PROGRESS REPORT

MAGSAT FOR GEOMAGNETIC STUDIES OVER INDIAN REGION

Investigation Number M-38

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The investigation team consists of the following members:

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The following collaborators participated in data analysis during this investigation period:

S Srinivasan and L Carlo

I. Summary

The major activities of the period were: (i) to read data tapes generated on IBM system on DEC-10 system accessible to this Institute and to prepare new tapes compatible with DEC-10 system for data sections of interest; (ii) removal of core and external current contributions from selected passes over Indian region and analysis of the residuals: and (iii) studies of possible equatorial electrojet contributions in the MAGSAT records.

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II. Techniques

Since: (i) the MAGSAT data tape were prepared on IBM system which has a 32-bit word size and the data are to be used by this Institute on a DEC-10 system which has a 36-bit word size, and (ii) the data records are a mixture of integer and real numbers and each of the record has a different mixture, an assembly language program was used to convert the tapes sent by NASA. From Investigator-B tapes, data were selected for days with Kp $<$ 10 and new tapes for Indian region were prepared. These tapes are directly readable on DEC-10 system and they contain data over the block 60°E to 110°E and 10°S to 50°N. Ten passes over India from this set were selected and the core field was removed using the values given for core contribution on Investigator-B tapes. Next stage involved the correction for ring currents contribution. This was done by assuming that the external and its associated internal current contribution supplied on Investigator-B tapes describe the correction at the dip equator. To further remove the residual effects of external current systems a two-degree polynomial was removed from the data using a computer code BASFIT. The field left after these eliminations were treated to be of lithospheric origin.

The study for equatorial electrojet effect used the data from CHRONFIN tapes. The subroutine FDG sent by

NASA was used to subtract the main field contribution. The ring current contributions were removed by assuming that the values supplied on Investigator-B tapes describe the contribution at the dip equator. Morning and evening passes crossing each other in the neighbourhood of geomagnetic equator were then subjected to height correction (as they are separated sometimes by about 250 kms in height). This was done by assuming that

$$\left(\frac{\partial B_x}{\partial z}\right)_y = \left(\frac{\partial B_z}{\partial x}\right)_y$$

for the crustal anomaly field. In the above equation x, y & z are the north, east and vertical (downward) directions. The difference of the dawn-dusk field values after accounting for this correction were plotted as a function of latitude in the $\pm$ 8° range of the cross-over point.

III. Accomplishments

(1) A program called CONVERSION has been prepared, debugged and made operational to read and convert into DEC-10 compatible mode the data tapes received from NASA. This program is written in assembler language.

(2) The FDG program supplied by NASA to calculate the main field has been debugged and made operational on DEC-10 system. The program used has a provision to include the external component in the model field.

(3) A program called BASFIT has been developed to account for unaccounted part of the external field correction.

(4) A program called PLOT has been developed to plot the residual fields pass by pass.

(5) The program UPCON supplied by NASA is being debugged.

IV. Significant Results

(1) A separate data tape (readable on DEC-10 system) has been prepared from Investigator-B tapes. This tape contains data over the block 60°E to 110°E and 10°S to 50°N. The data are selected for those periods when $Kp \leq 10$.

(2) Anomalies in all A,X,Y & Z measurements were plotted after correcting for core and external current contributions. Data for 10 passes were investigated. In general the anomalies in individual components (x,y,z) are much more than in the total field (A). This difference is more pronounced over the Himalayas.

(3) Equatorial electrojet effect is distinctly seen in both X and Y components of the field (Z component data has not been analysed so far). Results show that ionospheric contribution is of the order of 10-15 nT in X and 5-6 nT in Y in the immediate neighbourhood of the equatorial electrojet for regions near Indian sub-continent.

V. Publications : Nil

VI. Problems : Nothing significant

VII. Data Quality and Delivery :

The quality of data collected during MAGSAT mission is fabulous and delivery through World Data Centre-A has been regular.

VIII. Recommendations: Nothing for the present

IX. Conclusions : The recent visit of Dr R A Langel and Mr G W Ousley to India and their discussions with Indian Investigators have been extremely useful. Clarifications given by them to many of our queries will greatly expedite the investigations at this Institute.