SOLAR WIND INTERACTION WITH LUNAR MAGNETIC ANOMALIES: VERTICAL VS. HORIZONTAL DIPOLE. J. Deca[1,2], A. Divin[3,4], X. Wang[1,2], B. Lembège[5], S. Markidis[6], G. Lapenta[7] and M. Horányi[1,2] [1]Laboratory for Atmospheric and Space Physics (LASP), University of Colorado, 1234 Innovation Drive, Boulder, CO 80303-7814, USA (jan.deca@gmail.com)., [2]Institute for Modeling Plasma, Atmospheres and Cosmic Dust, NASA/SSERVI, Boulder, Colorado, USA., [3]St. Petersburg State University, St. Petersburg, Russia., [4]Swedish Institute of Space Physics (IRF), SE-751 21 Uppsala, Sweden., [5]Laboratoire Atmosphères, Milieux, Observations Spatiales (LATMOS), Université de Versailles à Saint Quentin, 11 Boulevard D'Alembert, 78280 Guyancourt, France., [6]High Performance Computing and Visualization (HPCViz), KTH Royal Institute of Technology, SE-100 44, Stockholm, Sweden., [7]Centre for mathematical Plasma Astrophysics (CmPA), Department of Mathematics, KU Leuven, Celestijnenlaan 200B, bus 2400 B-3001 Leuven, Belgium.

A detailed understanding of the solar wind interaction with lunar magnetic anomalies (LMAs) is essential to identify its implications for both robotic and human exploration and to enhance our physical understanding of the particle dynamics in partially and/or fully magnetized plasmas. We present three-dimensional full-kinetic and electromagnetic simulations of the solar wind interaction with both a vertical and a horizontal dipole model, resembling a medium-size LMA. We find that, in contrast to a horizontal dipole, a vertical dipole twists its field lines and cannot form a mini-magnetosphere. Instead, it creates a ring-shaped weathering pattern and reflects up to 21% of the incoming solar wind ions, that is ~4 times more than the horizontal case. We deliver hereby a vital piece to fully comprehend and interpret lunar observations as we find the amount of reflected ions to be a tracer for the underlying field structure. Observing more reflected ions, however, does not necessarily point to the existence of a (larger) density cavity.

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