Quarterly
E82-10339
CR-168958

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To: Goddard Space Flight Center
Greenbelt, MD 20771
ATTN: a) Technical Officer, Code 902
b) Contracting Officer, Code 269
c) Publication Branch, Code 253.1
d) Patent Counsel, Code 204

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Subject: Quarterly Progress Report - January, February and March, 1982

Date: March 31, 1982

Progress has continued on all phases of the research program during the period January, February and March, 1982. Documentation is proceeding on the programs NVERTSM, SMFLD, NVERTG and GFLD which were forwarded to NASA-GSFC on magnetic tape during the previous quarter. Processing the Investigator B data-tapes has also been initiated using in part the IBM facilities of Purdue's Laboratory for Applications of Remote Sensing (LARS). Current data holdings for this research program include:

1) Investigator B data-tapes for the period 2 November 79 through 19 May 1980,

2) MAGSAT 2°-averaged scalar anomaly values for the world between latitudes 50°S and 50°N,

3) NASA's current 1°-averaged surface free-air gravity values for the world courtesy of Richard Rapp of OSU, and

4) project MAGNET aeromagnetic anomaly data for South America.

Efforts also have been initiated to process the 2°-averaged MAGSAT data for a radially polarized map of Africa and western Europe. This is for a paper being prepared in collaboration with Dr. Raymond Olivier (Prof. of Geophysics at the Swiss University of Lausanne) for presentation at the MAGSAT session of the Society of Exploration Geophysicists (SEG) annual meeting that will be held in Dallas during the week of October 17-21, 1982. A second paper on regional potential field modeling of the Mississippi Embayment also is being prepared for presentation at the SEG's session on the "Utility of Regional Gravity and Magnetic Anomaly Maps".

A number of papers related to the MAGSAT program have recently been accepted for journal publication. These include the paper entitled LONG WAVELENGTH AEROMAGNETIC ANOMALY MAP OF THE CONTERMINOUS U.S.A., by J.L. Sexton, W.J. Hinze, R.R.B. von Frese and L.W. Braile which will appear in Geology. Further papers entitled REGIONAL MAGNETIC AND GRAVITY ANOMALIES OF SOUTH AMERICA by W.J. Hinze, R.R.B. von Frese, M.B. Longacre, L.W. Braile, E.G. Lidiak and G.R. Keller; A SATELLITE MAGNETIC MODEL OF NORTHEASTERN SOUTH AMERICAN AULACOGENS by M.B. Longacre, W.J. Hinze and R.R.B. von Frese; and VERIFICATION OF THE CRUSTAL COMPONENT IN SATELLITE MAGNETIC DATA by

(E82-10339) [AEROMAGNETIC AND SATELLITE MAGNETIC ANOMALY MAPPING] Quarterly Progress Report, Jan. - Mar. 1982 (Purdue Univ.) 8 p HC A02/MF A01 CSCL 05B N82-25801
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R.R.B. von Frese, W.J. Hinze, J.L. Sexton and L.W. Braile, will shortly appear in the special MAGSAT issue of Geophysical Research Letters. Another paper entitled DO SATELLITE MAGNETIC ANOMALY DATA ACCURATELY PORTRAY THE CRUSTAL COMPONENT? by R.R.B. von Frese and W.J. Hinze, which focuses on possible sources for the long-wavelength discrepancies between aeromagnetic and satellite magnetic anomalies, is being prepared for presentation at the U.S. Geological Survey's Geomagnetic Workshop that will be held in Denver during April 13-15, 1982. The abstracts for these papers are enclosed.

LONG-WAVELENGTH AEROMAGNETIC ANOMALY MAP OF THE CONTERMINOUS U.S.A.

by

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Abstract

Total intensity magnetic anomaly unfiltered and low-pass filtered profile and contour maps of the conterminous U.S.A. have been prepared from data provided by the U.S. Naval Oceanographic Office's Project MAGNET Survey. The maps are useful for regional geological investigations because the anomalies, particularly on the filtered maps which emphasize long-wavelength anomalies, can be correlated with known major geological features. The most intense positive, long-wavelength anomaly occurs over Precambrian mafic basement rocks in eastern Tennessee and Kentucky. Other examples of prominent positive anomalies occur over the Great Valley of California and the Colorado Plateau and along the Appalachian Fold belt. In contrast, prominent negative long-wavelength magnetic anomalies occur over the Cascade Mountains, Mississippi Embayment, Southern Rocky Mountains and marginally to the positive anomaly related to the Midcontinent Rift.

REGIONAL MAGNETIC AND GRAVITY ANOMALIES OF SOUTH AMERICA

by

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Abstract

Preliminary satellite scalar magnetic anomaly data (MAGSAT) reduced to vertical polarization and long-wavelength-pass filtered free-air gravity anomaly data of South and Central America are compared to major tectonic features. A number of correlations are observed, but these must be generalized because of the preliminary nature of the geophysical data and the inherent petrophysical variations within tectonic features. Statistical analysis of the magnetic data reveals that South and Central America are more magnetic and magnetically more variable than adjacent marine areas. More obvious correlations exist between magnetic anomalies and tectonic elements of the continents than in the case of oceanic areas. No obvious correlations occur between the tectonic features of the Atlantic Ocean, including the Mid-Atlantic Ridge, and magnetic anomalies. The continental shields generally are more magnetic than adjacent basins, oceans and orogenic belts. In contrast, the major aulacogens are characterized by negative magnetic anomalies. Positive free-air gravity anomalies are related to the Andean Foldbelt, but the relationship of this feature to magnetic anomalies is much less obvious. However, along the west coast of South America, the magnetic anomalies of the Pacific Ocean are separated from those of the eastern

platforms by north to northwest trending anomalies. South of the equator along the Foldbelt, gravity maxima are related to magnetic minima, a relationship analogous to the situation observed in the Rocky Mountain Cordillera. North of the equator in Columbia, gravity and magnetic maxima roughly correlate along the Foldbelt.

A SATELLITE MAGNETIC MODEL OF NORTHEASTERN SOUTH AMERICAN AULACOGENS

by

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Abstract

Magnetic modeling of the Amazon River and Takatu Aulacogens in northeastern South America illustrate the utility of satellite magnetic data in characterizing the properties and structure of the lithosphere. Specifically, reduction of preliminary MAGSAT scalar magnetic anomaly data to an equivalent condition of vertical polarization shows a general correlation between magnetic anomaly minima and the Amazon River and Takatu Aulacogens. Surface gravity data demonstrate a correlative positive anomaly. Spherical earth modeling of the magnetic data indicates a less magnetic crust associated with the aulacogens which is compatible with previous studies over the Mississippi River Aulacogen and Rio Grande Rift in North America.

VERIFICATION OF THE CRUSTAL COMPONENT IN SATELLITE MAGNETIC DATA

by

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Abstract

To investigate the utility of satellites for mapping crustal magnetic anomalies, POGO (Polar Orbiting Geophysical Observatory) and preliminary MAGSAT magnetometer data are compared with scalar aeromagnetic data obtained by the U.S. Naval Oceanographic Office (NOO)-Vector Magnetic Survey of the conterminous U.S.A. POGO and available MAGSAT data demonstrate remarkable consistency over the study region. The NOO aeromagnetic data are low-pass filtered for wavelengths larger than about 4° and spherically upward continued to 450 km elevation by equivalent point source inversion for direct comparison with POGO satellite magnetometer observations. The upward continued NOO data show that most of the energy is in the long wavelength (≅ 1000-3000 km) anomalies. Removal of these wavelengths by suitable filtering reveals a residual anomaly field that corresponds well with the satellite anomalies, thus demonstrating that the satellite data are useful for mapping crustal magnetic anomalies. A number of correlations between the NOO, POGO and preliminary MAGSAT data are evident at satellite elevations, including a prominent transcontinental magnetic high which extends from the Anadarko Basin of the eastern Texas panhandle to the Cincinnati Arch. The transcontinental magnetic high is breached by negative anomalies located over the Rio Grande Rift and Mississippi River Aulacogen.

DO SATELLITE MAGNETIC ANOMALY DATA ACCURATELY PORTRAY THE CRUSTAL COMPONENT?

by

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Abstract

Scalar aeromagnetic data obtained during the U.S. Naval Oceanographic Office (NOO)-Vector Magnetic Survey of the conterminous United States have been upward continued by equivalent point source inversion and compared with POGO satellite magnetic anomaly and preliminary scalar MAGSAT data. Initial comparisons indicate that the upward continued NOO data is dominated by long wavelength ($\geq$ 1000-3000 km) anomalies which are not present in the satellite anomaly data. Thus, the comparison of the data sets is poor. Several possible sources for these differences are present in the data analysis chain. However, upon removal of these long wavelengths from the upward continued NOO data, a close comparison observed between the anomalies verifies that satellite magnetic anomaly data do portray the crustal component within a range of wavelengths from roughly 1000 km down to the resolution limit of the observations.