Meteor no longer prime suspect in great extinction

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The greatest mass extinction in Earth's history also may have been one of the slowest, according to a study that casts further doubt on the extinction-by-meteor theory.

Creeping environmental stress fueled by volcanic eruptions and global warming was the likely cause of the Great Dying 250 million years ago, said USC doctoral student Catherine Powers.

Writing in the November issue of the journal *Geology*, Powers and her adviser David Bottjer, professor of earth sciences at USC, describe a slow decline in the diversity of some common marine organisms.

The decline began millions of years before the disappearance of 90 percent of Earth's species at the end of the Permian era, Powers shows in her study.

More damaging to the meteor theory, the study finds that organisms in the deep ocean started dying first, followed by those on ocean shelves and reefs, and finally those living near shore.

"Something has to be coming from the deep ocean," Powers said. "Something has to be coming up the water column and killing these organisms."

That something probably was hydrogen sulfide, according to Powers, who cited studies from the University of Washington, Pennsylvania State

University, the University of Arizona and the Bottjer laboratory at USC.

Those studies, combined with the new data from Powers and Bottjer, support a model that attributes the extinction to enormous volcanic eruptions that released carbon dioxide and methane, triggering rapid global warming.

The warmer ocean water would have lost some of its ability to retain oxygen, allowing water rich in hydrogen sulfide to well up from the deep (the gas comes from anaerobic bacteria at the bottom of the ocean).

If large amounts of hydrogen sulfide escaped into the atmosphere, the gas would have killed most forms of life and also damaged the ozone shield, increasing the level of harmful ultraviolet radiation reaching the planet's surface.

Powers and others believe that the same deadly sequence repeated itself for another major extinction 200 million years ago, at the end of the Triassic era.

"There are very few people that hang on to the idea that it was a meteorite impact," she said. Even if an impact did occur, she added, it could not have been the primary cause of an extinction already in progress.

In her study, Powers analyzed the distribution and diversity of bryozoans, a family of marine invertebrates.

Based on the types of rocks in which the fossils were found, Powers was able to classify the organisms according to age and approximate depth of their habitat.

She found that bryozoan diversity in the deep ocean started to decrease about 270 million years ago and fell sharply in the 10 million years before the mass extinction that marked the end of the Permian era.

But diversity at middle depths and near shore fell off later and gradually, with shoreline bryozoans being affected last, Powers said.

She observed the same pattern before the end-Triassic extinction, 50 million years after the end-Permian.

Source: University of Southern California

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