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ON LONG-WAVELENGTH MAGNETIC ANOMALIES OVER INDIAN REGION

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Aeromagnetic surveys are the most common component of the reconnaissance surveys conducted to locate mineral deposits. Their one use lies in estimating the depth of basement rocks, or equivalently, the thickness of sedimentary basins. The analysis requires a good model of the core field. Conventional spherical harmonic expansion for the core field account for wavelengths of about 3000 kms. Ground magnetic anomaly map for the Indian region shows anomalies much smaller than these wavelengths. The question then remains that how good are the quantitative estimates made from aeromagnetic data by removing the core field mentioned above.

Vector magnetic measurements from low altitude satellite (MAGSAT) have been made by NASA using very high precision magnetometers. Further, very accurate attitude determinations were made using Sun sensors and star cameras, providing a data first of its kind. From this data set passes over Indian region limited to 10°S – 40°N and 60°E – 110°E, for very quiet days ($K_p \leq 2$) were selected for analysis. Since the satellite always passed during dawn or dusk hours, and since only very quiet periods were considered, one can safely assume that the ionospheric and magnetospheric contributions are minimal. To further account for the external effects, ring current contributions, estimated using both X and Z variations were subtracted from the observed values. Before this, core contribution was eliminated through a spherical harmonic expansion with terms upto N 13. Analysis of the residual measurements using fast Fourier techniques indicate that the anomalies contain substantial power for wavelength of about 1500 kms. Unfortunately, the ring current effect also has a spatial structure of this dimension over India. Efforts are being made to exactly estimate these two interfering effects from the data. Over some regions the 1500 km contribution is more in X-component and in others, it is more in Z-component. Methods to accurately eliminate external current contribution in a situation like this will be discussed.