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Core Samples from Chicxulub are Revealing

Adapted from Information by Purdue University and The International Ocean Discovery Program

We've all heard the story about the demise of the dinosaurs over 60 million years ago, when an asteroid the size of a small city smashed into the Earth. In addition to causing the extinction of the dinosaurs, the asteroid left a scar several miles underground and more than 115 miles wide under the Yucatán Peninsula of Mexico.

Chicxulub is the best preserved, large impact crater on the planet even though it has become buried underneath a half mile of rocks. It's also the only crater on the planet with a mountainous ring of smashed rocks inside its outer rim, called a peak ring. Scientists have long wondered and debated how these features form. However, a new study indicates they're a product of extremely strong vibrations in the Earth which allowed rock to flow like liquid for a crucial few minutes after the impact.

Photos courtesy of IODP.

"For a while, the broken rock behaves as a fluid," said Jay Melosh, a professor of earth, atmospheric, and planetary sciences at Purdue University. "There have been a lot of theories proposed about what mechanism allows this fluidization to happen, and now we know it's really strong vibrations shaking the rock constantly enough to allow it to flow."

It's called acoustic fluidization, and it's what allowed the ring of mountains in the crater's center to rise within minutes of the asteroid's strike.

Craters are essentially the same on all terrestrial planets - Earth, Mercury, Venus, Mars, and even our Moon. Obviously we can't study the craters in space as thoroughly as we can on Earth, but understanding the consequences of large asteroid strikes teaches us about the potential impacts in other parts of our solar system.

Accessing the Chicxulub crater, which has been buried for the past 66 million years, wasn't easy. The International Ocean Discovery Program (IODP), a group within the International Continental Scientific Drilling Program, wanted to get a better look at the crater, so they drilled into it. The team drilled a core roughly six inches in diameter and a mile into the Earth, collecting rock which was shattered and partly melted by the impact.

While examining fracture zones and patterns in the core, the international research team found an evolution in the vibration sequence which would allow debris to flow.

"These findings help us understand how impact craters collapse and how large masses of rock behave in a fluid-like manner in other circumstances, such as landslides and earthquakes," Melosh said. "Towns have been wiped out by enormous landslides, where people thought they were safe but then discovered that rock will flow like liquid when some disturbance sets a big enough mass in motion."

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