Just how strong should lunar induced fields be?

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Electromagnetic (EM) sounding is a powerful method for constraining the internal conductivity structure of planetary bodies. At the Moon, time-domain EM sounding is often considered for observations on the lunar nightside while the Moon is immersed in the solar wind. Changes in the upstream interplanetary magnetic field (IMF) induce currents and associated fields within the conductive layers of the lunar interior and the sum of these signals (inducing + induced) can then be observed at the lunar surface or in orbit. If the inducing and induced fields can be properly separated, the magnitude and decay period of the induced fields can then yield constraints on lunar interior conductivity. Here, we take a two-pronged approach to studying induced fields at the Moon. First, we aggregate upstream ARTEMIS observations over its ~8 year duration at the Moon and use a simplified analytic model of lunar interior conductivity to predict the theoretical range of magnitudes within which induced fields should fall. Second, we aggregate all ARTEMIS measurements near the Moon and separate between quiet and active upstream IMF conditions in order to search for and possibly constrain the presence and strength of induced magnetic fields. If successfully isolate, observations of induced field strengths can be inverted to place constraints on interior conductivity. Applications of this method for EM sounding at other airless bodies will also be briefly discussed.