New analysis of earthquake zone raises questions

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Oregon State University scientists have completed a new analysis of an earthquake fault line that extends some 200 miles off the southern and central Oregon coast that they say is more active than the San Andreas Fault in California.

The Blanco Transform Fault Zone likely won't produce the huge earthquake many have predicted for the Pacific Northwest because it isn't a subduction zone fault. But the scientists say an earthquake of magnitude 6.5 to 7.0 is possible, if not probable in the near future, and their analysis suggests that the region may be under some tectonic stress that potentially could affect the Cascadia Subduction Zone.

Results of the study were just published in the *Journal of Geophysical Research.*

During the past 40 years, there have been some 1,500 earthquakes of magnitude 4.0 or greater along the Blanco Transform Fault Zone, and many thousands of smaller quakes. The Blanco fault is the boundary between the Juan de Fuca and the Pacific plates. As the Juan de Fuca plate moves to the east, it is subducted beneath the North American plate at the rate of about 1.5 inches per year. But as it moves, it must break free of the adjacent Pacific plate.

This slippage causes the numerous earthquakes, according to John Nabelek, an associate professor in OSU's College of Oceanic and Atmospheric Sciences and one of the authors of the study. When the

earthquakes that relieve stress do not account for predicted motion rates, he added, it raises questions.

"The eastern portion of the fault has moved at a predictable rate and the earthquake activity associated with it has been what we would expect," Nabelek said. "But the western part of the fault has been lagging in terms of the number and size of earthquakes. It seems to be straining, absorbing the motion.

"It could mean that the fault is getting ready for a large earthquake, or it could mean that the movement has been so gradual that we couldn't detect it," he added.

The OSU study is important because the Blanco Transform Fault has become the most intensely studied ocean transform fault in the world. Its close proximity to the Oregon coastline puts it within reach of land-based seismographs that can detect moderate ocean earthquakes. Another key is the research done at OSU's Hatfield Marine Science Center, where marine geologist Bob Dziak monitors undersea seismic activity using a hydrophone system deployed by the U.S. Navy.

In April of this year, Dziak reported on a swarm of 600 earthquakes in 10 days in this region, including magnitude 5.4 and 5.0 events.

"Land stations also detected a four-fold increase in the number of earthquakes along the Blanco fault in 2008 compared to background rates," Nabelek said, "with the largest anomaly in the enigmatic western part."

Jochen Braunmiller, a research associate in OSU's College of Oceanic and Atmospheric Sciences and lead author on the paper, says land-based seismographs can detect earthquakes of 4.0 or greater along the Blanco fault, and the ocean hydrophones monitored by Dziak can pick up

quakes down to a magnitude of 3.0 and sometimes smaller, depending on location.

"Our monitoring may be missing a lot of earthquakes that are less than 3.0," Braunmiller said. "The western side of the fault may be experiencing a series of mini-quakes that we can't detect, or it could be slowing creeping along in a way we cannot measure.

"But we can't discount the possibility that its energy hasn't been released and it will some day in the form of a good-sized earthquake," Braunmiller added.

The risk of a major tsunami from an earthquake in this transform fault is slim, the scientists point out, because the plates move sideways past each other. "You need quite a bit of vertical displacement on the ocean floor to generate a tsunami," Braunmiller said, "and earthquakes along the Blanco fault don't generate it."

The Blanco Transform Fault Zone begins at a point about 100 miles off of Cape Blanco, south of Bandon, Ore., and extends in a northwest direction to a point about 300 miles off of Newport. Of all the world's ocean transform faults – or those that lie between tectonic plates – it is the closest to shore and can be monitored more readily by land-based seismographs.

Northwest scientists have approximately 60 such land-based seismographs deployed from British Columbia to California that can pick up moderate offshore quakes.

"Between the land-based network, the hydrophones and other instruments, the threshold of detection for earthquakes has definitely lowered over the past 20 years," Nabelek said. "But we still can't tell whether the western part of the fault has thousands, or even millions of

infinitesimal slips – or it is building up to a major earthquake."

Source: Oregon State University