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Development of a Thermal Model for Hypervelocity Impact into Aerogel[1] WILLIAM ANDERSON, FRANK CHERNE, Los Alamos National Laboratory — The STARDUST mission was the first to return cometary material from a known source. The spacecraft passed through the comet's coma at a relative velocity of 6.5 km/s, collecting the dust particles by impact into very low-density silica aerogel. The low impedance of the aerogel allowed shock stress to remain low, but at the expense of producing very high shock temperatures, which thermally compromised the samples. To support the sample analysis community, we are developing a new model to invert impact track geometries to get detailed thermal histories of some samples during capture. This project requires development of a specialized hydrocode that can deal with large lengthscale disparities and extreme volumetric compressions, while remaining capable of being run efficiently. Also required are material models for the shocked aerogel with accurate thermodynamic, mechanical, and transport properties at a wide range of conditions. We present results for this project and discuss problems that remain.

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