

# Indonesia cave reveals history of ancient tsunamis

December 24 2013, by Margie Mason

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In this Monday, Dec. 2, 2013 photo, a guide stands at the entrance of a cave which scientists said reveals history of ancient tsunamis in Lhong, Aceh province, Indonesia. The cave discovered near the source of 2004's massive earthquake-spawned tsunami in Indonesia contains the footprints of past gigantic waves dating up to 7,500 years ago, a rare natural record suggesting future generations living in the coastal area must stay prepared because disasters can occur in relatively short bursts or after long lulls. (AP Photo/Heri Juanda)

A cave discovered near the source of Indonesia's massive earthquake-

spawned tsunami contains the footprints of past gigantic waves dating up to 7,500 years ago, a rare natural record that suggests the next disaster could be centuries away—or perhaps only decades.

The findings provide the longest and most detailed timeline for tsunamis that have occurred off the far western tip of Sumatra island in Aceh province. That's where 100-foot (30-meter) waves triggered by a magnitude-9.1 earthquake on Dec. 26, 2004, killed 230,000 people in several countries, more than half of them in Indonesia.

The [limestone cave](#), located within a couple hundred yards (meters) of the coast near Banda Aceh, is about 3 feet (1 meter) above knee-high tide and protected from storms and wind. Only huge waves that inundate the coastal area are able to gush inside.

Researchers in 2011 uncovered seabed sand deposits that were swept into the cave over thousands of years and neatly layered between bat droppings like a geological cake. Radiocarbon analysis of materials, including clamshells and the remains of microscopic organisms, provided evidence of 11 tsunamis before 2004.

The disasters were by no means evenly spaced, said lead researcher Charles Rubin from the Earth Observatory of Singapore. The last one occurred about 2,800 years ago, but there were four others in the preceding 500 years.

And it's possible there were others. Researchers know, for instance, that there were two mammoth earthquakes in the region around 1393 and 1450. Rubin said a big tsunami could have carried away evidence of other events through erosion.



In this Monday, Dec. 2, 2013 photo, a guide stands inside a cave which scientists said reveals history of ancient tsunamis in Lhong, Aceh province, Indonesia. The cave discovered near the source of 2004's massive earthquake-spawned tsunami in Indonesia contains the footprints of past gigantic waves dating up to 7,500 years ago, a rare natural record suggesting future generations living in the coastal area must stay prepared because disasters can occur in relatively short bursts or after long lulls. (AP Photo/Heri Juanda)

The scientists are still working to determine the size of the waves that entered the cave.

"The take-home message is perhaps that the 2004 event doesn't mean it won't happen for another 500 years," said Rubin, who added that the cave was discovered by chance and not part of planned field work. "We did see them clustered together closer in time. I wouldn't put out a warning that we're going to have an earthquake, but it shows that the timing is really variable."

The quake that triggered the 2004 tsunami surprised scientists because the fault that unleashed the megathrust temblor had been quiet for hundreds of years. And since the last big earthquake had struck more than 500 years earlier, there was no surviving oral history that could have helped people understand the risk.

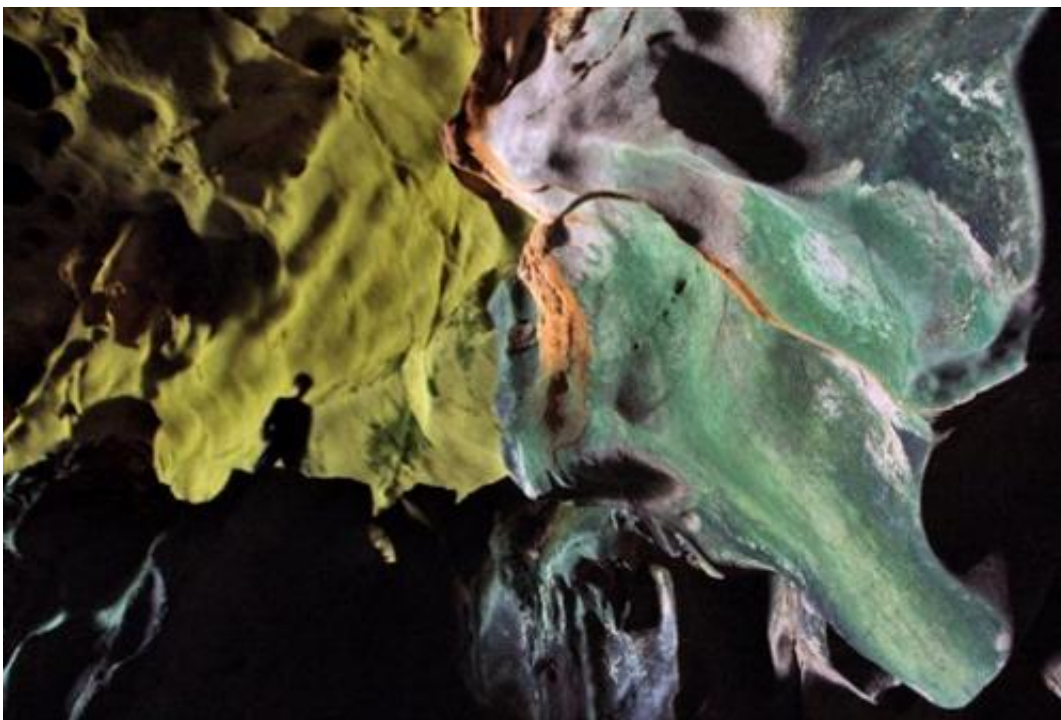


In this Monday, Dec. 2, 2013 photo, a guide uses candles to illuminate the interior of a cave which scientists said reveals a history of ancient tsunamis in Lhong, Aceh province, Indonesia. The cave discovered near the source of 2004's massive earthquake-spawned tsunami in Indonesia contains the footprints of past gigantic waves dating up to 7,500 years ago, a rare natural record suggesting future generations living in the coastal area must stay prepared because disasters can occur in relatively short bursts or after long lulls. (AP Photo/Heri Juanda)

Since 2004, much research has been done to try to learn about the area's past by examining sand deposits, uplifted coral and GPS data.

"The findings are very significant," Katrin Monecke, a geosciences professor at Wellesley College in Massachusetts wrote in an email. She worked on tsunami sand deposits discovered in marshes in the area, but was not involved with the cave research, which was presented this month at an American Geophysical Union conference in San Francisco. "The sand sheets in the cave cover a very long time span and give an excellent idea about earthquake frequency."

Despite the long record preserved in the cave, Rubin said it did not provide any clear clues about tsunami frequency or when events might happen in a relatively close period of time.



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bursts or after long lulls. (AP Photo/Heri Juanda)

Geologist Kerry Sieh, director of the Singapore group and also part of the [cave](#) investigation, has predicted that another monster quake could rock the area in the next few decades. They tend to come in cycles and the 2004 temblor heaped more pressure on the fault. However, the history is so variable, it's impossible to make an exact forecast.

"By learning about the type of tsunamis that happened in the past, maybe we can do planning for mitigation for the next tsunami," said Nazli Ismail, head of the physics and geophysics department at Syiah Kuala University in Banda Aceh who worked on the project.

Indonesia is an archipelago located on the so-called "Ring of Fire," a horseshoe of fault lines and volcanoes surrounding the Pacific Basin. It is home to some of the world's biggest and deadliest seismic activity.

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