Mondo Quake in Pacific Northwest?

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Geologists have discovered evidence of a massively powerful earthquake zone beneath the Pacific Northwest just offshore from the Seattle area.

They made the discovery by piecing together ancient accounts of a giant Japanese tsunami and a computer simulation of a huge temblor in the 17th century.

Thought to be inactive, the earthquake zone runs 600 miles up the Pacific Coast from Northern California to southern British Columbia. It appears to be subject to monster quakes every 500 years.

Known as the Cascadia subduction zone, the fault could threaten Vancouver, Portland and Seattle, which are full of buildings and high rises not built to withstand massive earthquakes.

"This region has the potential for truly enormous earthquakes," said Brian Atwater of the U.S. Geological Survey, one of three authors of a new paper about a giant 17th-century quake along the fault.

Published in the *Journal of Geophysical Research-Solid Earth*, the paper catalogs evidence for a magnitude-9 quake, which sent a tsunami across the Pacific to wreak havoc in Shogun-era Japan.

The idea that the Cascadia region caused the tsunami isn't new; Japanese researchers first floated the idea in 1996. But the paper's authors present a solid case that a magnitude-9 quake on Tuesday, January 26, 1700, sent a 15-foot tsunami into Japan about 14 hours later.

The paper, authored by Atwater, Kenji Satake of the Geological Survey of Japan and Kelin Wang of the Geological Survey of Canada, also presents a new

computer model of the cataclysmic event.

In the United States, the quake survives only in Native American legend, but in Japan, the tsunami was well-documented, Atwood said.

"It flooded farmed fields, ruined salt kilns, damaged fishermen's shacks, ascended a castle moat, entered a government warehouse, drove people to high ground, and probably ran 2 kilometers up a river," the paper says. "It wrecked houses not only by flooding them but also by starting a fire. It contained multiple waves that range in reported time from midnight until the following noon. The tsunami initiated a nautical accident in which were lost two crew members and tons of rice."

The geologists say several pieces of geological evidence exist in the United States that indicate a big quake happened about 300 years ago, including a 5-foot shelf in the ocean floor. But whether the quake caused the Japanese tsunami, or is coincidental, has not been clear.

Atwood said the link was provided by stands of dead trees along the coast that drowned in seawater between August 1699 and January 1700. Their time of death was determined by the trees' last growth ring.

"That's the tightest link we have between the Japanese tsunami and the evidence in North America," said Atwood.

During the quake, the sea floor stretched 60 feet and dropped 5 feet. "It was a sudden lowering of a sizeable chunk of the ocean floor," Atwood said, "The ocean rushed in, and that's what created the tsunami."

In Japan, Satake created a detailed computer model showing how the tsunami crossed the Pacific before crashing into Japan.

Atwood said the geological record indicates the fault ruptures about once every 500 years and is capable of unleashing "truly giant earthquakes."

He said only three quakes this century compare in magnitude -- a 9.0 quake in Kamchatka in 1952, a 9.5 quake in Chile in 1960 and a 9.2 temblor in Alaska in 1964.

"The 1906 earthquake (in San Francisco) was a very big earthquake, but this thing in 1700 was in a different class," said Atwood.

He said the fault, which is long and slopes gently under the North American tectonic plate, is characterized by tremors that last for several minutes. "It is very challenging for building design," he said. "Most earthquakes don't last that long. We have no experience for building to withstand it."

Thomas Heaton, an earthquake expert at CalTech, said the research was pretty solid.

"Clearly, something very unusual happened in the winter of 1700 in the Pacific Northwest, and it coincided with a pretty remarkable tsunami in Japan," Heaton said. "It could, of course, be a coincidence, but I think they've made a pretty good case."

Heaton said the Cascadia subduction zone is worrying because no one knows how buildings in the region, especially high rises, will behave in these twice-a-millennium events.

"People don't have an adequate understanding of events of this magnitude," he said. "Most buildings in Seattle, Vancouver and Portland were built without consideration for this kind of event.

"Most wooden buildings would ride it out adequately," he said. "Unreinforced masonry might have problems ... and tall buildings ... and the big bridge ... are the most sensitive to long-period ground motions."

So, would they fall down?

"We don't really know what to expect," Heaton replied. "We have no good recordings."