Geophysical Research Abstracts
Vol. 19, EGU2017-17781, 2017
EGU General Assembly 2017

New Experimental Results of Simulating Micrometeoroid Ablation in the Laboratory

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A facility is developed to simulate the ablation of micrometeoroids in laboratory conditions, which also allows measuring the ionization probability of the ablated material. An electrostatic dust accelerator is used to generate iron, aluminum and meteoric analog particles with velocities 10-50 km/s. The particles are then introduced into a cell filled with nitrogen, air or carbon dioxide gas with pressures adjustable in the 0.02 – 0.5 Torr range, where the partial or complete ablation of the particle occurs over a short distance. An array of biased electrodes is used to collect the ionized products with spatial resolution along the ablating particles' path, allowing thus the study of the temporal resolution of the process. A new optical observation setup using a 64 channel PMT system was added to the setup to allow the observation of the ablating particle and deceleration of the particle from the neutral drag. A simple ablation model is used to match the observations. For completely ablated particles the total collected charge directly yields the ionization efficiency. The measurements using iron particles in N2 and air are in relatively good agreement with earlier data. The new experimental data using aluminum particles suggest that the neutral drag acting of the particle is smaller than expected.