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1P45 - Laboratory Simulations of Solar Wind Interactions with Airless Bodies: Magnetic Anomalies and Wakes

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The Colorado Solar Wind Experiment (CSWE) simulates solar wind plasma with ion energy up to 1 keV. We present two sets of experimental results related to the interaction of the solar wind with airless bodies: 1) solar wind interactions with lunar magnetic anomalies (LMAs); and 2) wake formation with various Debye lengths relative to the object size. In the first experiment, a permanent magnet was used to create a vertical dipole field behind an insulating surface that faces a plasma flow. Potential profiles on the upstream side were measured using an emissive probe. It was found that surfaces in the dipole lobes are charged to a large positive potential by unmagnetized beam ions and the surface in the cusp is charged negatively by magnetically focused electrons. At lower ion beam energies (< 200 eV), the surface potential in the dipole lobes follows the ion beam energy. However, at higher ion beam energies (200-800 eV), the surface potential becomes significantly lower than the ion beam energy. The exact mechanism is not well understood though various tests have been performed. In the second experiment, an obstacle was inserted in the plasma flow and the wake formed behind it was characterized, including both potential and electron density profiles. The wake is filled by electrons because supersonic beam ions stream by. The ratio of the Debye length to the size of the obstacle was varied from larger than to smaller than 1 to simulate wakes behind bodies with various sizes in space, from small asteroids/rocks to the Moon. Potential and electron density features are shown in preliminary results.

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