



SCIENTISTS EXPLAIN THE ORIGIN OF SOUTH ASIA'S DEADLY TSUNAMI

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The earthquake that triggered massive tsunamis in South Asia Dec. 26, killing more than 100,000 people and leaving millions more homeless, was centered deep under the Indian Ocean off the coast of Indonesia. As relief workers struggle to help survivors, scientists are working to better understand the forces that unleashed such devastation.

What caused the tsunami?

The most powerful earthquake in 40 years -- measuring 9.0 on the Richter scale -- occurred approximately four miles below the Indian Ocean near the Indonesian Island of Sumatra. Scientists say this happened when two of the major plates that make up the Earth's crust, the India plate and the Burma plate, collided and created a tsunami, or extremely powerful waves.

"[The earthquake] causes large-scale immediate uplifting of the terrain under the water that creates a massive wave. That wave travels very efficiently across the ocean. And so it shows up hundreds and even thousands of miles away with much of the same energy that it started with," said Jim Devine, a senior science adviser to the director of the U.S. Geological Survey, the government agency in charge of monitoring earthquakes.

These large wave swells, some of which traveled 3,000 miles to the African coast of Somalia, caused the majority of the death and destruction throughout Sri Lanka, India, Indonesia, Thailand and Malaysia.

"I myself was out swimming in the sea with my husband when all of a sudden we heard screams from the beach to return to the shore. We had no idea why. I started to return to the beach and as soon as I got there, I turned my back again and to see what I can only describe as a wall of water approaching," said Di Ridley, a television news producer on her honeymoon in Thailand.

Tsunamis

The term tsunami, which is often incorrectly referred to as a tidal wave, was officially adopted for general use in 1963 during an international scientific conference. It is a Japanese word represented by two characters: "tsu" which means harbor and "nami" which means wave.

Most waves that hit the typical beach are wind generated. Smaller and less powerful than other waves, wind-generated waves have a period -- the time between two successful waves -- of five

to twenty seconds. Their wavelength -- the distance between two successful waves -- is usually about 50 to 600 feet.

Tsunamis, on the other hand, can have periods between ten minutes and one hour and a wavelength in excess of 430 miles.

With an underwater disturbance like an earthquake, millions of gallons of seawater are suddenly and violently displaced. The waves they create radiate in all directions from the epicenter of the quake, moving at the speed of a commercial jet. As they get closer to a shoreline or coast the front of the tsunami wave slows due to friction. The waves behind stack up onto each other creating a pile of waves that can reach 30 feet, hitting land with enough force to flatten buildings and trees and carry boats and ships miles inland.

Why weren't people warned?

Unfortunately, scientists say, the earthquakes that cause such massive tsunamis are notoriously hard to predict. They may be able to predict where large quakes are likely to occur but not exactly when.

There are systems to warn people that a tsunami is approaching, but the system of sensors can cost countries an enormous amount.

"A system to record, identify and get the word out to all the countries is expensive. And for something that only happens once every 100 years or so, it is very difficult to justify having such a system. We only put one in place in the Pacific Ocean in 1967 after the 1964 earthquake, which killed many people in Hawaii and even in California," Devine said.

Because earthquakes of this magnitude are rare in the Indian Ocean, warning systems like those in the Pacific had not been put into place. But, following the destruction of December's tsunamis, India has announced that it will install an early tsunami warning system to predict the lethal waves in the future. The \$27 million project should take two and a half years to implement, according to India's Science and Technology Minister Kapil Sibal.

The existing international warning system, which attempts to predict tsunamis in Pacific-Rim countries, did record the giant earthquake that created the deadly tsunami. But without ocean sensors in the region they were unable to determine the size of the waves or their direction.

The human toll of the earthquake and deadly tsunamis will not be fully known for weeks, as doctors, relief workers and government officials struggle to help those injured and in need. But scientists in all the heavily affected nations have already set to work to try and improve the prediction and tracking of these deadly waves in hopes that the horrifying death and destruction won't be repeated in the future.

--Compiled by Annie Schleicher for NewsHour Extra

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