

Not My Fault: Excitement at the triple junction

Lori Dengler/For the Times-Standard
Posted June 27, 2019

At 8:53 pm PDT on Saturday evening I was in the air over France en route from Johannesburg to London, eating a miserable airplane “breakfast” in steerage. It was the third leg of what would be a 32-hour transit from Zambia to the United States. If you were in the Cape Mendocino area, you were quickly jolted out of whatever you were doing. There was no question an earthquake was occurring and I hope you took care to drop to the ground, stay put and protect yourself by covering your head/neck with your arm and getting under a table or desk if one was nearby. If you were inside, you probably heard rattling sounds as the building shook, furniture slid and items toppled from shelves. Elsewhere in Humboldt County, you probably felt it if you were inside and recognized it as an earthquake.

Final analysis would peg the earthquake at a magnitude of 5.6 and locate it on shore about 4 miles SSW of Petrolia at a depth of 5 miles beneath the surface. The USGS Did You Feel It website reported more than 2800 felt reports, primarily from Humboldt County but a smattering from as far as Fort Bragg and Crescent City and inland to Redding. It was the most strongly felt earthquake in our area since the January 2010 M6.5 offshore of Eureka.

All earthquakes are caused by stress. The Cape Mendocino area is a triple junction region where forces are concentrated by the movements of three plates: Gorda, Pacific and North America. North of the triple junction, the Gorda plate and its northern cousin the Juan de Fuca plate are converging with North America and subducting beneath it along the Cascadia subduction zone. To the west, the Pacific and North American plates are moving horizontally relative to each other along the Mendocino fault. South of the triple junction, the North American and Pacific plates move horizontally along the San Andreas fault system. Year in and year out more earthquakes are recorded in the triple junction area than in any other part of the North Coast.

Maps depict the triple junction as a point. This is an oversimplification and causes confusion. A better way to think of it is a zone at least 30 miles across where the three plates grind against one another creating a variety of faults and some of the most complex geology in our

area. And whenever something big happens on one of the three fault systems extending outwards from the triple junction or in the adjacent plates, this zone lights up producing numerous aftershocks even when the earthquake epicenter may have been far away.

What happened on Saturday was not unusual or unexpected. Over the past twenty years, the average annual number of earthquakes of magnitude 3 or larger in the triple junction region is about 45. But there is considerable variation anywhere from 32 to 68. This year so far has been a little more active than usual with 42 at the halfway point. These numbers pale compared to 1992 when over 700 earthquakes were recorded in the triple junction region – not at all surprising as these were primarily aftershocks of the M7.2 Cape Mendocino earthquake.

Most triple junction earthquakes have been small – of magnitude 4 or less, but 5s and 6s are not unusual and going back to the turn of the century, there have been at two least 7s (1992 and 1923) that qualify as triple junction quakes.

Each earthquake brings lessons and discussion points and Saturday’s 5.6 is no exception. The initial USGS posting listed two quakes, a 5.6 and a 5.4 doublet at essentially the same time. This generated some alarm and a number of posts on social media. There was only one earthquake and a few minutes later, after seismologists had had a chance to review the seismic data, it was clear that the automated system had created a “ghost” quake and the listings were updated. This wasn’t an error, just a consequence of the need to balance getting information out quickly and the time to make a thorough review.

Initial postings on the USGS web site and various quake apps based on the USGS data, are from automated analysis. The Northern California seismic network consists of stations operated by the USGS and the Berkeley Seismology Lab. Digital data is streamed to an analysis system, which automatically picks signals above a background amplitude level. There are other filters that attempt to discriminate the signal from noise caused by human activities and wind and the surface wave signals from large earthquakes originating far away. Most of the time the system does a good job and initial estimates pop up in a few minutes and turn out to be close to the final assessment. On Saturday, the automated system interpreted the signals as belonging to two different events. Whenever the system posts an event large enough to be felt, seismologists are alerted and quickly review the data. In this case, it was clear that all of the

signals belonged to a single event. It's an important reminder that until you see the tag "REVIEWED" under the USGS Review Status, the results are preliminary and you shouldn't jump to any conclusions.

The big question is what does this earthquake mean for the future. Will the somewhat elevated level of activity continue? Could we have a stronger quake in the triple junction area? The answers are maybe and yes. There are no crystal balls when it comes to predicting earthquakes and the 2019 activity rate could slow, increase or continue as is. And of course we will have another strong earthquake – perhaps like 1992 in the triple junction region, or maybe offshore in the Gorda plate or on the Mendocino fault. It's only a question of when. Saturday's earthquake is another reminder that we live in earthquake country and the best way to assuage concerns is take actions to prepare.

Just a heads up – I've now missed the last two strong North Coast quakes. I was in the Heathrow airport in 2010 when the Eureka earthquake occurred and was about to land at Heathrow Saturday evening. In two weeks I head abroad again, but I won't be anywhere near Heathrow. But just to be safe – I suggest you brush up on your preparedness plans.

Lori Dengler is an emeritus professor of geology at Humboldt State University, an expert in tsunami and earthquake hazards. Questions or comments about this column, or want a free copy of the preparedness magazine "Living on Shaky Ground"? Leave a message at (707) 826-6019 or email Kamome@humboldt.edu

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