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# Electrical Conductivity of the Lunar Interior from Magnetic Transient-Response

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The electrical conductivity structure of the lunar interior provides us very important information for investigation of the lunar origin and evolution. We attempt to give a constraint on the lunar electrical conductivity from magnetic field measurements by the Lunar MAGnetometer (LMAG) onboard SELENE (KAGUYA). The primary science goal of LMAG was global mapping of lunar surface magnetic anomalies, and secondary purpose was to measure time-dependent magnetic responses containing information on the electrical conductivity of the lunar interior. We investigate whether the signals of lunar induced magnetic field are recorded as well as magnetic anomalies during the period from 21 December 2007 to 31 October 2008, when SELENE was in the orbit of 100-km altitude.

Magnetic fields are induced in the moon by changes in the interplanetary field (IMF). LMAG measures inducing and induced fields simultaneously. So, to confirm the inducing field generated by changes in the IMF, we also examine the magnetic data measured by magnetometers of ACE or WIND satellites, which are moving around the Lagrange point (L1) where the gravity of the sun balances with that of the earth. Twenty-two events showing damped response curves against the step-function transients in the IMF are selected. In the second step for quantitative analysis, we further selected three events among twenty-two events, which show relatively low noise and good geometry of satellites' positions when step-function transients are measured by ACE or WIND.

In the three events, the apparent differences in magnetic responses measured by LMAG are seen depending on the relative position between SELENE and the moon by reference to the direction of the magnetic transient field. However, a moon model of uniform conductivity explains well the apparent differences. The induced fields in the three events show the step amplitudes of 10 nT and the decay times of 500 s. Using the homogeneous moon model, having a uniform conductivity inner sphere with radius 1738 km (lunar radius) and non-conducting outer shell with thickness 100 km (SELENE altitude), we estimated the homogeneous conductivity to be 1.0 - 4.0∗10-4 S/m.

Keywords: Moon, KAGUYA, SELENE, LMAG, induction, conductivity