

## **Not My Fault: Transitions can be messy**

Lori Dengler/For the Times-Standard

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Several people have mentioned reading my 'letter to the editor' in the paper two weeks ago but weren't quite sure of my point. So an explanation seems to be in order. Over the years I have written a number of "My Word" Guest Opinions for ShakeOut and Tsunami Week. The Times-Standard is now graciously allowing me a regular biweekly "Not My Fault" column for me to muse on earthquakes and tsunamis both at home and elsewhere in the world.

This week it is an earthquake, which though far away, has several important lessons for us.

On Sunday November 13 (Nov. 14 in New Zealand) a magnitude 7.8 earthquake struck New Zealand's South Island. It was centered 58 miles north of Christchurch and ruptured along a series of faults extending at least 100 miles to the northwest. It is tied for the largest quake of 2016 – along with the March Sumatra and April Ecuador temblors. The New Zealand quake killed two and caused extensive damage to roads and structures.

Note I said "faults". All earthquakes occur on faults but the overwhelming majority rupture one fault at a time. The New Zealand earthquake is looking to be far more complex.

The quake started off slowly and seemed like an ordinary moderate event at first. People in the area described the shaking as noticeable but not particularly strong. Then the rupture picked up steam, jumping to other faults with much larger displacements. At least six faults and perhaps more participated in the rupture. The initial slip showed reverse motion with one side being pushed up and over the other, but the displacements further to the north were larger and showed both reverse and lateral motion. Nearly adjacent faults showed very different behavior – one fault exhibiting over 30 feet of lateral movement and another close by showing almost as much vertical motion.

Why the complexity and what does it mean for the North Coast?

The earthquake was less than two weeks ago and the answers are not yet clear. Reconnaissance teams are still working in the field and scientists have a mountain of data to analyze. But it is likely that part of the answer has to do with the tectonic setting.

The South Island, like Humboldt County, occupies a transition zone between two different tectonic regions. The South Island's Alpine fault and California's San Andreas are both transform boundaries where the movement is primarily horizontal. The Hikurangi trench off the east coast of New Zealand's North Island is a compressional boundary like Cascadia subduction zone. The November 13 earthquake straddled the different regimes and offers a glimpse into how transition zones operate.

One of the scientists looking into these questions is my colleague and HSU Geology Department Chair Mark Hemphill-Haley. Mark is an expert in neotectonics – the study of recent faults. He left Humboldt on Sunday to lead an NSF-sponsored Geotechnical Extreme Events Reconnaissance (GEER) Association team to investigate surface faulting produced by the quake. Much of the geologic evidence of faulting, landslides and other earthquake effects are ephemeral and quickly modified by weather and time so it is important for researchers to study the area soon after the event. Mark will be posting field updates of his observation in New Zealand on the HSU Geology Facebook page:  
[www.facebook.com/humboldtgeology](http://www.facebook.com/humboldtgeology).

The similarities between New Zealand and our area go beyond tectonics. Our climates, topography, economy and built infrastructure are also alike. The New Zealand earthquake provides a mirror of what will happen here when a similar-sized quake strikes.

Considering the magnitude of the earthquake, casualties and injuries were low. Like much of our area, the epicentral region was rural and most of the structures in the region were wood frame and generally resilient to strong shaking. But the damage to the infrastructure was enormous with roads and bridges disrupted by faulting and landslides and many communities have been isolated.

An obvious lesson from the New Zealand earthquake is to identify infrastructure vulnerabilities – like Del Norte County's Last Chance Grade - and do something beforehand to make them more resilient. The economic losses and replacement costs of an earthquake-caused failure of Highway 101 would make the costs of Caltrans

Last Chance Grade Project seem very small by comparison.

I am sure this earthquake has more lessons to teach. We can be good students and learn from the New Zealander's experience or ignore those lessons and pay a much higher price when we have our own quake.

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