On magnetic field modulation associated with interaction between the solar wind and lunar magnetic anomalies

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Magnetic field environment around the Moon varies depending strongly on solar wind conditions, and where the Moon is in the orbit around the Earth. It is well known that exterior to the terrestrial magnetosphere, the interaction between solar wind and crustal magnetic fields (i.e. magnetic anomaly) on the Moon yields anomalously large modulation in the magnetic field. Such a disturbance related to lunar magnetic anomaly is interpreted as a compressional wave or a shock. Here, we analyze the magnetic field modulation detected at 100 km altitude above lunar magnetic anomalies by exploiting magnetic field data by KAGUYA (SELENE). First, we search for the magnetic field modulation by comparing time series of KAGUYA/LMAG with magnetic field data of ACE. Apparent modulation is found above and downstream of some specific magnetic anomalies such as South Pole-Aitken basin (SPA), Crisium Anitipode Anomaly (CAA) at (¥sim 20^{o}S, ¥sim 125^{o}W), Reiner Gamma Anomaly (RGA) at (¥sim 10^{o}N, ¥sim 58^{o}W), Descarte Anomaly (DEA) at (¥sim 10^{o}S, ¥sim 15^{o}E), and Lomonosov-Fleming Anomaly (LFA) at (¥sim 20^{o}N, ¥sim 105^{o}E). Then, using high resolution dataset at 32 Hz sampling frequency, we construct Fourier-time (F-t) diagrams of the magnetic field covering from 1 mHz to 16 Hz frequency range in order to identify the frequency responsible for the modulation. In the F-t diagrams some peaks in the power spectral density (PSD) are found at around 10 mHz, which appears every two hours when KAGUYA is orbiting around the magnetic anomalies. In addition, we find sizable power at around 2 - 4 Hz, which also shows two-hour periodicity. Therefore, a key role of magnetic anomaly is strongly suggested for such peaks in PSDs. For the purpose of investigating excitation mechanisms of these waves, further analyses have been conducted. Based on these results, we will determine how the solar wind interacts with magnetic anomaly.