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Gravity anomalies over Indian Cratons and their Geological implications

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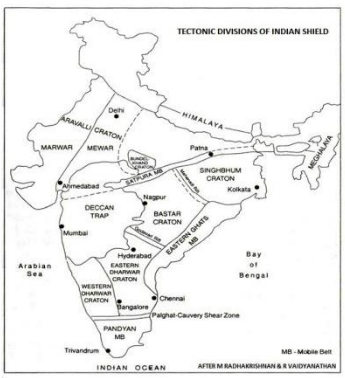
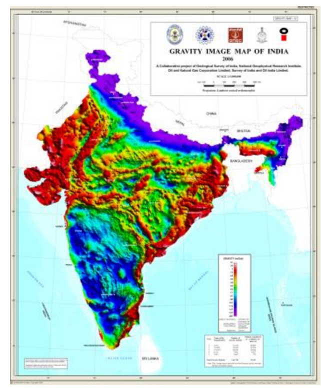
Regional Gravity anomalies being representative of cumulative responses of entire column they are expected to yield the sub-surface geology effectively. Another significant feature of gravity anomalies is that they clearly mark the continuity of features, even if they are obscured by later geological events. Thirdly, gravity anomalies due to surface/subsurface geology are superposed on regional (Global/Indian) anomalies due to nature of moho and lithosphere. With these constraints, the Regional Gravity Map of India (RGMI, GSI and others, 2006) is digitized domain wise and a uniform methodology is adopted for analysis in choosing the gridding parameters, generating the profiles across the Cratons, applying the same wavelength for filtering the anomalies; 60 km and 120 km generally representing 15 Km and 30 km respectively and constructing the power spectrum for splitting the anomalies in to different frequencies. The data is processed using Geosoft software (V8.0.3).





Major inferences drawn from the analysis of gravity anomalies of different Cratons included the following: there is definite evidence about the nature of basement beneath the Deccan Trap area and the extent of Dharwar Craton could be mapped from gravity anomalies bringing out the Proterozoic basins and gneissic basement. The extent of these basins beneath the Trap area can be traced based on the negative gravity anomalies. Interestingly it is observed that there is a transitory zone of about 60 km wide and 350 km length between Western and Eastern Dharwar Cratons, partly occupied by Closepet granite. Gravity high zone indicated that there is possibility of Betul like supracrustal belt beneath Deccan Traps south of Vadodara. Gravity gradients mark the disposition of Bastar Craton, in variance with the geological map, by not including Sakoli belt, Sausar belt and Chilpi Group of rocks. Status of Kondagaon granulite belt (fold belt?) is not in accordance with the expected anomalies. Singhbhum Craton is predominantly represented with gravity highs excepting over the granites. Chotanagpur Gneissic Complex (CGC) appears to be part of Central Indian Tectonic Zone (CITZ) based on similarity of anomalies. The southern margin of these high zones marks the disposition of CITZ with progressive shift towards north. CITZ is likely extends towards west and not possibly join with Aravalli-Delhi Fold Belt (ADFB). Meghalaya massif is likely to be part of CITZ and not a Craton as characterized with high gravity anomalies over gneisses, granites and meta- sedimentaries. Gravity anomalies suggest the possibility of older Dharwarian trends in the Northern Indian shield area particularly as extension of Godavari and Mahanadi Rift zones. Gravity anomalies mark the complete disposition of Bundelkhand Granite and the northern margin of Bundelkhand Craton. There is a possibility of narrow rift zone between Marwar and Mewar Cratons. Indian Cratons can be divided in to three groups with deep crust as over Dharwar, Bastar and Budelkhand, moderate crust as over Aravalli and very shallow crust over Singhbhum and Meghalaya massif.

References:

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2. Geological Survey of India and Others (2006): Regional Gravity Map of India