On magnetic field observation in and near a lunar pit for understanding magnetic history of the Moon

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History of the Moon and lunar dynamo can be discussed using quantities related with magnetization near the lunar surface. For example, paleointensity studies of lunar rock samples showed that the Moon likely possessed strong intrinsic magnetic field until 3.56 Ga, and probably had weaker magnetic field up to around 1 Ga. Also, directions of isolated magnetizations estimated from magnetic field observations by Lunar Prospector and SELENE-Kaguya show possibility of reorientation of lunar pole in the past. However, it is not well understood what was the energy source to drive the lunar dynamo during the period, and also when the dynamo stopped generating the magnetic field.

Magnetic field observation at the lunar surface by Apollo project revealed existence of local-scale magnetic anomalies which cannot be detected by satellite magnetic field observations. The local-scale magnetic anomalies are likely due to the magnetization close to the surface of the Moon. Since this magnetization also contain information of the magnetic field at the time when the part of the crust was magnetized, it is worth pursuing further information of the magnetization by in-situ magnetic field observations.

A lunar pit can be a suitable place for magnetic field observation to estimate magnetization very close to the lunar surface. A reason is that a pit is a place where large magnetic field signal due to magnetization is expected, because it introduces inhomogeneity to the crustal magnetization. In addition, layered magnetization, which is caused by variation of lunar magnetic field, may be obtained by magnetic field observations along the pit wall.

A feasibility study on the use of magnetic field observation in and around a lunar pit to estimate local crustal magnetization was conducted. In this presentation, requirement to prove the magnetization and favorable configuration of observation are discussed by supposing location and size of the lunar pit.

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