

FURTHER MAPPING OF MERCURY'S CRUSTAL MAGNETIC FIELD USING MESSENGER MAGNETOMETER DATA. L. L. Hood¹, J. S. Oliveira^{2,3}, P. D. Spudis⁴, V. Galluzzi⁵, ¹Lunar & Planetary Lab, 1629 E. University Blvd., Univ. of Arizona, Tucson, AZ 85721, USA; lon@lpl.arizona.edu, ²ESA/ESTEC, SCI-S, Keplerlaan 1, 2200 AG Noordwijk, Netherlands; ³CITEUC, Geophysical & Astronomical Observatory, University of Coimbra, Coimbra, Portugal (joliveira@cosmos.esa.int); ⁴Lunar & Planetary Institute, USRA, Houston, TX; ⁵INAF, Istituto di Astrofisica e Planetologia Spaziali, Rome, Italy.

Introduction: A valuable data set for investigating crustal magnetism on Mercury was obtained by the NASA MESSENGER mission during the final year of its existence [1]. Altitude normalized maps of the crustal field covering part of one side of the planet (90°E to 270°E; 35°N to 75°N) have previously been constructed from low-altitude magnetometer data using an equivalent source dipole (ESD) technique [2,3]. Results showed that the strongest crustal field anomalies in this region are concentrated around and within the 1550 km diameter Caloris impact basin. A second smaller concentration was mapped over and around Sobkou Planitia, which contains an associated older 770-km diameter impact basin. In general, anomalies over high-reflectance volcanic plains were relatively weak while anomalies over low-reflectance material that has been reworked by impact processes were relatively strong.

In this work, results of mapping low-altitude MESSENGER data over part of the other side of the planet (270°E to 90°E; 35°N to 75°N) are reported. Initial objectives include: (a) investigating in more detail the occurrence of anomalies associated with impact basins/craters; and (b) identifying anomalies that are suitable for paleomagnetic pole estimation.

Results: Figure 1 plots the calculated crustal field magnitude at 40 km altitude estimated using the ESD technique. As seen in the figure, some anomalies ap-

pear to correlate with impact crater/basin locations. These include two relatively strong anomalies (numbered 1 and 2) over Rustaveli (200 km in diameter, centered at 83°E, 52°N) and Vyasa (300 km in diameter, centered at 275°E, 50°N). These anomalies have filtered amplitudes of about 6 nT at 40 km altitude. For comparison, the strongest anomalies at the same altitude near and within Caloris had filtered amplitudes of about 8 nT [3]. On the other hand, some other named craters (e.g., Abedin and Hokusai, 116 and 114 km in diameter, respectively) have no associated anomalies. Similarly, several larger impact basins appear to have associated magnetic anomalies while others do not. Relatively weak anomalies are present over the northern lowlands, most of which has been volcanically resurfaced. Anomalies are, however, present over the northern rise. This includes a relatively strong (> 6 nT) anomaly centered at about 28°E, 67°N.

Overall, the association of anomalies with some impact craters/basins but not others represents a new constraint on crustal magnetic source models. An important remaining issue is whether some anomalies may be dominantly induced rather than remanent.

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References: [1] Johnson C. et al. (2015) *Science*, 348, 892-895. [2] Hood L. (2015) *GRL*, 42, 10565-10572. [3] Hood L. (2016) *JGR Planets*, 121, 1016-1025.

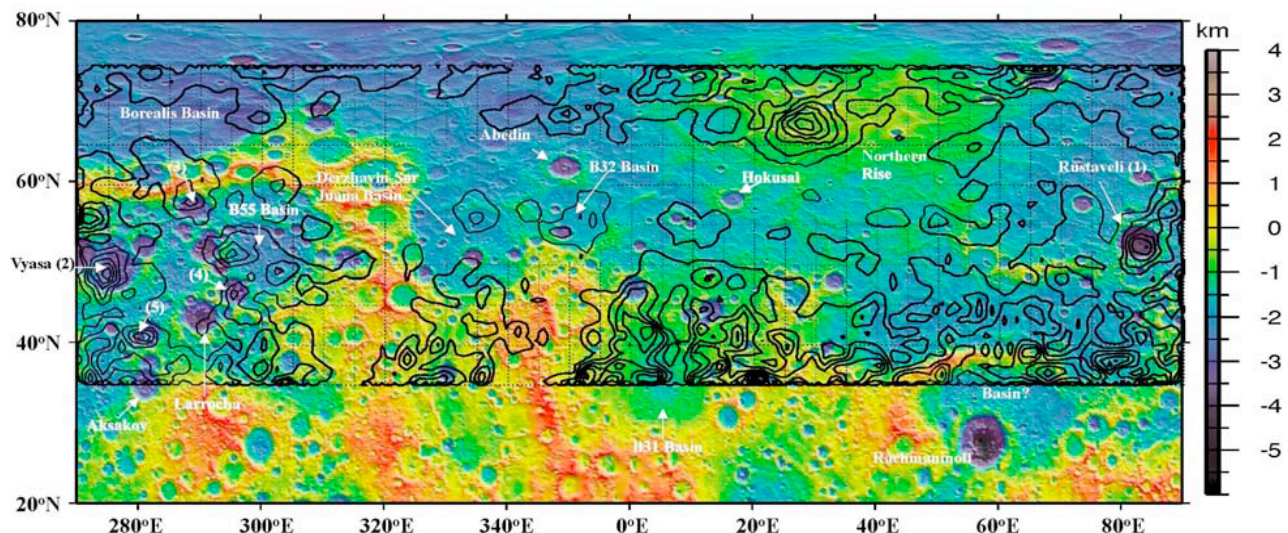


Figure 1: Calculated crustal field magnitude at 40 km altitude according to the ESD solution after two-dimensional filtering. The contour interval is 1 nT and the field map is superposed onto a MESSENGER Laser Altimeter elevation map (G. Neumann, priv. comm., 2016).