MODELLING ION BEHAVIOUR IN THE CASSINI COSMIC DUST ANALYSER. Jon K. Hillier[1], N. McBride[1] and S. F. Green[1].
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Interpreting the time of flight (TOF) mass spectra produced by the Cosmic Dust Analyser (CDA) on the Cassini spacecraft requires accurately identifying which ion species contribute to which spectral peaks. The relationship $t = a\sqrt{m}+b$ (t: time, a:stretch parameter relating to instrument field strengths, m:ion mass and b:zeropoint offset), usually used for calibrating TOF mass spectra is complicated in the CDA as the instrument does not perform any ion energy discrimination (such as that obtained by using a reflectron). The resulting spread in ion energies (and hence arrival times) tends to broaden and/or merge individual peaks, with plasma shielding, ion trajectory path length differences and field strength changes further affecting the spectra.

Hypervelocity dust impacts using a Van de Graaff generator to accelerate dust in the laboratory can be used to investigate the plasma (and spectra) produced by particles with a limited range of compositions, masses and velocities but this approach is unable to recreate the range of impact characteristics observed by CDA *in-situ.*

In this paper we present initial results from spectral modelling using the CDACAD numerical simulation software. This software uses the velocity verlet algorithm to simulate ion trajectories within the CDA instrument, allowing spectra to be created from impact plasmas of arbitrary composition with arbitrary initial velocity distributions. All of the CDA channels are simulated, at instrument-accurate sampling rates, allowing not only spectra to be recreated but also an estimation of ion losses to other parts of the instrument to be made. We present simulated fits to a variety of different types of flight spectra and comment on the implications for the impact plasma conditions.