Kansas scientists probe mysterious possible comet strikes on Earth

December 14 2009

It's the stuff of a Hollywood disaster epic: A comet plunges from outer space into the Earth's atmosphere, splitting the sky with a devastating shock wave that flattens forests and shakes the countryside.

But this isn't a disaster movie plotline.

"Comet impacts might be much more frequent than we expect," said Adrian Melott, professor of physics and astronomy at the University of Kansas. "There's a lot of interest in the rate of impact events upon the Earth. We really don't know the rate very well because most craters end up being destroyed by erosion or the comets go into the ocean and we don't know that they're there. We really don't have a good handle on the rate of impacts on the Earth."

An investigation by Melott and colleagues reveals a promising new method of detecting past comet strikes upon Earth and gauging their frequency. The results will be unveiled at the American Geophysical Union's Fall Meeting, to be held Dec. 14-18 in San Francisco.

The research shows a potential signature of nitrate and ammonia that can be found in ice cores corresponding to suspected impacts. Although high nitrate levels previously have been tied to space impacts, scientists have never before seen atmospheric ammonia spikes as indicators of space impacts with our planet.

"Now we have a possible new marker for extraterrestrial events in ice," Melott said. "You don't just look for nitrates, you also look for ammonia."

Melott studied two possible cometary airbursts with Brian Thomas, assistant professor of physics and astronomy at Washburn University, Gisela Dreschhoff, KU adjunct associate professor of physics and astronomy, and Carey Johnson, KU professor of chemistry.

In June 1908, a puzzling explosion rocked central Siberia in Russia; it came to be known as the "Tunguska event." A later expedition found that 20 miles of trees had been knocked down and set alight by the blast. Today, scientists have coalesced around the idea that Tunguska's devastation was caused by a 100-foot asteroid that had entered Earth's atmosphere, causing an airburst.

Some 13,000 years earlier, an occurrence thought by some researchers to be an extraterrestrial impact set off cooler weather and large-scale extinctions in North America. The "Younger Dryas event," as it is known, coincided with the end of the prehistoric Clovis culture.

Melott and fellow researchers examined data from ice cores extracted in Greenland to compare atmospheric chemistry during the Tunguska and Younger Dryas events. In both instances, Melott's group found evidence that the Haber process — whereby a nitrogen fixation reaction produces ammonia — may have occurred on a large scale.

"A comet entering the atmosphere makes a big shock wave with high pressure — 6,000 times the pressure of air," said Melott. "It can be shown that under those conditions you can make ammonia. Plus the Tunguska comet, or some fragments of it, landed in a swamp. And any Younger Dryas comet presumably hit an ice sheet, or at least part of it did. So there should have been lots of water around for this Haber process to work. We think the simplest way to explain the signal in both objects is the Haber process. Comets hit the atmosphere in the presence of a lot of water and you get both nitrate and ammonia, which is what both ice cores show."

Melott cautions that the results are inconclusive because the ice cores are sampled at five-year intervals only, not sufficient resolution to pinpoint peaks of atmospheric nitrates and ammonia, which rapidly would have been dissipated by rains following a comet strike.

But the KU researcher contends that ammonia enhancement resulting from the Haber process could serve as a useful marker for detecting possible comet impacts. He encourages more sampling and analysis of ice cores to see where the nitrate-ammonia signal might line up with suspected cometary collisions with the Earth.

Such information could help humankind more accurately gauge the danger of a comet hitting the Earth in the future.

"There's a whole program to watch for near-Earth asteroids as they go around the sun repeatedly, and some of them have close brushes with the Earth," said Melott. "But comets are a whole different ball game. They don't do that circular thing. They come straight in from far, far out — and you don't see them coming until they push out a tail only a few years before they would enter the inner solar system. So we could be hit by a comet and only have a few years' warning — possibly not enough time to do anything about it."

Source: University of Kansas

Citation: Kansas scientists probe mysterious possible comet strikes on Earth (2009, December 14) retrieved 23 April 2024 from https://phys.org/news/2009-12-kansas-scientists-probe-

mysterious-comet.html