

Subsurface magnetization source of Reiner Gamma and Rima Sirsalis magnetic anomalies on the Moon

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Since the Apollo missions, observations by magnetometer and electron reflectometer disclose presence of magnetic anomalies on the Moon. However, the origin of the lunar magnetic anomaly is still controversial. To infer the origin, it is essentially important to have information on magnetization of magnetic anomaly source. In this study, we have modeled lunar magnetic anomalies in two regions to gain insights into their formation process. Here the Reiner Gamma and Rima Sirsalis anomalies are focused. We use Lunar Prospector magnetometer data obtained during the low-altitude observation period. As a first step, a simple dipole source is assumed for modeling. Then, based on the results from the dipole model, the magnetic anomaly is modeled by a uniformly magnetized vertical prism. As a result of forward modeling approach, five magnetic anomalies within the two regions are suitably modeled. As for the Reiner Gamma anomaly it is found that locations and shapes of the prisms correspond well with the surface feature such as high albedo swirl morphology. Such correspondence suggests association of a magnetic anomaly source with high albedo feature. For the Rima Sirsalis anomaly, two slender sources are located at the depth of 8 km, which extend along the Rima Sirsalis rille. According to the result, the magnetic anomaly source may be related with the rille below the surface. The present study demonstrates that adopting a finite-size magnetized body such as prism is more beneficial rather than a dipole to discuss correlation of magnetic anomaly with other structures at the surface and below.

Keywords: moon, magnetic anomaly, prism source, swirl, rille