

Meteoritic Bombardment at the Moon and LADEE/LDEX Derived Gardening Rates

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Abstract. The surfaces of airless bodies are continually bombarded by micrometeoroids, which eject and redistribute the surface material in a process called gardening. The Lunar Dust Experiment (LDEX) was an impact ionization dust detector aboard the Lunar Atmosphere and Dust Environment Explorer. The grains detected by LDEX return to the surface on timescales of a few minutes and are the very same grains which contribute to the redistribution of lunar regolith. Using the impact rate data taken over many months of operation, LDEX was able to characterize the dust density distribution of the lunar dust cloud as a function of time, altitude, and local-time. LDEX discovered a permanently present, asymmetric dust cloud.

The lunar dust density distribution in the ecliptic plane was found to be primarily generated by three known sporadic sources: the helion (HE), apex (AP), and anti-helion (AH), with a minor contribution potentially coming from the anti-apex (AA) source. The ejecta cloud was observed to be sensitive to small changes in impactor fluxes and velocities. In this presentation, we discuss the various sources of meteoroids bombarding the lunar surface and how they contribute to the global dust density distribution. We derive an average lunar dust density distribution and calculate the rate at which exospheric dust rains back down onto the lunar surface.