What does really happen in a dust impact?

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Our current understanding of the solar system’s micrometeoroid environment relies to a substantial extent on in-situ data acquired by impact ionization dust detectors such as Ulysses’ and Galileo’s DDS or Cassini’s CDA. Such detectors derive the mass and speed of striking dust particles from the properties and evolution of the plasma created upon impact. In particular, empirical evidence suggests that the impact speed is a function of the duration of impact charge delivery onto the target - the so-called plasma rise time. Often, this dependence has been attributed to secondary impacts of target and projectile ejecta.

During recent years the capabilities of laboratory impact detectors have been significantly improved. In particular we now have ample evidence that secondary ejecta impacts are not responsible for the rise-time dependence. In fact the plasma rise-time is rather related to the ionization of target contaminants in the vicinity of the impact site.

In this talk we present new experimental data obtained with state-of-the-art impact ionization mass spectrometers, which shed new light on what is really going on during a hypervelocity dust impact. We further discuss the implications for the interpretation of dust data obtained with previous generations of impact ionization detectors.