# Dust cloud sparked explosion in primitive life on Earth, say scientists

## Smashing of monster asteroid half a billion years ago thought to have caused mini ice age

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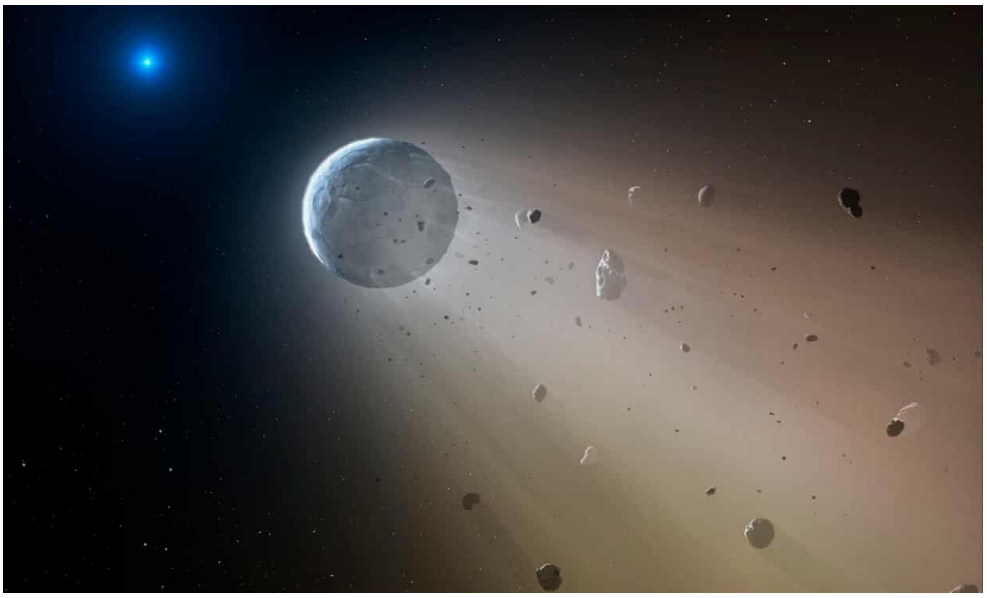

An artist's impression of an asteroid slowly disintegrating. Photograph: Mark A. Garlick

An enormous dust cloud that swept through the ancient solar system sent Earth into a mini ice age that sparked an explosion in primitive life on the planet, scientists say.

The space dust was created when a monster asteroid was smashed to pieces in a violent collision somewhere between Mars and Jupiter nearly half a billion years ago.

The destruction of the 93-mile-wide space rock scattered so much dust into the inner solar system that it blocked some of the sunlight falling on Earth, the researchers claim. As a result, temperatures dropped for at least 2m years.

Because the cooling occurred over such a long time, life on Earth had time to adapt. And while many species carried on unaffected in the warmer spots near the equator, others evolved to make the most of the world's freshly-formed colder regions.

"This the first time it's been shown that dust from an asteroid break-up can lead to cooling that triggers an ice age on Earth," said Birger Schmitz, a professor of nuclear physics at Lund University in Sweden.

Evidence from rock formations suggests that Earth experienced an unusual, short-lived ice age about 466m years ago. The drop in temperature locked water into ice that covered much of the planet, causing sea levels to fall globally. The period coincided with an apparent surge in the diversity of life on the planet, most of which was still in the oceans.

In the hope of shedding light on the mysterious ice age, Schmitz and his colleagues went looking for clues in ancient limestone rocks exposed at sites in southern Sweden and near St Petersburg in Russia. In particular, they looked for remnants of the huge asteroid, which geologists call the "L chondrite parent body".

The researchers used acid to dissolve more than a tonne of limestone rocks of different ages from the sites. They then picked over what was left behind. They found that after the asteroid's destruction, the abundance of grains matching its chemical make-up rose by between 1,000 and 10,000 times. The levels stayed high for 2m-4m years. "The grains come with the dust so when you see an increase in these, you know there's been an increase in the dust," said Schmitz.

Further tests on the ancient limestone revealed a similar spike in levels of an isotope of helium that streams out of the sun in the surge of particles known as the solar wind. The researchers believe that the helium was brought to Earth when it became embedded in the finer space dust particles as they travelled through the solar system.

Writing in Science Advances, the team describes how dust and coarse-grained particles from the asteroid's destruction rained down on Earth and became locked into sedimentary rocks. "We can nail that this ice age started to form when the dust from the break-up fell to Earth," Schmitz said. The asteroid still accounts for about a third of the meteorites that land on Earth.

Scientists call the apparent explosion in marine life at the time the Great Ordovician Biodiversification Event, or GOBE. David Harper, a palaeontologist at Durham University who worked on the study, said it was "the most spectacular hike in marine diversity in the history of life".

"Ice ages have been associated with major volcanic eruptions, but for the first time the team has implicated asteroid-derived dust in the initiation of global cooling and a major leap in biodiversity that changed marine ecosystems forever," he added.

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