THE LUNAR ATMOSPHERE AND DUST ENVIRONMENT EXPLORER (LADEE): INITIAL SCIENCE RESULTS. R. C. Elphic[1], B. Hine[1], G. T. Delory[2], J. S. Salute[3], S. Noble[3], A. Colaprete[1], M. Horanyi[5], P. Mahaffy[4], and the LADEE Science Team, [1]Planetary Systems Branch, NASA Ames Research Center, MS 245-3, Moffett Field, CA, 94035-1000, [2]Space Sciences Laboratory, University of California, Berkeley CA 94720, [3]Planetary Science Division, Science Mission Directorate, NASA, Washington, DC 20546, [4]NASA Goddard Space Flight Center, Greenbelt, MD, 20771, [5]Laboratory for Atmospheric and Space Physics, University of Colorado, Boulder, CO 80309.

On September 6, 2013, a near-perfect launch of the first Minotaur V rocket successfully carried NASA's Lunar Atmosphere and Dust Environment Explorer (LADEE) into a high-eccentricity geocentric orbit. LADEE arrived at the Moon on October 6, 2013, during the government shutdown. The spacecraft impacted the lunar surface on April 18, 2014, following a completely successful mission.

LADEE's science objectives were twofold: (1) Determine the composition and variability of the lunar atmosphere; (2) Characterize the lunar exospheric dust environment, and its variability. The LADEE science payload consisted of the Lunar Dust Experiment (LDEX), which sensed dust impacts *in situ*, for particles between 100 nm and 5 micrometers; a neutral mass spectrometer (NMS), which sampled lunar exospheric gases *in situ*, over the 2-150 Dalton mass range; an ultraviolet/visible spectrometer (UVS) acquired spectra of atmospheric emissions and scattered light from tenuous dust, spanning a 250-800 nm wavelength range. UVS also performed dust extinction measurements via a separate solar viewer optic.

The following are preliminary results for the lunar exosphere: (1) The helium exosphere of the Moon, first observed during Apollo, is clearly dominated by the delivery of solar wind He++. (2) Neon 20 is clearly seen as an important constituent of the exosphere. (3) Argon 40, also observed during Apollo and arising from interior outgassing, exhibits variations related to surface temperature-driven condensation and release, and is also enhanced over specific selenographic longitudes. (4) The sodium abundance varies with both lunar phase and with meteoroid influx, implicating both solar wind sputtering and impact vaporization processes. (5) Potassium was also routinely monitored and exhibits some of the same properties as sodium. (6) Other candidate species were seen by both NMS and UVS, and await confirmation.

Dust measurements have revealed a persistent "shroud" of small dust particles between 0.7 and several micrometers in size, present over the pre-dawn and morning sector of the Moon. This tenuous dust exosphere, with densities of ~10^-5 m^-3, appears to be sustained by the ejecta of micrometeoroid impacts.