The Dust Environment of the Moon

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The Earth and the Moon are constantly bombarded by interplanetary meteoroids. While meteoroids turn into shooting stars at Earth due to our thick atmosphere, the Moon's surface is completely exposed. Impacts from the meteoroids into the lunar surface are continually creating ejecta clouds, each with approximately 1000 times the mass of the impactor. The Lunar Dust Experiment (LDEX) was an impact ionization dust detector onboard the Lunar Atmosphere and Dust Environment Explorer (LADEE) mission, designed to measure impact ejecta. LDEX observed a permanently present dust cloud engulfing the Moon which is non-spherical and asymmetric with respect to the direction of the orbital motion of the Earth/Moon about the Sun. These density distributions are consistent with ejecta clouds generated from the continual bombardment of the lunar surface by sporadic interplanetary dust particles shed from comets.

During several of the well characterized annual meteor showers, LDEX observed an enhancement in the number of detected plumes, particularly during the Geminids. A significant enhancement in exospheric potassium was also observed during the intense Geminids. Characterizing the spatial and temporal variability of the dust environment of airless planetary bodies provides a novel way to understand their meteoroid environment by effectively using these objects as large surface area meteoroid detectors. Measurements from similar dust detectors near the moons Phobos and Deimos would greatly improve our knowledge of the Martian meteoroid environment, and improve the safety for future manned and unmanned missions to Mars. This presentation will cover the recently measured lunar dust exosphere and summarize recent research of this environment in the three years following the LADEE mission.