Surface magnetic field mapping on high albedo marking areas of the moon

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The correlation between high albedo markings (HAM) on the surface of the moon and strong magnetic anomalies has been claimed since the early time of the lunar magnetic field study (Hood and Schubert, 1980). Hood et al. (1989) mapped the smoothed magnetic field over the Reiner Gamma region using Lunar Prospector magnetometer (LP-MAG) data, and showed that the position of them matches well.

We have developed a method to recover the 3-d magnetic field from satellite field observations (EPR method which stands for Equivalent Pole Reduction; Toyoshima et al. 2008). Applying EPR to the several areas of strong magnetic anomalies, we calculated the magnetic anomaly maps of near surface regions, to see how the anomaly and the HAM correlate each other.

The data used is of the Lunar Prospector magnetometer (LP-MAG). They are selected from low altitude observations performed in 1998 to 1999.

The areas studied are Reiner Gamma, Airy, Descartes, Abel, and Crisium Antipode regions. The EPR determines a set of magnetic monopoles at the moon surface which produce the magnetic field of the observation. In each studied area, we put poles in 0.1^o intervals of both latitude and longitude, then the magnetic field at 5km in altitude is calculated. The field distribution is superimposed with the albedo map made from Clementine data.

The total force (Bf) maps indicate that the HMA occurs at the strong anomaly regions, but their shape does not quite overlie. However, taking horizontal component (Bh), not only position but the shape and size of the anomalies coincide with HMA regions. It is particularly true for the Reiner Gamma, and Descartes regions. The shape of HMA fits in a Bh contour.

The HMA is argued to be formed by the reduction of solar wind particles which are shielded by the magnetic field. Since the deflection of the charged particle becomes large at large horizontal component, the Bh distribution showed here support the argument.