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Heat Flow, Curie Depth and Composition of Lower Crust Beneath the Indian Shield

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We have analysed the available surface heat flow and Curie depth data from different geological provinces of varying ages from Upper Cretaceous to Precambrian of Indian shield to understand the composition of lower crust. Surface heat flow in the Indian shield varies from 36 to 107 mWm^{-2}. It varies from 36 to 55 mWm^{-2} in Archaean Dharwar province, southern granulite terrane, Aravalli-Bundelkhand craton and parts of Deccan volcanic province and 54 to 107 mWm^{-2} in Proterozoic mobile belts and Gondwana rifts/grabens. Curie depths derived from magnetic satellite (MAGSAT) data in Indian shield vary from 30 km under Cambay basin and 42 km under Aravalli, Singhbhum and Dharwar cratons. Curie depth depends upon the Curie temperature, which shows variation between 350 and 680 ^{0}C in magnetic minerals. However, Curie point is usually referred to a temperature of 550 $\pm$ 30 ^{0}C at which Fe-Ti oxide minerals loose their ferromagnetic property. Magnetic crust is the part of the crust, which shows significant magnetization and the lower boundary up to which the magnetization exists in the crust is Curie point isotherm.

We have estimated the depth of the magnetic crust using available surface heat flow data and 1- D exponential geothermal model beneath the Indian shield. It varies from around 18 to 32 km beneath mobile belts/rifts/grabens and around 48 to 60 km beneath Dharwar craton, southern granulite terrane, Aravalli-Bundelkhand and parts of Deccan Trap province. Comparing the results of the estimated depths of magnetic crust using MAGSAT and heat flow data, it can be inferred that the mismatch could be due to the variation in magnetic mineral composition in the lower crust. These results are discussed in the light of geodynamic implications.