



Discoveries from Revisiting Apollo Direct Active Measurements of Lunar Dust

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New missions to the moon being developed by China, Japan, India, USA, Russia and Europe and possibilities of human missions about 2020 face the reality that 6 Apollo expeditions did not totally manage or mitigate effects of easily-mobilised and very “sticky” lunar dust on humans and hardware. Laboratory and theoretical modelling cannot reliably simulate the complex lunar environments that affect dynamical movements of lunar dust. The only direct active measurements of lunar dust during Apollo were made by matchbox-sized minimalist Dust Detector Experiments (DDEs) deployed to transmit some 30 million digital measurements from Apollo 11, 12, 14 and 15. These were misplaced or relatively ignored until 2009, when a self-funded suite of discoveries (O'Brien Geophys. Research Letters FIX 6 May 2009) revealed unexpected properties of lunar dust, such as the adhesive force being stronger as illumination increased. We give the first reports of contrasting effects, contamination or cleansing, from rocket exhausts of Apollo 11, 12, 14 and 15 Lunar Modules leaving the moon. We further strengthen the importance of collateral dust inadvertently splashed on Apollo hardware by human activities. Dust management designs and mission plans require optimum use of such in situ measurements, extended by laboratory simulations and theoretical modelling.