Geophysical Research Abstracts, Vol. 7, 05098, 2005
SRef-ID: 1607-7962/gra/EGU05-A-05098

Ion and electron emission from dust grains: Laboratory simulation

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The charge accumulated in dust grains determines their behavior in the space because the Coulomb forces dominate over the gravity for small grains. The actual grain charge is a result of many concurrent processes and determination of their mutual weights of them is impossible in space measurements. Moreover, the grain charge can depend on a charging history which is generally unknown for a particular grain.

In order to investigate charging/discharging processes in detail, we are using a laboratory experiment. The single grain is trapped in an electrodynamic trap and irradiated by electron and/or ion guns. This set-up allows us to quantify the dust charge under well defined conditions. The experiments have shown that the charging history is a principal factor for the grain equilibrium charge. This is especially true for both ion and electron field emissions from insulators. We are comparing these results with measurements on metallic dust simulants of similar diameters.