ENHANCEMENTS IN THE LUNAR EXOSPHERE SEEN IN LACE DATA. R. M. Killen[1], D. Williams[1], J. Park[2], O. J. Tucker[1], and S. J. Kim[2]. [1]NASA/Goddard Space Flight Center, Solar System Exploration, Greenbelt, MD , [2] School of Space Research, Kyung Hee University, Republic of Korea (rosemary.killen@nasa.gov).

Introduction: Apollo 17 carried a miniature mass spectrometer, called the Lunar Atmospheric Composition Experiment (LACE), to the Moon as part of the Apollo Lunar Surface Experiments Package (ALSEP) to study the composition and variations in the lunar atmosphere [1]. The instrument, deployed in the Taurus-Littrow Valley, and was turned on December 27, 1971. Although our initial task was to archive the LACE data in the Planetary Data System (PDS), during this analysis we discovered a sudden increase in many, but not all, of the atomic species during the 5th lunation. We show that this sudden increase is temporally associated with an earlier increase in the solar wind flux at the Moon.

Neon data: A sudden increase of the mass 22 peak in the later part of 5th lunation suddenly appeared in the LACE data on May 7th, 1973, 00.38. It was seen that many, but not all, of the species up to mass 44 AMU also showed this sudden increase, but to different amounts. Densities were estimated from the calibration curve for a similar instrument onboard Pioneer Venus. The derived ^{20}Ne densities for lunations 2 - 5 averaged $2x10^3$ - $4x10^3$ atoms cm^{-3} and for the sudden increase in the 5th lunation it was $2.74x10^4$ atoms cm^{-3} at the surface. The solar wind plasma flux was elevated during the entire 10 hour period preceding the enhancements in exospheric density observed by LACE. The maximum in the solar wind plasma flux during this time period measured by the IMP6 spacecraft in Earth orbit at 20:00 hours on May 6 was $1.76x10^9$ protons cm^{-2} s^{-1}. The flux remained high throughout the period leading up to our observations on May 7, 1973, 00 hours, when the plasma flux was 7.58 $x10^8$ protons cm^{-2} s^{-1}. Data from OMNIWeb for IMF, proton density, solar wind velocity, and alpha/proton ratio for this time period are IMP6 data.

Conclusions: In order to test our assumption that the lifetime of ^{20}Ne is 4.5 days, and that an increase in the solar wind flux on the dayside would be reflected in an increase of ^{20}Ne exospheric abundance on the nightside 2.5 hours later we modeled the Ne exosphere using a Monte Carlo model (Tucker et al., 2015). The Monte Carlo simulation showed that the solar wind disturbance would result in a peak nighttime enhancement 2 - 3 days afterward. The photoionization lifetime of Ne is 3 months at this time in the solar cycle and we have not resolved the reason for the rapid loss or the apparent rapid response on the nightside. Further analysis is continuing.

References: [1] Hoffman, J. H., 1975. NAS 9-12074, 1975. [2] Tucker, O.J. et al., 2015. *Icarus 246, 291-297*.

Acknowledgements:
We acknowledge the use of the NASA OMNIWeb and Apollo 17 LACE data. RMK was supported by the DREAM2 team of SSERVI. DW was supported by the PDS. OJT is a NASA Post-doctoral fellow. JP and SJK acknowledge support from the Space Core Technology program funded by the Ministry of Education, Science and Technology, Korea.