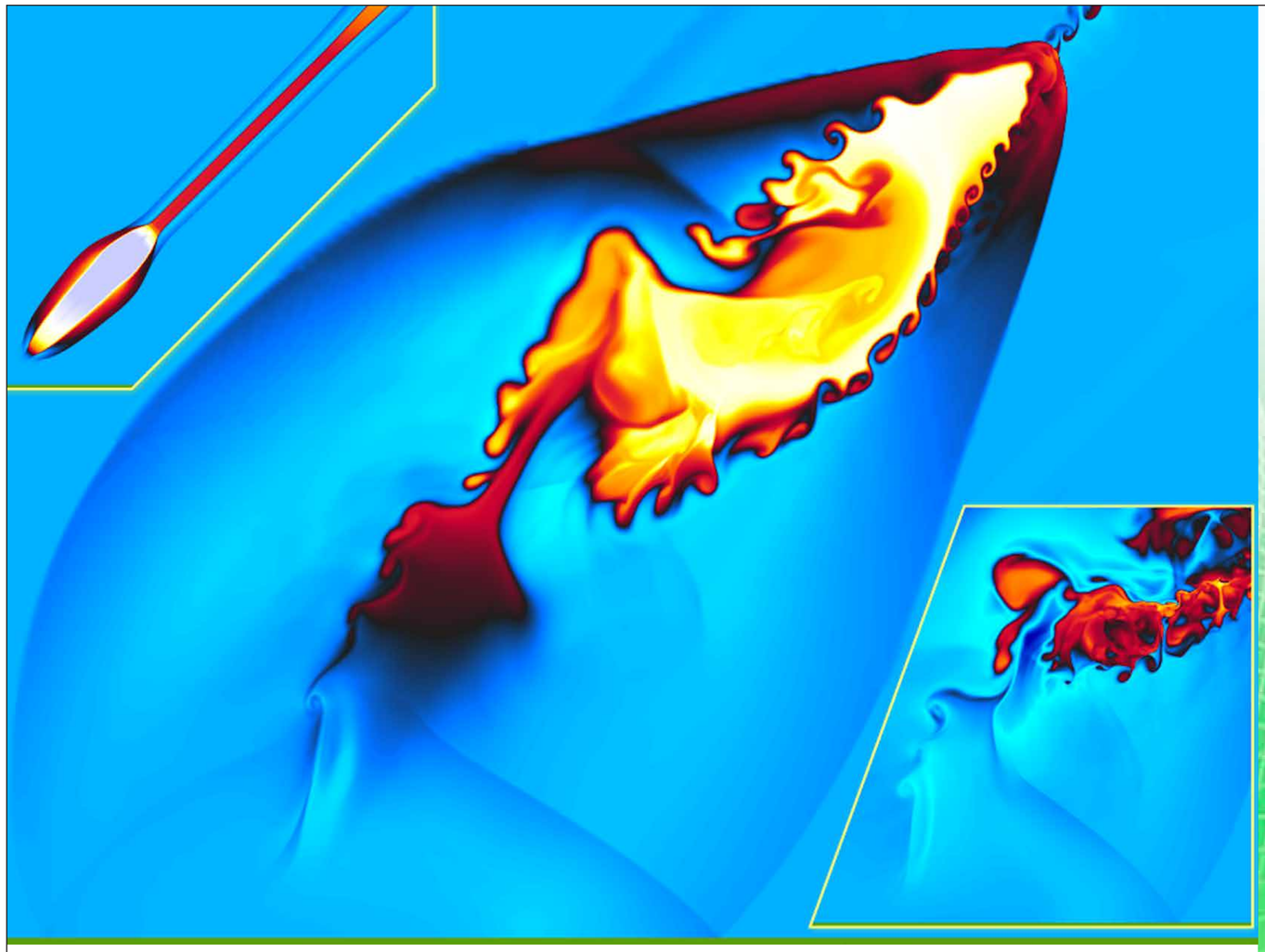
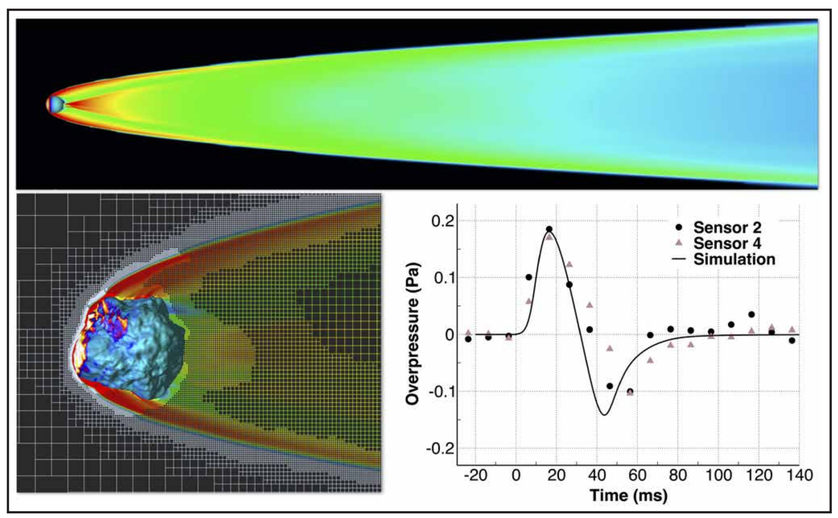


Simulation of an airburst at an altitude of about 10 kilometers (km) from a meteoroid with an entry speed of 20 km/s and a diameter of 60 meters. The energy release is equivalent to 10 megatons of TNT. The main image shows the temperature of the atmosphere about 45 seconds after entry. The vertical extent is 50 km above the ground. Inset images show early snapshots of the blast wave as it evolves from a prescribed energy deposition profile (upper left), and the dissipation of the meteoroid wake 70 seconds after entry (lower right). *Michael Aftosmis, Marian Nemec, NASA/Ames*



Simulation of a small, 5-centimeter meteoroid flying at an altitude of 53 kilometers (km) and a speed of 15 km/s (Mach 46), detected on October 28, 2008. The image at lower left shows the computational mesh near the meteoroid with emphasis on the strong bow shock immediately upstream of the body. Comparison of the simulation with the observed, infrasonic, ground pressure signature of the meteoroid is shown in the chart at lower right. *Marian Nemec, Michael Aftosmis, NASA/Ames*

National Aeronautics and Space Administration

Simulating Atmospheric Impacts: From Pebble- to Mountain-Size Meteoroids

The hypersonic entry of meteoroids into Earth's atmosphere generates shockwaves with potentially hazardous consequences when they reach the ground. As part of the Asteroid Threat Assessment Project within NASA's Planetary Defense Coordination Office, we enhanced the Cart3D software package to allow accurate prediction of shock arrival times and ground overpressures generated by these events. Uncertainties in entry conditions and meteoroid properties are characterized via large parametric studies. Simulations of centimeter- to kilometer-size meteoroids are run on NASA's Pleiades supercomputer; typical cases use 2,000 cores and turn around in about a day. Results are being used to help create more efficient risk models, and to calibrate optical and infrasound observations.

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