NE-SW trending lineaments are the oldest followed by NW-SE and NNE-SSW trending lineaments in chronological order.

THE NORTHERN ALLUVIAL PLAINS

The northern alluvial plains shows two dominant lineament trends, one in NNW-SSE and the second in E-W direction (Fig. 5.1). All the lineaments show good correlation with the subsurface data. The first one reflects the NW-SE aligned intrabasinal horst and graben feature in the subsurface. Around Tharad, a dominant ENE-WSW to E-W trend suggests the continuation of the Aravallis in the

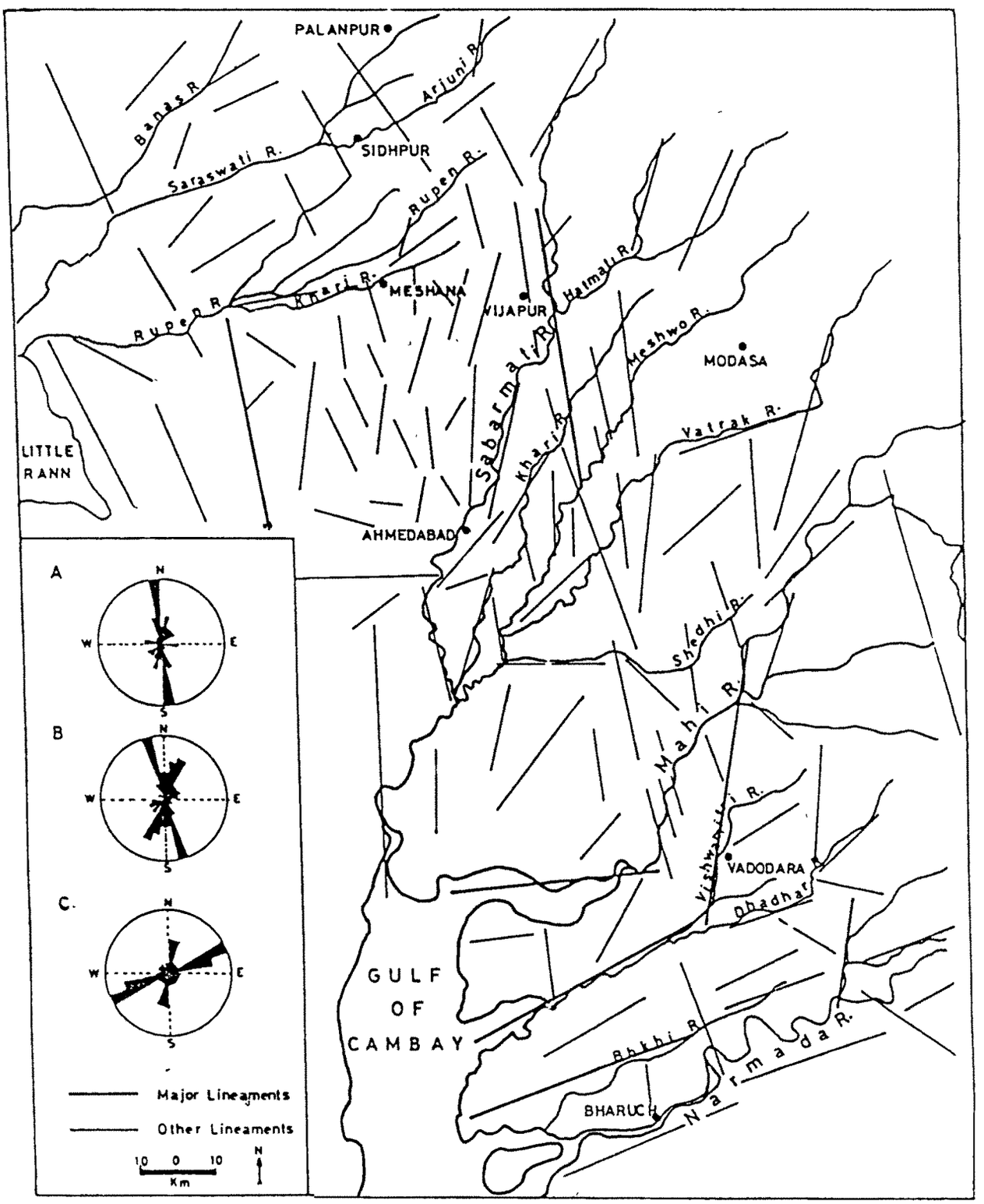

Fig. 5.1 Lineament map of Gujarat alluvial plains (Inset - Rossettes showing dominant trends in (A)-northern, (B)-central and (C)- southern alluvial plains.

subsurface. These lineaments represent the fault bounded intrabasinal horst and grabens within the Cambay basin. A major lineament trending NNW-SSE which passes through Deesa to the east of Sanchor coincides with the eastern limit of the Cambay basin in this part (Table 5.1). Similarly, a NNW-SSE trending lineament south of Luni river marks the western margin fault. To the west of this lineament the ONGC data indicates the presence of a granitic basement, the Mesozoics and Traps being absent. Further south between Radhanpur and Viramgam, two to three prominent lineaments which are arranged in an enechelon fashion trending NW-SE are observed. The lineaments passing west of Radhanpur, Sami and Bechraji, Detroj and east of Viramgam correspond to the western margin fault in the subsurface. A major fault lies between Ahmedabad and Banas river corroborated by bouger gravity data. To the west of this fault lies a series of structural highs viz. the Sanand high, Kalol high and Mehsana horst etc. South of Saraswati river, the NNE-SSW oriented features loose their identity and the major basement trends are oriented paralleling the Aravalli trend. These are very well reflected by the drainage system in the area. The area south of Mehsana upto Sabarmati river is devoid of any drainage suggesting the presence of basement highs diverting the streams to flow towards the south as evidenced by the Sabarmati river. The nearly north to south aligned lineaments corresponding with the subsurface horst and graben features around Mehsana gradually diminish south of Sabarmati river.

Table No. 5.1 Major lineaments and their morphotectonic characters

Lineament	Trend	Morphotectonic characters
1 Deesa lineament	NNW-SSE	marks the Eastern Margin Fault of Cambay basin
2. Enechelon lineaments between Sabarmati and Khari rivers	NNW-SSE	reflects the subsurface horst and graben structures
3. Bechraji-Viramgam	NNW-SSE	reflects the Western Margin Fault
4. Bok lineament	N-S	controls the course of Sabarmati and Bok river
5. Enechelon lineaments between Vatrak and Sabarmati	NNW-SSE	reflects the step faulted eastern margin
6. Enechelon lineaments along Mahi	NNE-SSW	reflects the step faulted eastern margin
7. Mahi lineament	E-W	marks the Mahisagar Fault along the Mahi estuary
8. Vishwamitri lineament	NNE-SSW	marks the limit of ravines around Mahi and the course of Vishwamitri river
9. Dhadhar lineament	ENE-WSW	controls the course of Dhadhar river and marks the northern limit of the lineaments related to Narmada geofracture
10. Bhukhi lineament	ENE-WSW	controls the course of Bhukhi river
11. Orsang lineament	NNE-SSW	controls the lower course of Orsang river

THE CENTRAL ALLUVIAL PLAINS

South of Sabarmati river, the transverse lineaments become more prominent. These lineaments trend in NE-SW direction. The eastern margin fault is represented by a series of subparallel enechelon lineaments trending N-S and NNW-SSE (Fig. 5.1). The number of lineaments on the eastern margin are more as compared to the western margin. This is because the eastern margin fault is discontinous and ill defined in this part. The drilling data of ONGC has delineated the Eastern Magin Fault passing through Deesa, Visnagar, west of Vijapur, west of Dahegam, Anand and Baroda upto the Narmada river. The subsurface data is indicative of a highly faulted zone of step faults descending towards the centre of the graben which are represented by the enechelon lineaments (Table 5.1). These lineaments are pronounced betwen the Vatrak and Sabarmati rivers and along the course of the Mahi river.

THE SOUTHERN ALLUVIAL PLAINS

The major lineament trend gradually swings to E-W near the Narmada river suggesting an obvious influence of the Narmada-Son geofracture (Fig. 5.1). The drainage too reflects the dominating E-W trend. The eastern margin of basin is represented by few almost N-S lineaments. South of Mahi river a major lineament trending NNE-SSW is seen which seems to control the extent of ravines south of Mahi river and the course of Vishwamitri river. A E-W trending lineament along the Mahi eastuary marks the Mahisagar Fault in the subsurface. South of Dhadhar river

the E-W lineaments dominate. A E-W lineament follows the courses of Bhukhi river and the Heran river (Table 5.1). The lower course of the river Orsang is marked by a prominent NNE-SSW lineament. This trend is also marked by the meanders of the Narmada river.

The lineament rossettes for the northern, central and southern alluvial plains show a change in the dominant trend (Fig. 5.1).The dominant trend gradually changes from N-S in the northern plains to E-W in the southern plains. In the northern plains the N-S Cambay basin trend is dominant whereas in the central plains, a gradual swing towards the east is observed possibly becuase of the increasing influence of the NE-SW Aravalli trend. In this part, the NNE-SSW and NE-SW trends dominate. In the southern plains, the lineaments parallel to the Cambay trend seem to loose their identity. The major lineaments in this part trend in E-W direction parallel to the Narmada trend.