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The transport of sand and dust on Mars, its importance to science and exploration.

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The transport of particulate matter across a planets surface is a powerful erosion mechanism and a significant factor affecting atmospheric dynamics by the creation of particulate aerosols. In this sense Mars is a test bed for the study of dust aerosols since it lacks the active circulation of water through the atmosphere, as we see on earth. Dust transport has therefore become the dominant process on Mars for both atmospheric contamination and evolution of the surface.

Laboratory simulations have shown that dust electrification and aggregation is crucial to the transport of dust on Mars [1,2]. Similarly, on earth electric fields and electrification can play an important role in sand and dust circulation. Even on airless bodies such as the lunar surface dust sized particulates can be emitted and suspended by electrification processes. Granular electrification is being studied in detail in all of these environments, though is still far from being understood [3].

Recently observations by the NASA MER mission have revealed, for the first time, active transport of sand on the surface (saltation). It is becoming clear that, although such sand transport is periodic and at a low rate, it may be an extremely important process for the properties of the surface with regard to bacterial survival and habitation. Similarly with regard to exploration it is clear that a deeper understanding of how dust behaves at the Martian (and lunar) surface, especially under the influence of humans/robots, is essential.

New laser and optoelectronic instrumentation is being developed in the study of particulate transport on Mars, specifically for the ESA ExoMars mission [4]. These technologies have potential application on earth, the moon and other solar system environments where granular material may be transported.

References:

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