



Solar Wind Backscattering from the Moon in the Terrestrial Magnetosheath - Joint Observations by Chandrayaan-1 and Kaguya

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When solar wind protons impact the lunar surface, a large fraction is backscattered as energetic neutral atoms (ENAs) of hydrogen [1, 2]. When the Moon is located in the terrestrial magnetosheath, the properties (e.g. fraction, energy spectrum, and angular spread) of the backscattered ENAs may differ [3] from those observed in the undisturbed solar wind, e.g., due to the wider energy- and angular spread of the incoming protons or due to differences in the exposed lunar surface (in the magnetosheath, the exposed surface contains more Mare regions).

In this presentation, we discuss these possible effects in detail, using simultaneous observations by two lunar orbiters: Chandrayaan-1, measuring the backscattered ENAs, and Kaguya, monitoring the incident magnetosheath proton characteristics. We find that the properties of the backscattering in the magnetosheath are similar to those in the undisturbed solar wind. The backscattering fraction does not change. The energy- and angular distributions of the backscattered ENAs are consistent with empirical models of the energy distribution [4] and angular distribution [5] measured in the undisturbed solar wind, when convoluted over a range of incident plasma speeds and directions to account for the spread of the magnetosheath protons. Like previous studies [3, 6], we could not identify an effect of the surface type on the backscattering properties.

- [1] McComas et al., 2009, doi: 10.1029/2009GL038794
- [2] Wieser et al., 2009, doi: 10.1016/j.pss.2009.09.012
- [3] Allegrini et al., 2013, doi: 10.1016/j.pss.2013.06.014
- [4] Futaana et al., 2012, doi: 10.1029/2011JE004019
- [5] Schaufelberger et al., 2011, doi: 10.1029/2011GL049362
- [6] Vorburger et al., 2013, doi: 10.1002/jgra.50337