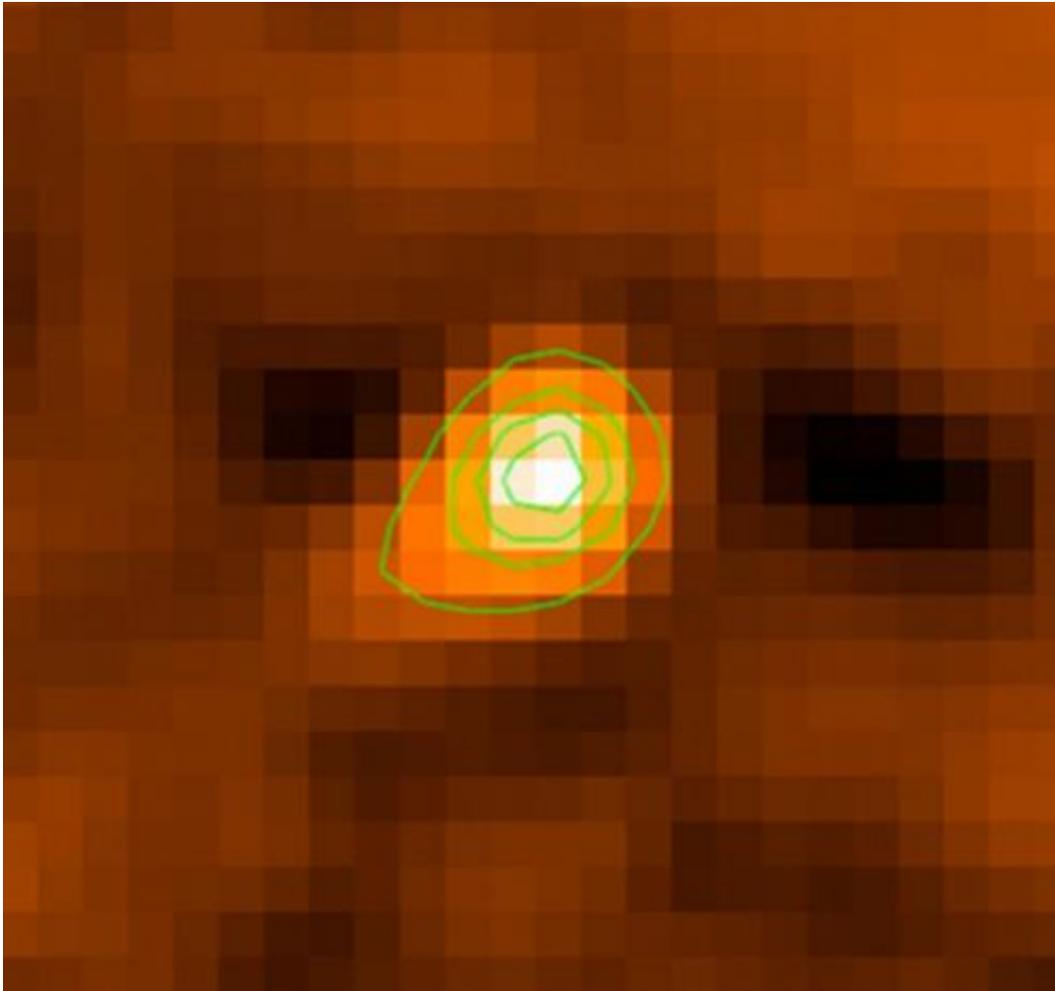


Rock comet sprouts a tail

November 28 2013, by Dr. Tony Phillips



This STEREO image of 3200 Phaethon reveals a stubby but distinct tail.

Astronomers have long been puzzled by a certain meteor shower.

Every year in mid-December the sky fills with flashes of light shooting out of the constellation Gemini. The Geminids are fast, bright, and reliable. They never fail to show up and many observers count them as the finest meteors of the year.

But where do they come from? That is the puzzle.

Meteor showers are supposed to come from comets, yet there is no comet that matches the orbit of the Geminid debris stream. Instead, the orbit of the Geminids is occupied by a thing called "3200 Phaethon." Discovered in 1983 by NASA's IRAS satellite, Phaethon looks remarkably like a rocky asteroid. It swoops by the sun every 1.4 years, much like a comet would, but it never sprouts a dusty tail to replenish the Geminids.

That is, until now.

A group of astronomers led by Dave Jewitt of UCLA have been using NASA's STEREO probes to take a closer look at 3200 Phaethon when it passes by the sun. The twin spacecraft were designed to monitor solar activity, so they get a good view of sungrazing comets and asteroids. In 2010 one of the STEREO probes recorded a doubling of Phaethon's brightness as it approached the sun, as if sunlight were shining through a cloud of dust around the asteroid. The observers began to suspect 3200 Phaethon was something new:

"A rock comet", says Jewitt. A rock comet is, essentially, an asteroid that comes very close to the sun—so close that solar heating scorches dusty debris right off its rocky surface. This could form a sort of gravelly tail.

Indeed, in further STEREO observations from 2009 and 2012, Jewitt along with colleagues Jing Li of UCLA and Jessica Agarwal of the Max Planck Institute have spotted a small tail sticking out behind the "rock."

"The tail gives incontrovertible evidence that Phaethon ejects dust," says Jewitt.

Jewitt's team believes that the dust is launched by thermal fracturing of the asteroid's crust. A related process called "desiccation fracturing"—like mud cracks in a dry lake bed—may play a role too.

Seeing 3200 Phaethon sprout a tail, even a small one, gives researchers confidence that Phaethon is indeed the source of the Geminids—but a mystery remains: How can such a stubby protuberance produce such a grand [meteor shower](#)?

Adding up all of the light STEREO saw in Phaethon's tail, Jewitt and colleagues estimate a combined mass of some 30 thousand kilograms. That might sound like a lot of meteoroids but, in fact, it is orders of magnitude too small to sustain the massive Geminid debris stream.

Perhaps Phaethon experienced a "big event" in the recent past. "The analogy I think of is a log in a campfire," says Jewitt. "The log burns, makes a few embers, but occasionally will spit out a shower of sparks."

Continued monitoring by NASA's STEREO probes might one day catch the rock comet spitting out a shower of dust and debris, solving the mystery once and for all.

Until then, it's a puzzle to savor under the stars. This year's Geminid meteor shower peaks on the nights of Dec. 13-14 with dozens of "rock comet meteors" every hour. Bundle up and enjoy the show.

Provided by NASA

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