Simulation of the electron reflection method in SELENE project

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The lunar magnetic anomalies will be explored by SELENE in 2004-2005. We will try to develop a new mapping technique with a high spatial resolution. SELENE will go around the moon at 100km altitude and observe various phenomena. As one of the SELENE scientific objectives, the magnetic anomalies on the lunar surface will be observed from the magnetic field and plasma electron measurements, that is called electron reflection (ER) method. However its detailed technique has not been established yet. For example, the calculated field intensity is averaging out a certain area of the surface, namely convolution of a part of magnetic anomaly, but we do not know its exact place. In this study the electron reflection at the surface is simulated to improve the previous conventional method.

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1. The moon is situated in an ambient field that is always constant. A certain magnetic anomaly arising from a single dipole source exists on the moon.
2. Electrons are incident from 100km altitude. They move along the field lines associated with helical trajectories and reach the moon's surface.
3. Electrons are reflected by the mirror effect and return to 100km altitude.

As a result, electrons are reflected nearly in the circle of 2RL radius on the surface, where RL is the electron lamour radius corresponding to the surface intensity and the incident electron energy. The mean surface intensity of the reflection area is almost equal to the value calculated from an electron flux with specific pitch angle intervals (reflection coefficient <1). From the simulation, the convolution function can be approximated to have unity weight over the 2RL circle. Therefore some deconvolution is applicable to obtain a high resolution map of magnetic anomalies.