Modeling the Lunar Wake Response to a CME Using a Hybrid-PIC Model. A. P. Rasca\textsuperscript{1,2}, S. Fatemi\textsuperscript{3}, and W. M. Farrell\textsuperscript{2}, \textsuperscript{1}NASA Postdoctoral Program, \textsuperscript{2}NASA/Goddard Space Flight Center, \textsuperscript{3}Swedish Institute of Space Physics.

In the solar wind, low density wake regions form downstream of the nightside lunar surface and in shadowed craters at the poles and terminators. With a new planned human presence on the Moon, it is important to use space weather models to understand how the lunar wake environment responds to extreme solar conditions. In this study, we use a series of 3-D hybrid-PIC simulations to model the response of the lunar wake to a passing coronal mass ejection (CME). Average plasma parameters are extracted from the Wind spacecraft located at 1 AU during three distinct phases of a passing halo (Earth-directed) CME on 22 June 2015. Each set of plasma parameters, representing the shock/plasma sheath, a magnetic cloud, and ICME, are used as the time-static upstream boundary conditions for three separate simulations and are compared with results that use nominal solar wind conditions. Results show a shortened plasma void and distinctive rarefaction cone originating from the terminators during the plasma sheath phase, while a highly elongated plasma void reforms during the magnetic cloud and ICME phases. Intense electric and magnetic field development are also observed during the plasma sheath phase along the central wake.