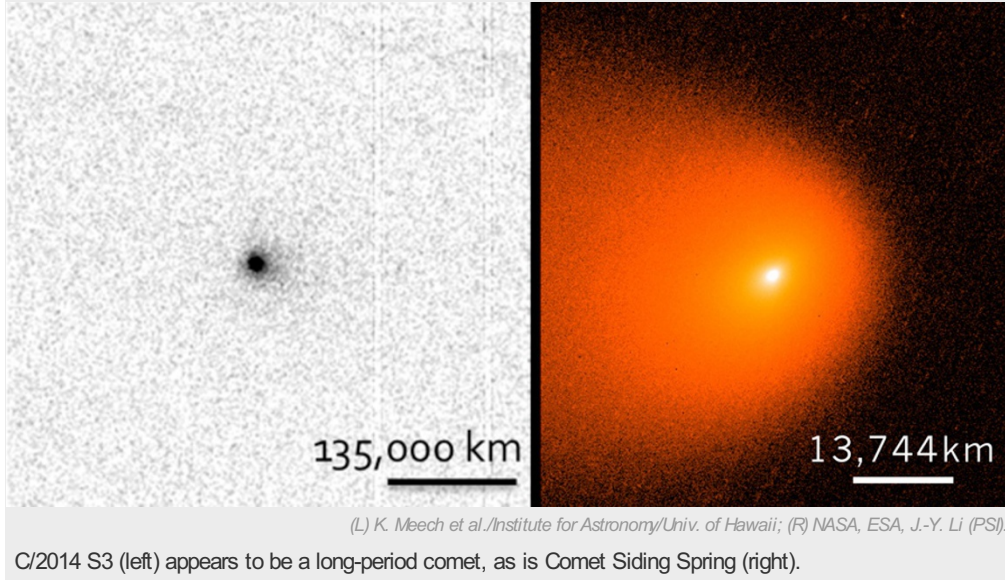


# Strange comet behaviour puzzles researchers

Dust from Comet Siding Spring pelted Mars, but another distant visitor seems to have no dust tail at all.

Alexandra Witze

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Two comets from the far-flung reaches of the Solar System are surprising astronomers with how much dust they are putting out — or not.

Comet Siding Spring [barrelled past Mars](#) on 19 October, enveloping the planet in a billowing cloud of dust and lighting up the Martian atmosphere. But astronomers have also spotted a mysteriously dust-free object from the Oort cloud, the deep-freeze reservoir beyond Neptune that is the origin of many comets, including Siding Spring.

The dust-free comet “is an exciting result because we’ve never seen anything like it before”, says Karen Meech, a planetary scientist at the University of Hawaii at Manoa.

Objects that zoom in from the Oort cloud are known as long-period comets, because they take thousands of years to loop around the Sun. Short-period comets, by contrast, zip around the inner Solar System frequently, and tend to bake off most of their ices and dust over time. That means that the discoveries are not immediately relevant for understanding the short-period comet [being visited this week](#) by the European Space Agency’s Rosetta spacecraft. But they are showing just how extreme comets can get.

Meech has been watching an object that was discovered last year and dubbed C/2013 P2. Orbital calculations suggested that it was a long-period comet that might be heading into the inner Solar System for the first time. If so, it should have been blazing with a long tail of dust. But it wasn’t.

Meech and her colleagues used the 8-metre Gemini telescope on Mauna Kea, Hawaii, to confirm that the comet was giving off hardly any dust. She calls it a “Manx comet”, tailless as a Manx cat. It could be the first-ever naked object seen that originated from the Oort cloud. Such objects were hypothesized by astronomer Jan Oort in 1950 but have never been seen until now.

A second object, known as C/2014 S3, also looks to be in an Oort-cloud-like orbit but with little to no dust activity, Meech adds. In fact, its colour resembles that of some asteroids in the inner Solar System. That could mean that it began its life relatively close to the Sun, billions of years ago, but was dragged into the Oort cloud as the giant planets migrated outward. “It looks like we may have the first evidence of some inner Solar System material thrown out into the Oort cloud,” she says. An asteroidal birth may help explain why it has so little dust.

Meech reported the findings on 10 November at the meeting of the American Astronomical Society’s Division for Planetary Sciences in

Tucson, Arizona.

### **Spectacular skies**

By contrast, there was plenty of dust coming off comet Siding Spring when it blew past Mars last month. More than 1,000 kilograms of material seem to have slammed into the planet, says Nick Schneider, a planetary scientist at the University of Colorado Boulder.

A battery of instruments on NASA's Mars Atmosphere and Volatile Evolution (MAVEN) mission watched as the dust shower lit up Martian skies. "We were all sort of pressed back in our chairs when we saw this booming signal," Schneider said at a NASA press briefing on 7 November.

Magnesium, iron and other metals carried by the comet hit the planet's ionosphere and began glowing, says Schneider. The European Space Agency's Mars Express mission confirmed that electron densities spiked in a layer about 100 kilometres above Mars's surface.

"We have definitely witnessed an accretion event of cometary material onto a planet," says Carey Lisse, a planetary scientist at the Johns Hopkins University Applied Physics Laboratory in Laurel, Maryland.

The dust included sodium atoms, which glow more brightly than other metal atoms and would have tinged the Martian skies yellow. An observer on Mars would have seen thousands of shooting stars per hour overhead, Schneider says.

During the barrage, NASA moved its three orbiters behind the planet to protect them from any possible impacts, as the Indian Space Research Organisation did with its Mars Orbiter Mission. Mars Express did not take shelter, but has not reported any damage so far. The dust seems to have spared the probes, in large part because their surface area was small and the dust was relatively dispersed.

Pictures from the Hubble Space Telescope show that the comet had been spewing dusty jets since at least October 2013, says Jian-Yang Li, who studies comets and asteroids at the Planetary Science Institute in Tucson. The dust started out a bluish colour, which is consistent with icy grains flying off the comet, and got redder as Siding Spring approached the Sun and lost more and more of its ice.

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### **Corrections**

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**Corrected:**An earlier version of this story implied that the MAVEN estimate of "thousands of shooting stars per hour" applied to the entire planet as opposed to the viewpoint of a single observer. The text has been corrected.