OVERVIEW OF THE LADEE ULTRAVIOLET-VISIBLE SPECTROMETER: DESIGN, OPERATIONS AND INITIAL RESULTS. A. Colaprete[1], R. C. Elphic[1], D. Landis[2], J. Karcz[1], M. Shirley[1], K. Vargo[1], D. Wooden[1], B. Hermalyn[1,3] [1]NASA Ames Research Center, Moffett Field, CA 94035 USA, [2]Draper Laboratory, Tampa, FL 33612, [3]University of Hawaii, Honolulu, HI 96822.

Introduction: The Lunar Atmosphere and Dust Environment Explorer (LADEE) is an orbital lunar science mission designed to address the goals of the 2003 National Research Council decadal survey, the Lunar Exploration Analysis Group Roadmap, and the "Scientific Context for Exploration of the Moon" (SCEM) report, and has been recommended for execution by the 2011 Planetary Missions Decadal Survey. The LADEE mission goal is to determine the composition of the lunar atmosphere and investigate the processes that control its distribution and variability, including sources, sinks, and surface interactions. It will monitor variations in known gasses, such as sodium, potassium, argon and helium, and will search for other, as-yet-undetected gasses of both lunar and extra-lunar origin. LADEE will also determine whether dust is present in the lunar exosphere, and reveal the processes that contribute to its sources and variability. LADEE launched September 6, 2013 and entered lunar orbit on October 6, 2013.

The Ultraviolet-Visible Spectrometer (UVS): One of three science instruments on LADEE, the Ultraviolet and Visible Spectrometer (UVS) is designed to make observations of the lunar exosphere and search for dust (Figure 1). UVS consists of a CCD spectrograph and two fore-optics: a three-inch telescope and a solar viewing optic. Both fore-optics are fed to the spectrometers via optical fibers.

UVS deployed its limb-viewing telescope door on October 17 and began a series commissioning activities, including pointing, wavelength and preliminary radiometric calibrations. UVS made its first lunar limb observations on October 23, 2013. UVS has been routinely monitoring two previously measured atmospheric species, potassium and sodium, and has been making observations to search for other, previously-sought species including OH, H_2O, Si, Al, Mg, Ca, Ti, and Fe. UVS is also able to detect the scattered light from lofted dust between the altitudes of a few km up to 50 km using its limb telescope, as well as search for dust very near the surface using solar occultation measurements. The UVS instrument operates between 230 – 810 nm with a spectral resolution of <1 nm. The spectrometer has been operating nominally.

Observations to Date: UVS has two means of observing: a "Limb Telescope" and a "Solar Occultation Viewer". Limb observations, using the UVS three-inch telescope, have been made on a routine basis, with limb "stares" at 20 km at the terminators, and 40 km at around local noon time. At the terminators the spacecraft "nods" the telescope between the surface and about 50 km. At noon it was found that near-surface scatter precluded observations below about 30 km, so nods are not performed then. There have been a mix of both "backward" looks (stares that point in the anti-velocity direction of the spacecraft), and "forward" looks (which flip the spacecraft to allow UVS to look in the velocity direction). This permits observations both in and away from the direction of the sun.

Occultations have been performed about once every two days, tracking the sun as it sets behind the sunrise terminator between about 35 km and the surface. In this mode UVS has gathered spectra at a rate of either 15 msec or 26 msec, corresponding to a spatial sampling of <1 km with very high SNR (typically >500 for a single scan).

Sodium and potassium are regularly measured in all activities, except for occultations. Trends in these measurements are made both spatially and temporally, and associations are with specific events, such as meteor streams, and surface composition are examined.

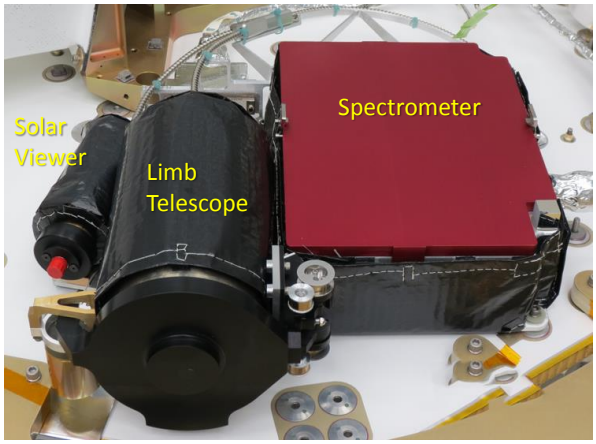

Figure 1. The LADEE UVS instrument showing the spectrometer, limb telescope, and solar viewer, integrated onto the top-deck of the LADEE spacecraft.

During terminator observations the spacecraft observes the illuminated lunar atmosphere while the SC is in lunar umbra. At these times lunar surface and solar scatter is absent, thus very faint emissions or scattering signatures can be searched for in the data. This talk will overview the design, performance and initial results of the LADEE UVS instrument.