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Demagnetization patterns seen in global magnetic models of Earth, Mars and Moon

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Measurements of the Martian magnetic field revealed significantly lower magnetic field intensities over the gigantic impact craters. This is commonly attributed to demagnetization processes related to meteorite impacts in the absence of a global magnetic field. As for Martian craters, some of the largest lunar craters exert magnetic fields which appear lower than that of neighboring terrains. Lower than average magnetic field intensities are also observed from the satellite observations above some large impact craters on the Earth. Here, we are interested by the largest multi-ring impact craters from Earth, Mars and Moon, identified from SRTM, MOLA and LOLA high precision topographic gridded data sets. The forward modeling approach describes the pre-impact magnetized lithosphere by Equivalent Source Dipoles and impacts are modeled as isolated holes of demagnetized area simulated by a paraboloid of revolution. In this way, only the signature of the impact demagnetization effect is computed, and the predicted intensity field of selected craters for Earth, Mars and Moon is compared with the measured or modeled field at the same altitude for each planetary body. The „deficit" of the magnetic field signature above a crater is assumed to be influenced by the transient diameter of the crater, the pre-impact magnetization magnitude, and the thickness of the magnetized layer. Remagnetization processes are omitted. These simple assumptions help in assessing what is the minimum size of a crater able to produce measurable and comparable magnetic field anomalies at various altitudes for the three bodies.