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Improved Strength and Damage Modeling of Geologic Materials
SARAH STEWART, LAUREL SENFT, Department of Earth and Planetary Sciences, Harvard University — Collisions and impact cratering events are important processes in the evolution of planetary bodies. The time and length scales of planetary collisions, however, are inaccessible in the laboratory and require the use of shock physics codes. We present the results from a new rheological model for geological materials implemented in the CTH code [1]. The 'ROCK' model includes pressure, temperature, and damage effects on strength, as well as acoustic fluidization during impact crater collapse. We demonstrate that the model accurately reproduces final crater shapes, tensile cracking, and damaged zones from laboratory to planetary scales. The strength model requires basic material properties; hence, the input parameters may be benchmarked to laboratory results and extended to planetary collision events. We show the effects of varying material strength parameters, which are dependent on both scale and strain rate, and discuss choosing appropriate parameters for laboratory and planetary situations. The results are a significant improvement in models of continuum rock deformation during large scale impact events. [1] Senft, L. E., Stewart, S. T. Modeling Impact Cratering in Layered Surfaces, J. Geophys. Res., submitted.

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