**THE LUNAR ATMOSPHERE AND DUST ENVIRONMENT EXPLORER (LADEE): T-MINUS ONE YEAR AND COUNTING.** R. C. Elphic[1], G. T. Delory[2], E. J. Grayzeck[3], A. Colaprete[1], M. Horanyi[5], P. Mahaffy[4], B. Hine[1], D. Boroson[6], and J. S. Salut[3], [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, [6]Lincoln Laboratory, Massachusetts Institute of Technology, Lexington MA 02421

**Introduction:** 40 years have passed since the last Apollo missions investigated the mysteries of the lunar atmosphere and the question of levitated lunar dust. The most important questions remain: what is the composition, structure and variability of the tenuous lunar exosphere? What are its origins, transport mechanisms, and loss processes? Is lofted lunar dust the cause of the Surveyor and astronaut horizon glow observations? How does such levitated dust arise and move, what is its density, and what is its ultimate fate?

Past National Research Council decadal surveys, and the "Scientific Context for Exploration of the Moon" (SCEM) report have identified studies of the pristine state of the lunar atmosphere and dust environment as among the leading priorities for future lunar science missions. These measurements have become particularly important since recent observations by the Lunar Crater Observation and Sensing Satellite (LCROSS) mission point to significant water and other volatiles sequestered within polar lunar cold traps. Moreover, Chandrayaan $M^3$/EPOXI/Cassini VIMS identifications of $H_2O$ and OH on surface regolith grains hint at variability in time and space; these species are likely present in the exosphere, and thus constitute a source for the cold traps.

**The LADEE Mission:** The Lunar Atmosphere and Dust Environment Explorer (LADEE) is currently in integration and test, aiming for launch in August of 2013. LADEE will determine the composition of the lunar atmosphere and investigate the processes that control its distribution and variability, including sources, sinks, and surface interactions. LADEE will also determine whether dust is present in the lunar exosphere, and reveal its sources and variability. These investigations are relevant to our understanding of surface boundary exospheres and dust processes occurring at many objects throughout the solar system, address questions regarding the origin and evolution of lunar volatiles, and have potential implications for future exploration activities.

**The LADEE Payload:** LADEE employs a high heritage instrument payload: a Neutral Mass Spectrometer (NMS) from Goddard Space Flight Center, an Ultraviolet/Visible Spectrometer (UVS) from Ames Rsearch Center, and a dust detection experiment (LDEX) from the University of Colorado/LASP. It will also carry the Lunar Laser Communications Demonstration (LLCD) as a technology demonstration. The LLCD is funded by the Space Operations Mission Directorate (SOMD), managed by GSFC, and built by the MIT Lincoln Labs.

The LADEE NMS instrument for LADEE draws its design from the MSL/SAM, CONTOUR and MAVEN projects, and covers the 2-150 Dalton mass range. The UVS instrument is a next-generation, high-reliability redesign of the LCROSS UV-Vis spectrometer, spanning 250-800 nm wavelength, with high (<1 nm) spectral resolution. UVS will also perform dust occultation measurements via a solar viewer optic. LDEX senses dust impacts in situ, at LADEE orbital altitudes, with a particle size range of between 100 nm and 5 μm. Dust particle impacts on a large spherical target surface create electron and ion pairs. The latter are focused and accelerated in an electric field and detected at a microchannel plate. The overall LADEE payload configuration is shown below.

**Status of LADEE Mission:** LADEE is currently in I&T, with the immiment integration of the first two payload instruments, UVS and LDEX. Integrated observatory testing will continue until LADEE is shipped to Wallops for launch processing in June 2013. The first launch opportunity is currently August 10, 2013.

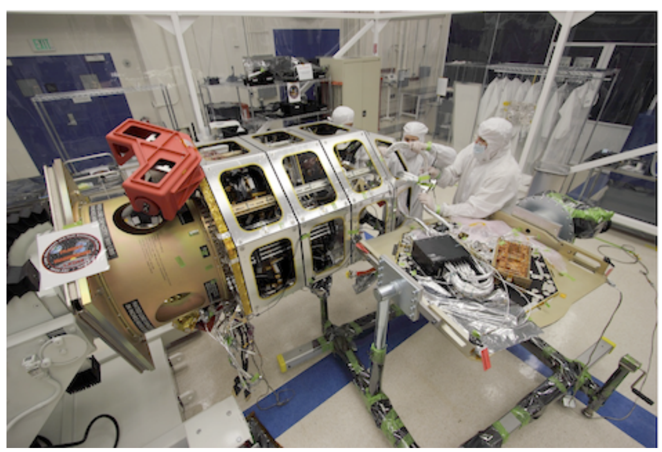

Fig. 1. LADEE in integration and test within its clean tent.