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Simulation of Comet Impact and Survivability of Organic Compounds BENJAMIN LIU, ILYA LOMOV, LLNL, JENNIFER BLANK, SETI Institute, TARABAY ANTOUN, LLNL — Comets have been proposed as a mechanism for the transport of complex organic compounds to Earth. For this to occur, a significant fraction of organic compounds must survive the shock loading, in particular the high temperatures, due to impact. 2D and 3D numerical simulations were performed to study the thermodynamic states due to a comet impact. The comet was modeled as a 1-km diameter icy sphere traveling at the Earth's escape velocity (11 km/s) impacting a half-space of basalt. Simulations were performed with GEODYN, a parallel, multi-material, Godunov-based Eulerian code employing adaptive mesh refinement. A constitutive model calibrated for hard rock was used for basalt. Tabular equations of state were used to account for the extreme conditions present upon shock loading. A major focus of the study was tracking the thermodynamic state of the comet material. Both the maximum temperature experienced and the phase were tracked for each point in the comet Temperature histories in the comet were also recorded. These quantities were used to estimate viability of organic compounds upon impact. This work was performed under the auspices of the U.S. Department of Energy by the University of California, Lawrence Livermore National Laboratory under Contract W-7405-Eng-48.

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