

THE IMPORTANCE OF METEORITIC INFLUX ON NEUTRALS IN THE LUNAR EXOSPHERE. J. R. Szalay¹, M. Horányi², A. Colaprete³, and M. Sarantos⁴, ¹Southwest Research Institute (jszalay@swri.edu), ²University of Colorado Boulder, ³NASA Ames Research Center, ⁴NASA Goddard Space Flight Center

Introduction: The Lunar Atmosphere and Dust Environment Explorer [1] orbited the Moon for approximately 6 months. Onboard, it carried three instruments: the Lunar Dust Experiments (LDEX), Ultraviolet-Visible Spectrometer (UVS) and Neutral Mass Spectrometer (NMS). In this work, we compare measurements of the dust influx taken by LDEX to neutral exospheric column densities measured by UVS. The LADEE measurements are the first coincident measurements of meteoritic influx and subsequent generation of exospheric neutrals. We find the exospheric density of potassium in the lunar exosphere to follow meteoritic influx, while sodium does not appear to be governed as efficiently by meteoroid bombardment.

Instruments: LDEX is an impact ionization dust detector, which is capable of detecting individual dust particles with radii greater than $0.3 \mu\text{m}$ [2]. LDEX discovered a permanently present, asymmetric dust cloud engulfing the Moon, sustained by meteoroid bombardment from the known sporadic sources impacting the Earth-Moon system [3, 4].

UVS is a point spectrograph, designed to take spectra in the range of 230 to 810 nm. UVS measurements revealed the lunar exospheric abundances of sodium and potassium both have a synodic trend, however, each peaks at a different lunar phase [5].

Observations: Figure 1 shows the LDEX impact rate data along with UVS measured column densities for sodium and potassium. Both the LDEX dust measurements and UVS neutral measurements show a synodic trend in the data. Figure 2 shows the correlation coefficients between LDEX and the two neutral species (Na and K). In addition, the Geminids meteoroid shower (not shown) produced a significant response in the LDEX impact rates and UVS potassium measurements, while sodium was not as affected.

References: [1] R. C. Elphic, *et al.*, *Space Sci. Rev.*, 185, 93-113 (2014) [2] M. Horányi *et al.*, *Space Sci. Rev.*, 185 (2015), [3] M. Horányi *et al.*, *Nature*, 522(7556) (2015), [4] J. R. Szalay and M. Horányi, *Geophys. Res. Lett.*, doi:10.1002/2015GL066908 (2015) [5] A. Colaprete, *et al.*, *Science*, doi:10.1126/science.aad2380 (2015)

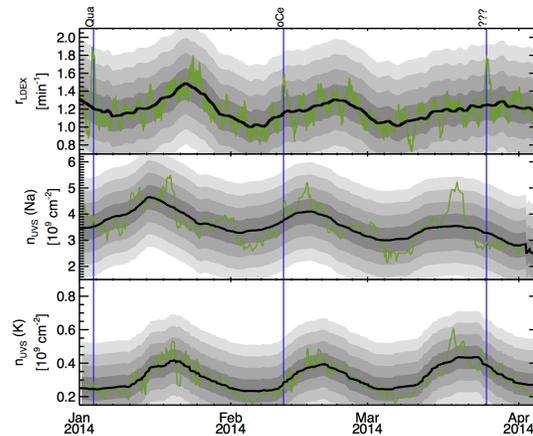


Figure 1. LDEX and UVS measurements for the period of January to April 2014, where meteoroid activity was relatively low compared to earlier in the LADEE mission. Gray bars indicate 1-4 sigma error bars.

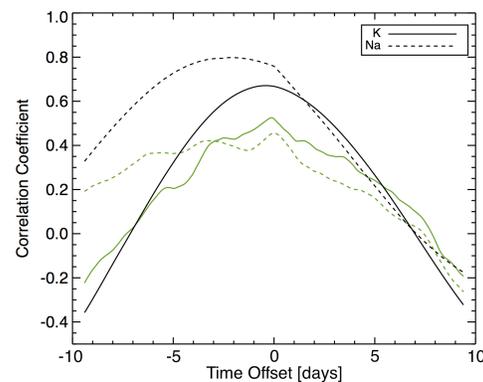


Figure 2. Correlation coefficient between LDEX and UVS measurements for the period of January to April 2014. Potassium column densities appear significantly more correlated compared to sodium.