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to end Numerical Simulation of a Comet's Reentry, Impact, Cratering, Fireball and Cloud Generation: Local and Global Consequences

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Simulations of a 1 to 2 km comet striking Earth on solid ground and on ocean waters have been conducted. Models include hydrostatic equilibrium profiles of temperature, pressure, and densities for atmosphere and ocean, in order to accurately predict impact consequences. Phase changes, such as melting and vaporization, combined with the material's tensile, shear, and compressive strength responses, under high temperature and high strain conditions, along with anisotropic responses, are considered in greater detail than in previous work. Our simulations illustrate the erosion of the comet and the creation of a dusty tail, the breakup of the comet into fragments, the erosion of some of the fragments, and the survival of others. The reentry of fragments into the stratosphere and their flattening is also demonstrated. For the first time, we present results of an integrated simulation of water and ground impact, the resulting crater formation, fireball evolution and cloud generation and transport of dust and debris to hundreds of kilometers from the impact site. We illustrate the seismoacoustic signature of an asteroid impacting Earth. Computations were conducted on LLNL HPC using SME++ framework developed over the last 7 years.

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Promotional text

Bring solutions to improve nuclear test monitoring discrimination from bolides, verification through hydro-seismoacoustic, and help frame and inform policy makers using high resolution, first-ever, fully coupled numerical model from source to receiver.

Oral preference format

in-person

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