

Not My Fault: The 2021 mid-year earthquake report

Lori Dengler/For the Times-Standard

Posted June 4, 2021

<https://www.times-standard.com/2021/07/04/lori-dengler-the-mid-year-quake-report/>

2021 is moving more quickly than last year and the midyear point took me by surprise. Earthquakes haven't gotten much press this year. Other disasters have dominated the headlines and it's good to be a back page story.

2021 has been a below-average year (so far) for earthquake and tsunami casualties. But we've had several events of note – the first earthquake in the M8 range in more than two years, a day when three separate tsunamis were recorded, and one earthquake that chalked up more than 100 casualties.

Seventy-seven earthquakes of M6 or larger and eight $M \geq 7$ were recorded in the first six months of the year, close to the average over the past two decades. These large earthquakes were clustered in the usual places, near plate boundaries and more than 80% on the Pacific rim. There were a few deadly exceptions: fatal quakes in Greece, Pakistan, India, China and the Congo, a reminder that earthquakes can happen anywhere.

Twelve earthquakes in 2021 caused deaths and 131 people have perished to date. The deadliest occurred January 14 on Indonesia's Sulawesi island, killing 105 and injuring over 3300. The magnitude 6.2 tremor was centered in the province of West Sulawesi near the provincial capital Mamuju. Many of the buildings in the area are not constructed to resist earthquake shaking, including hotels and hospitals. Two hospitals in the West Sulawesi region were severely damaged and several community health centers were also destroyed.

Of the 12 earthquakes that caused at least one death, most were magnitude 5s and 6s and the smallest had a magnitude of 4.9. This is sadly a lesson we struggle to relearn every year. Moderate magnitude earthquakes can produce strong shaking. The difference between them and larger magnitude earthquakes is they shake a smaller area and the shaking won't last as long. When magnitude 5s strike densely populated regions of poor construction, like many parts of Asia and Africa, the combination can be deadly.

March 4th was an exciting day. My phone alerted me a little after 5:30 AM. I get texts from the National Tsunami Warning Center (NTWC) in Alaska. This text said that a 7.4 had occurred off of New Zealand's North Island and that no tsunami was expected in California. I spent the next few hours learning what I could about the earthquake. I have a number of New Zealand colleagues and they were posting info on the Tsunami Bulletin Board. A tsunami warning was issued in New Zealand and I wanted to know how well the evacuation was being carried out.

About four hours later my phone beeps with another notification – a 7.4 in the Kermadec Islands north of New Zealand. Once again, NTWC in Alaska informed me that no tsunami was expected here. This earthquake was more than 600 miles north of the earlier New Zealand quake. The Kermadec Islands occupy the central and southern part of the Tonga – Kermadec trench, one of the most seismically active areas of the planet where M7 quakes happen nearly every year. It was just a coincidence that it happened after the New Zealand quake. I noted that a small tsunami was recorded.

Less than two hours later, yet another phone tsunami notification – a magnitude 8 in the Kermadecs. This got my attention. The first bulletin said earthquakes of this size can generate a tsunami and the danger for Alaska and the West Coast was being evaluated. A few minutes later, the USGS upgraded the magnitude to 8.1.

On average, an earthquake in the 8 range occurs almost every year. It's been nearly two years since the last (M8.2 8/19/2019). M8s are big quakes, releasing more energy than the USSR's Tsar Bomba, the largest nuclear device ever tested. Fortunately, the Kermadecs is nearly the best place on earth for big quakes. The nearest populated areas are hundreds of miles away. The big concern is a possible tsunami.

Remoteness has pluses and minuses. No populated areas mean no infrastructure to be damaged or people to get hurt. But it also means no instruments near the source to quickly determine if a tsunami had been generated. The tsunami warning centers could run models based on the seismic source parameters. But without calibrating models with actual data, they aren't very precise. There was a tide gauge on Raoul Island, a rugged volcanic island only 50 miles from the epicenter where New Zealand maintains remote-controlled instruments. on the site. Unfortunately, the earthquake damaged the instruments and nothing was recorded.

Earthquake-caused tsunamis are strongly directional, focusing the energy perpendicular to the fault. The nearest populated areas to the Kermadecs are parallel to the fault orientation – New Zealand to the south and Tonga, Fiji and Samoa to the north. This is where the tsunami energy is the weakest. It would take more than ten hours to get data from the higher energy zones.

Over the next 13 hours, the two US tsunami centers would issue 34 bulletins. The plethora of bulletins is caused by the complexity of our tsunami warning system. Separate bulletins are issued to different countries, states, and territories. It can become confusing even to those of us who understand how the system works. PTWC issued a Tsunami Warning for American Samoa and a Tsunami Watch for Hawaii – both cancelled when measurements and modeling confirmed that there was little tsunami energy generated to the north and northeast.

The earthquake did produce a tsunami that was recorded/observed at over 50 tide gauges throughout the central and southeastern Pacific, in Hawaii and at a number of locations along the US West Coast. The largest recorded amplitude was half a meter (1.6 feet) in the Galapagos. We got a small tsunami signal too – about six inches at Crescent City. It wasn't big enough to cause any problems, but the signal did persist for more than a day and should be a reminder that tsunamis can last a long time.

Lori Dengler is an emeritus professor of geology at Humboldt State University, 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."