

Explosions in the Sky: Should we worry about Asteroids?

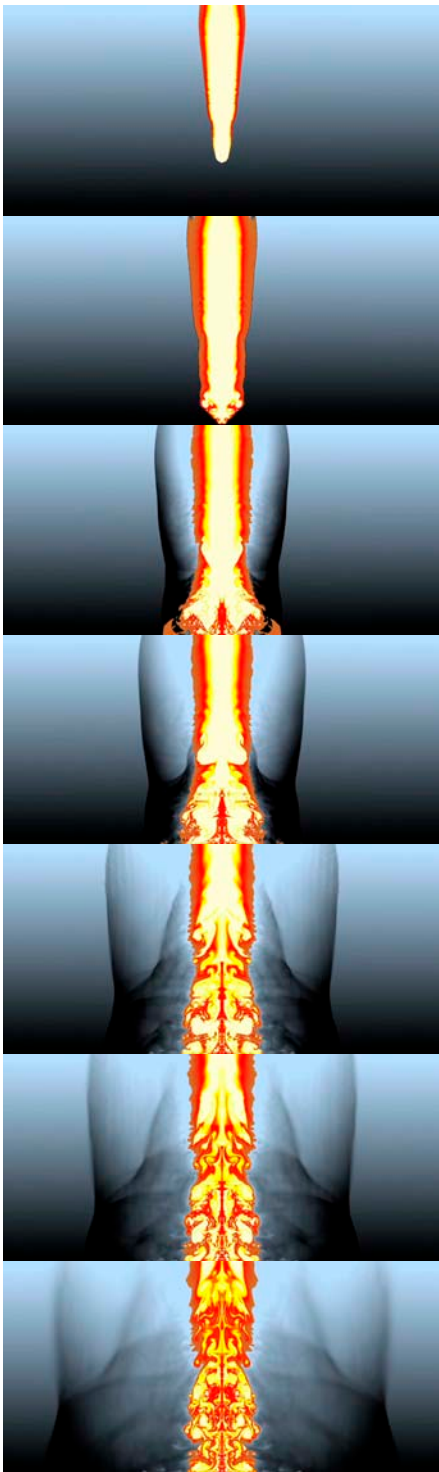
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It is often said that our atmosphere protects us from most asteroids. Very few are big enough to reach the ground without burning up. Crater-forming impacts are rare because there aren't many space rocks sufficiently massive to pass through the atmosphere. The record of impacts on Earth consists mainly of holes in the ground in various stages of erosion. But what about the ones that "burn up"? Do they really disappear harmlessly, without a trace--or have we been missing the geological evidence?

The 1908 Tunguska event was a multi-megaton explosion in Siberia from an asteroid too small to reach the surface. The thermal radiation ignited fires, and the blast wave threw down trees over many hundreds of square miles. A hundred years later the forest has healed. Only a trained eye can see the remaining signs. If the Tunguska explosion hadn't been observed the evidence might have never been recognized or believed.

Is there geological evidence for older, perhaps more devastating airbursts? Should we worry about them? The answers may come as a surprise.





Mark Boslough is a physicist who has been concerned about the future of the Earth for most of his life. When he was a teenager vacationing with his family in Grand Teton National Park, a blindingly bright object streaked across the sky. It became known as the Great Daylight 1972 Fireball, and was the first event ever recorded by U.S. DoD sensors which tracked the object as it descended to 53 km above the surface and then rose back into space.

Mark retained interest in impacts as he majored in physics at Colorado State University, which led him to experimental impact physics research as a graduate student at Caltech under the guidance of Tom Ahrens. He learned about planetary cratering and visited Arizona's Meteor Crater with impact pioneer Gene Shoemaker, at about the same time that Lois Alvarez's team published the first paper showing evidence that the dinosaurs had been wiped out by an asteroid impact. As an experimentalist Mark developed a radiation pyrometer to measure temperatures in minerals subjected to hypervelocity impacts and to detect high pressure phase transitions and shock-induced chemical reactions.

After obtaining his Ph.D. in applied physics, he joined Sandia in 1983. He has collaborated with scientists and engineers across Sandia on many aspects of impact physics ranging from NMR spectroscopy of shocked sandstone, testing space-station debris shields, and analyzing satellite observations of fireballs. In 1994 he was a member of a team that gained international recognition for using a supercomputer to correctly predict the effects of the impact of Comet Shoemaker-Levy 9 on Jupiter. His current impact research is focused on computational modeling of low-altitude airbursts and their effects. His work has been the subject of several recent television documentaries in which he joined expeditions to airburst sites in the Sahara Desert and in remote Siberia.