Geophysical Research Abstracts,
Vol. 11, EGU2009-11812, 2009
EGU General Assembly 2009

The lunar exosphere: expectations for LADEE measurements

M. Sarantos (1), R. M. Killen (2), M. Benna (3), R. Hartle (1), and A. S. Sharma (2)

(1) Heliophysics Science Division, NASA Goddard Space Flight Center, Greenbelt, MD, USA (menelaos.sarantos-1@nasa.gov), (2) Department of Astronomy, University of Maryland, College Park, MD, USA, (3) Solar System Exploration Division, NASA Goddard Space Flight Center, Greenbelt, MD, USA

The characterization of the rarified lunar atmosphere is a key science goal of the proposed Lunar Atmosphere and Dust Environment Explorer (LADEE) mission. We present an analytically tractable model of redistribution of neutrals supplied by the lunar regolith due to various source processes. The model is an extension of previously published models of a collisionless exosphere including non-Maxwellian distribution functions of released ejecta (e.g., that of sputtering). In the case of sodium the data from Lunar Prospector and Kitt Peak telescope, and simulations from this new model were used to compare the relative roles of the source processes such as sputtering, photon stimulated desorption (PSD), and impact vaporization. It is found that while the total rate of sodium emission during full and quarter Moon phases could be explained by a dominant PSD source, relatively higher contributions by the constant impact vaporization source are required to match the altitude profiles observed at full Moon. This result implies a variable efficiency of the PSD yield as a function of ion influx to the lunar surface. Among the new contributions of this model is the investigation of whether either the surface temperature-dependent PSD distribution or a Maxwellian PSD modified for radiation-enhanced diffusive effects may explain the morphology of the sodium exosphere, which is observed to decline with solar zenith angle(SZA) faster than cosine(SZA). The model is used to predict the density and flux of other volatile and refractory species expected to be present in the lunar exosphere.