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IN SEARCH OF CRATON ROOTS FROM GRAVITY DATA

N.K.THAKUR and RAMESH KHANNA
National Geophysical Research Institute, Uppal Road, Hyderabad – 500007, India

Seismic investigations suggest that the cratons could have deep roots extending down unto 250-400 km or could be of the order of 150 km in depth. The Indian subcontinent to a great extent comprises Archean crust surrounded by Proterozoic mobile belts. Three distinct cratonic nuclei have been identified, over which these cratons might have evolved. Teleseismic studies over the Indian peninsula have suggested high velocity (continental roots) in the upper mantle in the depth range of 60-300 km. Detailed teleseismic investigations have indicated that amphebolitic terrain is characterized by higher velocities, where as high grade granulitic terrain has significant low velocity. However beyond 200 Km homogenous high velocities were observed over the major part of South India. The global tomography indicated that the high velocity regime in India and East Asia were relatively thin and hardly exceeds 150 Km.

Such proposed velocity configuration should produce density perturbations, which should reflect in the gravity field measurements. Bouguer gravity data over the Indian subcontinent is utilized to validate such observations. The bouguer gravity anomaly map of Indian peninsula covering all the cratonic areas and ranging from 9-26° has been analyzed. The depths to Conrad and Moho are estimated from gravity data. The contribution from these layers and considering 150 Km as lithospheric thickness is removed through three-dimensional forward modeling. Conventional uniform density contrast for all these layers were assumed. The final map shows the anomalies in general have negative amplitude characteristics. Earlier the negatives in gravity anomalies over the southern Indian peninsula after removal of the effect of the Indian Ocean Goid low were ascribed to intra-curstal or sub-crustal lower density mantle. However, in the present investigation the contributions from the crustal configuration is primarily removed and hence, the negative characteristics of the anomalies could be ascribed to low density in the mantle.

Large-scale mantle anomalies are prevalent in the southern peninsular India indicating low-density configuration. A NW-SW trending Godavari graben, over which the negative characteristic is reduced, obliterates the low in the gravity field. This may probably imply that the mantle under this rift is comparatively having higher density. The graben demarcates the Dharwar and Baster craton. The entire southern peninsular India is marked by prominent gravity low, which covers the Dharwar craton, whereas, the other two cratons ViZ., the Singhbhum is the east and the Aravali in the north do not exhibit in significant gravity anomalies. Such configuration indicates that the later two cratons have not fully evolved around their nuclei.. Possible interpretation of this anomalous behavior of the craton would be discussed.

Keywords: Cratons, Indian Peninsula,Gravity , Dharwar Craton, Singhbhum Craton