FIRST QUARTERLY REPORT

FOR

GEOMAGNETIC FIELD MODELING
BY OPTIMAL RECURSIVE FILTERING

Contract NAS 5-26250

For the period

July 11, 1980 - September 30, 1980

Submitted to

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
GODDARD SPACE FLIGHT CENTER
Greenbelt, Maryland 20771

by

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Progress Report: C152

A) Problems

   None

B) Accomplishments

   1) Data Set Selection for Mini-Batches

      Data sets were examined for applicability to deriving models for the intervals 1950-1955, 1956-1960, 1961-1965, 1966-1970, and 1971-1976. The period 1950-1955 is especially difficult to model due to a lack of complementary data to the world-wide set of observatories. The Cain 12/66 data set was first examined as a candidate for the 1950-1955 period. While there are in excess of 8000 measurements in the interval (including observatory data), the origin of the data is masked in the data format so that the observatories cannot be separated to solve for station anomaly biases. A new data set was then fabricated for the interval 1950-1976 by processing the NOAA main field data tape (which includes survey, marine, aeromagnetic and marine data dating from 1900) and selecting non-observatory and non-satellite data from 1950-1976. The separate observatory data set for 167 selected world-wide stations designed for the GSFC models for the interval 1960-1976 was then extended back in time to 1950 where data was available and combined with the above set. A third data set consisting of the POGO 2/72 and filtered marine and repeat station data base designed for the GSFC models will complete the data set for the mini-batches.

   2) Software Modification

      The FIT program, which is a least squares estimation package designed to produce magnetic field models form a variety of data types, will be used to produce the mini-batch models. The system required two modifications for processing the new data set described in 1) above:

a) The system accommodated data in the NOAA format in a single input subroutine which could not simultaneously process the non-observatory data from the NOAA tape and process the observatory data in the NOAA format and solve for station anomaly biases. A new input subroutine, SNOATA, was designed and implemented to separately accommodate the non-observatory data and provide the needed program flexibility.

b) The FIT software solves for the observatory anomaly biases using an elimination/back substitution method which provides estimates of the biases, but no statistics. Code was designed and implemented to provide, on option, the sigmas and the correlation matrices for the recovered anomaly biases.

3) Model Analysis for "Mini-Batch" Recovery

Using the data sets described in 1) and the program modifications described in 2), some initial analysis has been performed on mini-batch field model recovery---particularly for the first interval 1950-1955. While the new data set provides on the order of 14000 measurements for this period, only approximately 300 are observatory measurements. Moreover, the majority of the 14000 observations are of the non-linear angular types D and I. Studies are being performed to examine the convergence of the solutions and the maximum expansion order the data will support in the constant and secular terms.

C) Significant Results
None

D) Publications
None

E) Recommendations
None

F) Funds Expended

Total Project	31.1
Prior Expenditure	0.0
Expenditure this Period	1.3
Total Expenditure to Date	1.3
Amount Remaining	29.8
Amount Next Period (est.)	10.0

G) Data Utility

Not applicable.