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SELENE-2/月電磁探査装置 (LEMS): インバージョンのテスト (2)
SELENE-2/Lunar ElectroMagnetic Sounder (LEMS): a test of inversion (2)

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The so-called giant impact hypothesis is likely to explain the origin of the Moon in view of physical and chemical evidence such as angular momentum, materials possibly through magma ocean processes, and compositional similarity of the Earth and the Moon. Numerical simulations of such a giant impact indicate that most of the Moon-forming material around the proto-Earth originates from the projectile. This means that such a standard giant impact is difficult to form the Moon whose isotopic composition is essentially identical to the Earth's as found from the lunar samples in the Apollo mission. This would be a reason why new giant-impact models are devised. It should be noted that the lunar samples were obtained only from the lunar surface, and that information on bulk composition and interior structure of the Moon is still insufficient. Therefore it is of significance to obtain information regarding the whole lunar composition and interior structure, which can advance our understanding of lunar origin and evolution.

In the SELENE-2 mission, we propose a lunar electromagnetic sounder (LEMS) to estimate the electrical conductivity structure of the Moon. The electrical conductivity varies with temperature even for the same composition, and therefore it can be used to deduce the present thermal structure of the Moon.

Temporal variations in the magnetic field of lunar external origin, which can be observed by magnetometers onboard a lunar orbiter and a lunar lander, induce eddy currents in the lunar interior depending on the electrical conductivity distribution and frequencies of the temporal variations. The eddy currents, in turn, generate temporal variations in the magnetic field of lunar internal origin, which can be observed by a magnetometer onboard a lunar lander. Thus electromagnetic response of the Moon is obtained by magnetic field measurements. Then the electromagnetic response function is used to estimate the electrical conductivity structure by solving an inverse problem. We show results for some tests of inversion, assuming a one-dimensional interior structure for electrical conductivity distribution.

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