'Shocking' Experiment Reveals How Asteroids Explode

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Sometimes in science, if you want answers, you just have to bust things up. That's what Kazushige Tomeoka and colleagues did in order to learn why most of the space dust that falls to Earth is wet, while larger space rocks found on the planet are usually dry as a bone.

More than 97 percent of all meteorites collected on Earth's surface lack water. Meanwhile, about 30,000 tons of interplanetary dust reaches Earth's surface every year. Almost all of this dust contains water, resembling the paltry 2.8 percent of known, hydrated meteorites.

"Why is that?" wonders Tomeoka, of the Kobe University in Japan. "There has been no convincing answer to this question."

Scientists have been left to assume that wet space rocks simply don't survive the trip through Earth's atmosphere.

Not buying that explanation, Tomeoka's team decided to figure out what happens in space when asteroids collide. With a specially designed gun -- 16 feet long (5 meters) with a 30 millimeter bore -- they shot meteorites with projectiles moving at up to 4,026 mph (1.8 kilometers per second).

The result was as revealing as it was explosive.

"The application of shock to the watery meteorite reduces it to minute particles and produces explosive expansion upon release of the pressure," Tomeoka told *SPACE.com*. "In contrast, the dry meteorite does not show significant changes."

The researchers conclude that what's collected on Earth is a result of what happens in space. When watery asteroids are shocked at the surface by an impact -- something that happens to all space rocks several times during their histories -- dust explodes into space. When a dry asteroid is hit by a another rock, not much happens, dustwise.

"As a result of these differences in shock response, watery material would become the predominant kind of dust particles produced by mutual collisions of asteroids, Tomeoka said, adding that larger watery fragments would not be abundant.

Most asteroids roam around the Sun in a belt between Mars and Jupiter. The fragments of their collisions, and the dust, can be drawn toward the inner solar system and sometimes approach Earth. Dust and rocks moving fast in relation to Earth frequently slam into the atmosphere and burn up, generating shooting stars. Stuff moving more slowly relative to Earth can be captured by the planet's gravity and survive the plunge.

The findings will be detailed in the May 1 issue of the journal *Nature*.