

Not My Fault: Are recent earthquakes related?

Lori Dengler/For the Times-Standard
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A few more earthquakes were added to the 2020 tally in the past week. A 5.5 far offshore of the Humboldt coast occurred on May 18 followed the next day by a more widely felt 4.2 in the Mendocino triple junction region. Larger earthquakes have been reported in Nevada, Idaho and Utah over the past two months. This leads to the question of relationships – which earthquakes are connected and which are just coincidence?

Human brains are hard wired to find patterns. We see a series of events and jump to conclusions. Popular science writer Simon Winchester made such a leap after the 2011 Japan earthquake. He published a Newsweek article in March 2011 (<https://www.newsweek.com/scariest-earthquake-yet-come-66211>) asserting that earthquakes were following a rectangular path around the Pacific..

Winchester argued that the M8.8 in Chile in February 2010 led to a 6.2 in New Zealand the following year and the New Zealand quake triggered the M9.1 Japan earthquake 17 days later. To complete the rectangle, he suggested California or the Pacific Northwest was clearly next. There were many things wrong with his conjecture – the New Zealand 6.2 was an aftershock of a 7.1 earthquake five months earlier and there was no way such a moderate-sized quake could affect Japan nearly 6000 miles away, and he ignored several much larger earthquakes in the periods between the earthquakes including two 7.8's in Indonesia, a 7.6 in the Philippines and several 7s in the SW Pacific that didn't fit his picture, to name a few. The scientific outcry was so loud that Winchester gave a public apology at the Annual Meeting of the American Geophysical Union the following December.

My answer to the connection question for recent activity is a definitive Yes, No and Maybe.

Foreshocks and aftershocks are the easiest to connect. The May 18 5.5 is a good example. At 11:56 pm last Sunday, a magnitude 4.7 earthquake occurred near the Gorda ridge 160 miles west of Eureka. Six minutes later, a 5.5 was recorded in nearly the same location. Eight minutes after the 5.5, a 4.4 was noted, again in the same

area. The 4.7 is the foreshock, the 5.5 the mainshock and the 4.4 an aftershock. The close proximity in time and space is the linkage, so yes they are clearly related.

What about connections to other recent North Coast earthquakes, the 5.8 on March 8 on the Mendocino fault and a 5.2 ten days later just offshore of Cape Mendocino? The late Sunday/early Monday earthquakes near the Gorda ridge were over 130 miles from the March quakes and on different faults. Every earthquake changes stress in the rock nearby but the area of influence depends on magnitude. An earthquake in the magnitude 7-range can affect regional stresses for hundreds of miles. A 5.8 has a much smaller area of direct influence and I think it unlikely it had any direct relation to this week's quakes.

The two March earthquakes are a different story. They were 31 miles apart and connected by the Mendocino fault. It's reasonable to conjecture that the right lateral strike slip fault movement of the 5.8 added an incremental addition of stress to Mendocino triple junction region where the 5.2 was located.

So no direct connection between the Gorda ridge and the March earthquakes, but they are in the same neighborhood. The Gorda ridge is an active spreading center. The east-west extensional forces created by the movement of the Gorda plate and the Pacific plate away from each other was the cause of 5.5. As the Gorda plate moves away from the ridge to the east, it creates stress along the Mendocino fault and adds to stress in the triple junction region. I'll call the two March quakes siblings and this week's Gorda Ridge quakes second cousins.

On a larger scale, the lower 48 has been more seismically active than the norm of the past two decades. I did a quick analysis of the USGS earthquake catalog for the contiguous 48 states. On average over the past two decades there are 18 to 25 earthquakes in the magnitude 4.5 or larger range per year, releasing the energy equivalent to 115 kilotons of TNT. This past year (from June of 2019), 85 earthquakes of M4.5 or larger were reported and the energy released was nearly 100 times greater.

These recent earthquakes included the March 18 M5.7 near Salt Lake City (Utah's largest quake since 1992), the March 31 M6.5 in Idaho (the state's largest since the M6.9 Borah Peak earthquake in 1983), and the May 15 M6.5 in Nevada (the largest in the State since 1954). But in terms of energy release, these were small potatoes compared to the last July's M7.1 Ridgecrest earthquake in the Mojave

Desert of South-Central California, the largest onshore California quake since the 1992 M7.3 Landers earthquake.

Could the Ridgecrest earthquake have contributed to the earthquakes in our area or in Utah, Idaho and Nevada? A connection to Utah and Idaho earthquakes is tenuous at best. Those earthquakes were 460 and 600 miles away respectively and on different fault systems. I'll rule out the North Coast too. We are about the same distance away as Utah and have a very different tectonic setting. But I'd put a big 'maybe' on the May 15th earthquake in Nevada.

The Ridgecrest earthquake and the recent Nevada quake are in the Walker Lane/Eastern California shear zone fault system that extends from the Mojave Desert in SE California to the Idaho border. This fault system doesn't get nearly the press of the San Andreas but it is every bit as interesting. Next week, a more detailed introduction to Walker Lane and what it means to tectonics and hazards in the Western US.

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