

## Dating earthquakes - Written in stone

Thursday, 02 October 2008

A new way of detecting ancient earthquakes, writes The Economist, Oct 2nd 2008 at <http://www.economist.com>. Forwarded by Budhi Mulyawan 101008.

On December 16th 1811, the residents of New Madrid, Missouri, were startled out of their beds by a huge earthquake, which was quickly followed by a second. Those who survived the catastrophe reported that cracks opened in the earth's surface, that the ground rolled visibly in waves and that large areas of land sank downwards. The crew of the New Orleans, the first steamboat to ply the Mississippi, told locals that they had moored on an island the evening before the earthquake only to discover that it was gone in the morning. People in places as far away as Boston declared that they heard church bells ringing at the time the earthquake happened.

That huge earthquakes occur in parts of North America outside their traditional habitat on the Pacific margin is well known from accounts like those from New Madrid. Such records, however, have been kept only since Europeans arrived, so it has been hard to work out how active the faults that cause them are. Now it is a little easier. A study carried out by Samuel Panno of the Illinois State Geological Survey and his colleagues has revealed that nearby caves store the dates of past earthquakes in stone.

Dr Panno and his team found their recording angel in the form of stalagmites, the conical projections that grow on the floors of limestone caves. (The structures that hang down above them are called stalactites.) They made their discovery when they were using a radioactive dating technique to check the ages of small stalagmites occupying a number of caves in the Midwest. Many of these stalagmites, they found, had come into existence at about the same moment, and that moment coincided with the New Madrid earthquake.

This makes sense. Stalagmites form when water trickles through crevices in a cave's ceiling and drips to the floor. Each drop carries with it a quantity of dissolved calcium carbonate (the defining ingredient of limestone) that it has picked up while flowing through the rock above. When a drop lands, some of this mineral is deposited at the landing site, where it accumulates, forming a stalagmite. A paper to be presented at a meeting of the Geological Society of America in Houston on October 5th by Dr Panno's colleague Keith Hackley suggests that when large earthquakes shake the ground, new cracks in cave ceilings open. The result is the formation of a new generation of stalagmites.

Like trees, stalagmites are often composed of concentric layers that represent annual growth periods. Counting the layers is one way of assessing how old a stalagmite is. But radioactive dating provides a second, and sometimes more accurate, assessment. In this case the geologists drilled into the stalagmites and estimated their age from the way that uranium decays into an isotope of thorium. Many, they found, dated back to 1811, while others began life in 1917, the date of another nearby earthquake.

Subsequent investigation has confirmed a further seven big earthquakes previously suspected to have happened over the course of the past 18,000 years. An average interval between quakes of 2,500 years is a hopeful sign for New Madrid's immediate future. But if the technique can be tried out in other places it might reveal areas now thought safe, precisely because there has not been a recent earthquake, that are actually under threat.