

Not My Fault: November seismic surprises

Lori Dengler/For the Times-Standard
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A break is good for anyone, and it was nice to spend the long holiday focused on family, not earthquakes. But Mother Nature never takes vacations and now I'm playing catch up.

In the past two weeks there have been two deadly earthquakes, two tsunamis, and, if that wasn't quite enough, the world's largest volcano began erupting. Four other quakes caused damage and Alberta, Canada experienced its largest earthquake in recorded history.

The most notable of the earthquakes was a M5.6 on November 21 in western Java, Indonesia's most populous island. The death toll stands at 329 and nearly 8,000 injuries were reported. It is the second deadliest earthquake of 2022 to date, behind the June 22 M6 in Afghanistan that claimed 1,163 lives.

More than 1000 earthquakes earthquake in the magnitude 5 range occur each year, but few cause damage and casualties are even rarer. Why was this one so deadly? Location and exposure. The USGS estimated that 1.7 million people experienced strong to very strong ground motion. It was a shallow earthquake, only 7 miles beneath the surface centered only 40 miles from the greater Jakarta metropolitan area.

Had the earthquake been centered a similar distance from Los Angeles or San Francisco, the damage would have been minimal by comparison. I'll use the October 1987 M5.9 Whittier Narrows earthquake in Southern California as a comparison. It was also fairly shallow (8.7 miles) and produced ground shaking felt over an even larger area than the West Java quake. It did produce damage, killing eight, injuring hundreds and damaging more than 3000 structures. But the impacts were orders of magnitude less than what happened two weeks ago in Indonesia.

It's not difficult to come up with the reason. Building codes and building code enforcement. Indonesia has building codes similar to those in California and structures built according to those modern guidelines suffered little

damage on November 21. But many structures were built haphazardly and without oversight. Indonesian and international earthquake engineering teams are currently studying the causes of failure and I don't know all the details yet. But I am sure that inadequately braced structures played a role.

California building codes have improved since 1987 and the Whittier-Narrows earthquake. Every strong earthquake tests our construction methods and provides data for an upgrade. The 1994 Northridge quake was the most recent test in an urban area. We learned that some welds in steel frame buildings did not perform as they should. Codes were revised.

I am a big fan of building codes. I am an even bigger fan of code enforcement. Great codes on paper won't save lives if they don't go into practice. I've done remodels and know what a pain it is to deal with permits and building departments. I was annoyed at the time, but thankful they were on the job, and we could be reasonably assured the building was safe.

The biggest gap in our building codes is upgrading existing structures. Only schools and critical structures are supposed to meet recent code requirements. California does a good job with public K-12 schools, but not as good a job with universities, hospitals, and public safety structures. Los Angeles and San Francisco Counties have spearheaded efforts to retrofit other older structures, but the task is daunting and very expensive. Alas it may take the next major quake to move faster on this front.

Two tsunamis occurred while I was on break. On November 22 a one-inch tsunami was observed on Guadalcanal in the Solomon Islands after a M7 earthquake. The more interesting one occurred last Wednesday in New Zealand. The culprit was another 5.6 earthquake that was centered beneath Lake Taupo on New Zealand's North Island.

You must be scratching your head – a 5.6 earthquake on land causing a tsunami? Our tsunami outreach efforts are focused on oceans and big earthquakes that deform the sea floor. But tsunamis can occur in any large lake or reservoir when something deforms the lake floor. I don't know the details of the Taupo tsunami yet – it may be that the vibrations caused the entire lake to slosh (seiche), or there was some tectonic deformation of the lakebed in the earthquake (<https://www.gns.cri.nz/news/strong-earthquake-at-lake-taupo/>), but two small pedal boats were uplifted onto the grass.

I claim to have called the eruption of Mauna Loa (Not My Fault 11/12/22), but I am glad I was paying attention. Late Sunday evening November 30 the first eruption of the world's largest volcano began with fissures in the Northeast Rift Zone near the Mauna Loa summit. Earthquake activity abruptly increased in the hour before the earthquake. A 4.2 and 4.0 earthquakes, felt throughout the Island, accompanied that initial throat clearing. Nearly 200 small earthquakes were recorded in the first 24 hours.

The USGS Hawaii Volcano Observatory has been closely monitoring Mauna Loa, raising it to an Advisory or Yellow status in July 2019. It stepped up monitoring this August when earthquake activity increased and were centered closer to the surface. The sudden increase of earthquake activity on Sunday night began less than an hour before the eruption, without enough time to officially issue an Orange status (eruption imminent), and the USGS quickly went straight to Red (eruption in progress).

The eruption has provided spectacular photos with lava flows emerging from four fissures and fountains up to 200 feet high. All of the eruptive activity is presently confined to the Northeast Rift Zone on the relatively gently summit slopes. Earthquake activity has subsided, but volcanic tremor (nearly continuous vibrations of the ground) continues, typical of an eruption in progress. There is no way to tell how long this eruption will last. At present, no structures or property is at risk. Check out the Mauna Loa eruption page to keep current

<https://www.usgs.gov/volcanoes/mauna-loa/mauna-loa-eruption-webpage>).

And that earthquake in Alberta? A mag 5.8 (Earthquakes Canada magnitude) on November 29 in Northern Alberta surprised residents as far away as Calgary and Edmonton with the first shaking many had ever experienced. Canadian geologists argue it was a natural tectonic event, not caused by human activities. Far from any plate boundaries or known seismic zones, it goes to show that earthquakes really can happen anywhere.

Lori Dengler is an emeritus professor of geology at Cal Poly Humboldt and an expert in tsunami and earthquake hazards. The opinions expressed are hers and not the Times-Standard's. All Not My Fault columns are archived online at <https://kamome.humboldt.edu/resources> and may be reused for educational purposes. Leave a message at (707) 826-6019 or email rctwg@humboldt.edu for questions and comments about this column, or to request a free copy of the North Coast preparedness magazine "Living on Shaky Ground."