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Not My Fault: Did you feel it? There's been lot of little shaking going on.

Lori Dengler/For the Times-Standard
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Do I have your attention? If you felt any of the weekend tremors in the Cape Mendocino area, Monday's short jolt from south of Eureka, or the Wednesday morning 4.4 from east of Blue Lake, perhaps you are ready to think about earthquakes more seriously.

Most of the recent earthquake activity was centered in the Mendocino triple junction region near Cape Mendocino and the town of Petrolia. The triple junction is one of the most seismically active areas in California and experiences several earthquakes in the magnitude 2 to 3 range almost every week. The Mendocino triple junction marks the zone where the Pacific plate, the Gorda plate and the North American plates meet. It is also the area where three major plate-bounding fault systems - the San Andreas fault, the Mendocino fault, and the Cascadia subduction zone - come together.

On most maps, triple junctions are shown as a dot, giving the misconception that it is a single point. In fact, triple junctions are regions, characterized by numerous faults, folds and sheared up rock reflecting tens of millions of years of unrelenting strain accumulation. It's better to think of the Mendocino triple junction as a 20 to 30 mile diameter-wide zone of high deformation centered roughly on Cape Mendocino. It's a dynamic place, not only in terms of earthquakes today, but it continues to evolve. It was born roughly 30 million years ago when the Farallon plate, the progenitor of the Gorda plate, first hit the west coast roughly at the latitude of Los Angeles. As more of the old Farallon plate was consumed along the subduction zone, the triple junction marched north. By 15 million years ago it had made it to where San Francisco is today. Ten million years from now it will be further north, perhaps near Crescent City or Port Orford.

A swarm is a group of similar-sized earthquakes clustered in time and space. Swarms can last for days, weeks and, in some cases even years and may include anywhere from a handful of quakes to hundreds or thousands. This weekend's triple junction swarm began on Friday at 4:30 pm PST with a M2.9. It appears to have ended Sunday evening. In a 28-hour period, 25 earthquakes were recorded by the USGS in a small area 9 to 11 miles west of Petrolia. The swarm included three earthquakes in the magnitude 4 range and five M3s. The largest was Sunday's 4.5 at 2:18 pm local time, which received 286 felt reports to the USGS Did You Feel It web page ranging from Mendocino to Trinidad. By Sunday evening, activity in this area had stopped and as I write this, it appears that the swarm is over.

On Monday, even more people reported feeling a smaller earthquake SE of Eureka. The M3.1 occurred at 10:19 am PST, centered about three miles from Pine Hill. More than 400 people submitted felt reports from Fortuna to McKinleyville. Like the triple junction swarm, it was a shallow earthquake, about 5 miles beneath the surface. It was felt by more people because of the larger population nearby.

And just as I was about to wrap up this column on Wednesday morning, my chair rumbled and I thought, "oh drat another earthquake and I am going to need to rewrite this column". The Wednesday M4.4 earthquake at 10:23 am represented yet another of the North Coast's seismically active source areas. It was centered on land about 8 miles SSE of Blue Lake, 16 miles beneath the surface, much deeper than the triple junction or Pine Hill quakes. As I write this, 577 people have reported feeling it from Fortuna to Crescent City and inland to Redding.

Several questions immediately arise. The first, how are these earthquakes related and are they precursors to a bigger earthquake? The tremors mean you live in earthquake country and that the North Coast is just living up to its reputation as a seismically active place. All of these earthquakes are related in the sense that they are responding to the complex tectonic stresses in the region, but are probably not directly related to one another. The triple junction earthquakes weren't large enough to affect the regional stress in the Pine Hill area and the deeper earthquake east of Blue Lake was in a completely different tectonic regime. It was coincidence that they occurred so close together.

I don't believe that any of these earthquakes mean we are more or less likely to have a stronger earthquake in the near future. The North Coast is a seismically active place and the likelihood of a strong earthquake is larger here than in other parts of the country. As demonstrated this week, we have multiple sources of potentially damaging earthquakes, faults near the triple junction, offshore faults in the Gorda plate and Mendocino fault and onshore faults. Humboldt and Del Norte Counties also sit atop the southern portion of the Cascadia subduction

zone, a fault system capable of producing an earthquake of magnitude 9.

The second question, isn't it good to have small earthquakes to let of steam and keep larger ones from happening? Oh if only this were true. Unfortunately, small earthquakes don't release enough seismic energy to make any dent in the long-term strain accumulation. We would need about five M5 earthquakes every day for 500 years to equal what a single Cascadia M9 will release. M4 earthquakes are even less effective, requiring more than 150 a day to do that job.

Third question, what's the best thing to do when the ground start shaking? Drop, Cover and Hold On. The worst thing to do is to let your instincts take over and bolt for the door. The number one cause of injuries in California temblors is moving while the ground is shaking. The further you move, the more likely you are to get hurt. Dropping down to the ground will keep your instincts under control. Is there is a sturdy table or desk nearby? Get under it and hang on.

Earthquakes on the North Coast may be inevitable but they can be prepared for. Stockpiling food and water, developing a family or business emergency plan, and reducing the hazard from items that may topple or slide will help insure that you and your family will survive and thrive. And remember, earthquake shaking is the first warning you are likely to receive that a tsunami could be on its way. Find out if you live in a tsunami zone by looking for the entering/leaving tsunami zone signs or contacting your county Office of Emergency Services.

Note: The best way to visualize the birth and evolution of the Mendocino triple junction is with an animation. UC Santa Barbara emeritus professor Tanya Atwater has constructed a number of plate animations. Take a look at https://www.youtube.com/watch?v=9F8AcDJq2QU. The Gorda plate is the small southernmost piece of the Juan de Fuca plate.

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