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1. Introduction

Title of investigation: Spherical harmonic representation of the main geomagnetic field for world charting and investigations of some fundamental problems of physics and geophysics

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2. Techniques

Data used: Magsat Investigator B test tapes
- Magsat Investigator B data tapes
- Tapes of selected data on 15 magnetically quiet days
- Spherical harmonic models of the geomagnetic field produced from Magsat data by GSFC

Programs used:
- GSFC program for analysing selected quiet day data
  - Analysis program producing spherical harmonic models of the geomagnetic field and including, besides the usual internal poloidal field, external and toroidal fields
  - Various test programs produced by IGS and Liverpool groups

3. Accomplishments

Investigator B test tapes were read successfully. A start had been made on a preliminary survey of the first batch of Investigator B data tapes when it was discovered (and later verified by NASA) that these were not error-free. It was decided to postpone further work on these tapes until corrected versions were received. These finally arrived at the end of the reporting period.

The selected quiet-day data are of particular interest to the Liverpool group. They have experienced some difficulties with the GSFC analysis program, particularly concerning the altitude correction. Tests of Maxwell's equations against other proposed modified equations have begun and initial results look promising.

The 1980 World Chart spherical model has been compared with the MGST (3/80) and MGST(6/80) models. Agreement in declination is satisfactory (to within ±0.5°) between latitudes of 50°N and 50°S, the region where Magsat vector data were used in the MGST models.
4. **Significant results**

The investigation is at too earlier a stage for there to be any really significant results to be announced. The agreement of the 1980 World Chart model with the Magsat data (as represented by the MGST(3/80) and (6/80) models) is reassuring, however.

5. **Publications**


6. **Problems**

Delays in delivery of Investigator B data tapes and errors in the first batch of tapes have caused hold-ups in the investigation.

7. **Data quality and delivery.**

See remarks in Section 6.
Geomagnetic field modelling using satellite data

from David R. Barralough

Accurate descriptions of the Earth's magnetic field are useful for navigational purposes and for fo2nding data for many scientific studies. Such descriptions usually take the form of mathematical models, most often in terms of an expansion in spherical harmonics, and magnetic charts can readily be produced from the models.

A major difficulty in producing geomagnetic field models has always been the acquisition of an up-to-date and well-distributed set of accurate observations. As a satellite in a polar orbit can survey the entire globe in a matter of days, it was an obvious step to use such a satellite to measure the geomagnetic field.

The most recent satellite survey of the geomagnetic field was performed by the NASA/US Geological Survey satellite MagSat between November 1979 and June 1980. MagSat differed from previous geomagnetic surveys in that it was able to measure not only the strength of the field but also its direction.

Since the geomagnetic field is derivable from a scalar potential which satisfies Laplace's equation, it was possible to use the earlier satellite observations of F to refine existing models of the field. Although such models fitted the input F data very well (with a r.m.s. residual of importance because of the particular con- 