Solar wind scattering from the lunar surface: ARTEMIS and Chandrayaan-1 comparison

C. Lue, J.S. Halekas, A.R. Poppe, J.P. McFadden, Y. Futaana, M. Wieser, S. Barabash.

A fraction of the solar wind protons that impact the lunar surface are scattered away from the surface. 10%-20% of the incident solar wind flux is scattered as energetic neutral atoms (ENAs) of hydrogen [McComas et al., 2009; Wieser et al., 2009], and 0.1%-1% is scattered as protons [Saito et al., 2008]. The scattering of hydrogen ENAs is important for the lunar hydrogen budget [Hodges et al., 2011] and for remote-sensing of plasma precipitation [Wieser et al., 2010; Vorburger et al., 2012; Futaana et al., 2013], while the scattering of protons is important for the lunar plasma environment [Nishino et al., 2009; Holmström et al., 2010]. Both phenomena are important for the study of particle-surface interaction physics between ~keV ions and rough, porous, insulating surfaces - a very common interaction in the Solar System. In the present study, we investigate scattering characteristics of protons off the lunar regolith using ARTEMIS and Chandrayaan-1 data, and compare our findings to previous studies [Schaufelberger et al., 2011; Futaana et al., 2012; Lue et al., 2014]. We present the proton directional scattering function, and updated views of the energy spectrum, and scattering rate. We find that the proton scattering is similar to ENA scattering, albeit at a lower rate. We also discuss differences between these results and the results by Lue et al. [2014].