Laboratory micrometeoroid/dust ablation studies

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Abstract. Each day, 5-270 tons of meteoric material ablates in Earth's upper atmosphere. This enormous range is significant because the Interplanetary Dust Particle (IDP) input has implications in our understanding of meteor effects in the upper atmosphere[1], but it also can improve our understanding of dust evolution in the solar system. As the dust ablates, it produces light, as well as a plasma trail of ionized atmospheric atoms and electrons. These meteor signatures are detected by photographic means, or by radar, but there remain uncertainties in the luminous efficiency and ionization coefficient of meteors - two parameters that are essential to evaluate densities, masses, height distributions and fluxes[2]. Precise measurements of these parameters would allow for the Earth's atmosphere to be used as a dust detector to detect and characterize the dust environment in our solar system. Gaining greater understanding of our solar system's dust environment is critical to mitigating hazards of exploration. This talk discusses the preliminary results of the new dust ablation facility at the 3 MV hypervelocity dust accelerator at the Institute for Modeling Plasma, Atmospheres and Cosmic Dust (IMPACT) at the University of Colorado, which aims to characterize the ionization coefficient (β) and luminous efficiency (τ) of ablating micrometeoroids. Measurements of β for iron particles impacting various gases are presented here at lower velocities than have been measured before and are compared to a commonly used analytical model.

[1] John M.C. Plane, *Chem Soc Rev*, 41 (2012).
[2] William Jones, *Mon. Not. R. Astron.*, 288 (1997).