One year after Solomon Islands, scientists learn barrier to earthquakes weaker than expected

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On the one year anniversary of a devastating earthquake and tsunami in the Solomon Islands that killed 52 people and displaced more than 6,000, scientists are revising their understanding of the potential for similar giant earthquakes in other parts of the globe.

Geoscientists from The University of Texas at Austin’s Jackson School of Geosciences and their colleagues report this week that the rupture, which produced an 8.1 magnitude earthquake, broke through a geological province previously thought to form a barrier to earthquakes. This could mean that other sites with similar geological barriers, such as the Cascadia Subduction Zone in northwestern North America, have the potential for more severe earthquakes than once thought.

In an advance online publication in the journal *Nature Geoscience*, the scientists report that the rupture started on the Pacific seafloor near a spot where two of Earth’s tectonic plates are subducting, or diving below, a third plate.

The two subducting plates—the Australian and Woodlark plates—are also spreading apart and sliding past one another. The boundary between them, called Simbo Ridge, was thought to work as a barrier to the propagation of a rupture because the two plates are sliding under the overriding Pacific plate at different rates, in different directions, and each is likely to have a different amount of built-up stress and friction with the overlying rock. But the boundary did not stop the rupture from spreading from one plate to the other.

“Both sides of that boundary had accumulated elastic strain,” says Fred Taylor, a researcher at the university’s Institute for Geophysics and principal investigator for the project. “Those plates hadn’t had an earthquake for quite a while and they were both ready to rupture. When the first segment ruptured, there was probably stress transferred from one to the other.

“What our work shows is that this is a barrier, but not a reliable one,” says Taylor. In other words, it resists rupturing, but not insurmountably. The work has implications for earthquakes in other parts of the world.

“Cascadia is an important boundary because of its potential for a great earthquake in the future,” says Taylor. “You have these transform faults separating the plates—Juan de Fuca, Gorda and Explorer. If such boundaries are not a barrier to rupture in the Solomons, there’s no reason to believe they are in Cascadia either.”

The last great earthquake along the Cascadia Subduction Zone was in the year 1700. The intensity of the quake has been estimated at around magnitude 9. If it happened today, it could be devastating to people living in the northwestern U.S. and western Canada. The geological record suggests such great quakes occur there every few hundred years.

The scientists were able to piece together where and how the fault near the Solomons ruptured by observing how it affected corals living in shallow water around the islands. Because corals normally grow right up to the low-tide water mark, scientists can readily measure how far they have been displaced up or down by an earthquake. In the case of uplift, scientists measure how far the coral dies back from its previous height as a result of being thrust up out of the water. In the case of subsidence, scientists measure how deep the coral is compared to its usual maximum depth below sea level.

“In many ways the corals are much better than manmade instruments as you don't need to deploy corals or change their batteries—they just go on measuring uplift and subsidence for you anyhow,” says Taylor.

With funds from the Jackson School of Geosciences, Taylor was able to travel to the Solomons just 10 days after the earthquake to make observations, an extremely swift trip in the world of scientific field work. It was part of a new rapid response capability the Jackson School is developing for research that cannot wait several months for government or foundation grants to be approved.

“The trip wouldn’t have happened without the Jackson School support,” said Taylor. “We are extremely grateful for that.”

Source: University of Texas at Austin

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