

New data: Mega-quake could strike near Seattle

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Using sophisticated seismometers and GPS devices, scientists have been able to track minute movements along two massive tectonic plates colliding 25 miles or so underneath Washington state's Puget Sound basin. Their early findings suggest that a mega-earthquake could strike closer to the Seattle-Tacoma area, home to some 3.6 million people, than was thought earlier.

The deep tremors, which humans can't feel, occur routinely every 15 months or so and can continue for more than two weeks before they die back to undetectable levels.

The instruments are detecting an inch or two of movement -- known as "episodic tremor and slip" -- as the Juan de Fuca plate grinds and sinks beneath the North American plate. Closer to the surface, the two plates are locked together. When they snap, scientists say, it could produce a massive 9.0 or greater earthquake and a tsunami.

By comparison, the largest earthquake ever recorded was 9.5 on the Richter scale, in Chile in 1960. The largest in North America was the 9.2 Great [Alaska](#) Earthquake in 1964, which killed nine people and spawned a tsunami that struck the Northwest coast. The 1906 [San Francisco](#) earthquake, which killed 750 to 2,500 people, was estimated to be an 8.2.

Whereas the scientists once predicted that a mega-earthquake would be centered just off the Northwest coast, now -- using data from the

tremors research -- they say that it could be 30 miles or more inland, under the Olympic Peninsula, which lies to the west of [Seattle](#) and Tacoma across Puget Sound.

"The closer you are to the source, the stronger the shaking," said Steve Malone, a research professor emeritus at the University of Washington.

Exactly how much stronger, and how much more damage such a quake would cause in the Puget Sound area, hasn't been calculated, Malone said.

While there's still plenty of debate about the findings within the scientific community, and while they may not be consistent with the models that geologists have developed, state officials are aware of the latest studies.

"People are aware of the possibility," said John Vidale, a professor of geophysics at the University of Washington and the state's seismologist. "We haven't exactly calculated the impact, but bringing the fault closer (to metropolitan areas) could increase the shaking."

Scientists have spent years studying what's known as the Cascadia subduction zone, an area where the two tectonic plates collide that stretches roughly 600 miles off the coast of Northern California to southern British Columbia, Canada.

As the Juan de Fuca plate slides under the North American plate, the two can become locked. When plates become locked, pressure builds. The pressure is released in what scientists call a mega-thrust earthquake, which easily can be magnitude 9.0. The Sumatra-Andaman Islands earthquake the day after Christmas in 2004 was a 9.2 mega-thrust quake that produced a devastating Indian Ocean tsunami that killed an estimated 233,000 people in 11 countries.

The last mega-thrust earthquake along the Cascadia subduction zone, estimated at 9.2, was in January 1700. It produced a tsunami that reached Japan. Cascadia subduction zone mega-thrust earthquakes happen on average every 400 to 500 years, but they can happen as little as 300 years apart or as much as 800.

A mega-thrust earthquake would be different from those that shake the Northwest occasionally. A mega-thrust quake occurs right on the boundary of two tectonic plates, while other earthquakes occur along cracks in the plate. Vidale likened what's going on beneath the Earth's crust to a bunch of blocks jostling around. Where the smaller blocks collide, you can have more standard-type quakes. Where the biggest blocks, the [tectonic plates](#), collide, you have a mega-thrust earthquake.

Since the deep tremors were first detected 15 years ago, scientists have been trying to determine what was causing them along the Cascadia subduction zone. Eventually, they concluded that the tremors reflected the slippage of the Juan de Fuca plate under the North American plate.

"It's a burst of noise that can go on for up to 24 hours over a period of several weeks," said Herb Dragert, a geophysicist with the Geological Survey of Canada in Victoria, British Columbia, who was among those who first developed the theory.

What's unique about the deep tremors, which occur in an area stretching roughly from Olympia, Wash., to Canada's Vancouver Island, is that they reappear about every 15 months. While tremors have been detected elsewhere along the Cascadia [subduction zone](#), none is as regular or as prolonged as those in the Puget Sound basin, Dragert said.

"Every 15 months it's like tightening the guitar string a little more," Dragert said. "You don't know whether it will take it beyond the break zone."

According to the timetable, episodic tremor and slip should be going on just about now. Instead, it came last spring, catching scientists by surprise. Malone said that some tremors were detected southwest of Olympia last week, but that it was too soon to determine whether they were part of a new episode or just isolated ones.

If all the energy associated with tremors over two weeks were released in 10 seconds, Vidale said, it would equal a 7.0 [earthquake](#).

Similar deep [tremors](#) are being tracked at other subduction zones around the globe, including in Alaska, Japan, Mexico and Chile.

ON THE WEB

Pacific Northwest Seismic Network:
www.ess.washington.edu/SEIS/PNSN

U.S. Geological Survey: www.usgs.gov

Geological Survey of Canada: tinyurl.com/5n97nf

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