DO MAGSAT ANOMALIES CONTAIN A RECORD OF PAST AND PRESENT-DAY MANTLE CONVECTION UNDER SOUTH AMERICA?

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Global anomaly maps from the National Aeronautics and Space Administration's Magnetic Field Satellite (MAGSAT) have been spatially filtered to reduce the prominence of long-wavelength east-west bands and to improve the discrimination of anomalies within structural provinces.

Previous research has suggested a correlation between total-field MAGSAT anomaly lows in equatorial regions with crustal bodies of relatively high average magnetic susceptibility (such as Archaean shields), and of anomaly highs with bodies of low susceptibility (such as deep parts of basins). These correlations reverse at higher latitudes.

The filtered data show a trend of magnetic lows between Buyana and southern Peru. This trend aligns with that of the contact between Africa and North America in a hypothetically reconstructed Pangea. Interpreted as being caused by a regionally higher susceptibility above the Curie point, the anomaly lows might be associated with crustal uplift, mafic intrusion, or higher metamorphic grade. The existence of Mesozoic grabens and other reported features characteristic of extension suggest that the interpreted higher susceptibility may be remnant of convectional upwelling that opened the Atlantic Ocean farther north along this trend, but which failed to form an ocean along this trend in South America.

The Middle America Trench is marked by high MAGSAT anomalies flanked to the east by MAGSAT lows. This anomaly trend continues across South America to the Santos Basin and the Rio Grande Rise (Atlantic Ocean), and fits the association of equatorial MAGSAT highs with trenches and basins, and of MAGSAT lows with uplifts. It suggests that convective downwelling may continue along this trend, causing crustal warping of the South American continental crust in addition to subducton, trenching, and mountain building along the Pacific margin of Central America.

Reference

Hastings, David A., 1984. Do MAGSAT anomalies contain a record of past and present-day mantle convection under South America? Geological Society of America Abstracts with Programs, v. 16, no. 6, September 1984 (in press).