SPACECRAFT MEASUREMENTS OF LUNAR CORE EFFECTS ON LOW-ALTITUDE MAGNETIC FIELD. P. J. Chi[1], [1]Department of Earth, Planetary, and Space Sciences, University of California Los Angeles (Box 951567, Los Angeles, California 90095-1567, pchi@igpp.ucla.edu).

Magnetic sounding of the lunar interior can be performed in at least two different ways. A popular approach is to measure the transfer function, which compares surface magnetic field fluctuations with the external magnetic field fluctuations [1]. An alternative approach is to use low-altitude magnetic field measurements to detect the induced magnetic moment due to the conducting core. This approach requires only spacecraft measurements and has successfully been applied to the data from Apollo subsatellites [2], Lunar Prospector [3], and Kaguya [4] for estimating the size of the lunar core.

This paper considers both theoretical and measurement aspects of the second approach of magnetic sounding. We perform 3-D finite-element calculations of the magnetic field, including the crustal magnetic fields and the core effects, to examine expected magnetic field at low altitudes. We also examine the magnetic field measurements collected by the two ARTEMIS probes when the spacecraft were in the Earth's magnetotail. Since the start of its lunar orbit in 2011, ARTEMIS has been making many low-altitude passes to tens of km from the lunar surface, where the induced magnetic moment is observable. We find that simultaneous magnetic observations at two different locations in the lunar orbit are useful in understanding the fluctuations in the external magnetic field, reducing the measurement uncertainty and the estimate of the core size. We will demonstrate examples of ARTEMIS low-altitude magnetic field measurements and the comparison with modeled calculations.

References:

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