

## **Not My Fault: Earthquakes and tsunamis - how did 2020 stack up?**

Lori Dengler/For the Times-Standard  
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No matter how you look at it, 2020 will stand out as a difficult year. The year when the pandemic took top billing and wildfires, the economy and political strife battled it out for the next slots. And it was a year when earthquakes and tsunamis rarely made the front page. There were fewer large or deadly earthquakes in 2020 than any year in the last two decades. 205 people lost their lives from earthquake related shaking in 2020, the lowest number since 1984 and about the same as the number of LA County residents who died from COVID on Friday.

No catastrophic earthquakes is good news, and even without great loss, it is worth a look back on the year to see what was learned and what surprised me.

The July 22 M7.8 south of the Alaska Peninsula was the largest earthquake of the year. It was fortuitously located about 60 miles away from the nearest town where distance muted the shaking strength to a moderate level. The 7.8 and its nearly as strong 7.6 aftershock on October 19th are interesting from a tectonic perspective. They were centered in the Shumagin gap, an area of the Aleutians that had not experienced a great earthquake in the past century and had been identified by some seismologists as a likely source of the next great Alaska quake. The 2020 earthquakes didn't quite fill the gap and they were complex.

The July earthquake was a thrust event probably on or near the subduction zone interface but it produced a very small tsunami. The October earthquake was a strike slip earthquake oriented nearly perpendicular to the mainshock. It produced a modest tsunami that was larger than the bigger quake. I am still scratching my head about that one. Some seismologists now speculate that the Shumagin gap is a transitional zone in the Aleutians and might not produce M9s. Only time will decide if they are correct.

In terms of energy release, the 2020 total was even less than last year, taking over the bottom slot for the last two decades from 2019. In my 2019 summary column, I used Tsar Bomba, the Soviet Union's largest nuclear test ever

conducted, to describe seismic energy release. Tsar Bomba, an atmospheric test in 1961, released 50 megatons. The total seismic energy output in 2020 was about six tenths of a Tsar Bomba, down about 11% from last year. Earthquakes are quite capable of exceeding the Tsar's output. The seismic release in 2011 equaled about 14 Tsar Bombas.

Most tsunamis are caused by great earthquakes so it is not much of a surprise that the planet experienced fewer and smaller tsunamis this year. Only one tsunami caused damage and killed a person. It was produced by the October 30th M7 earthquake in the Aegean Sea and reached a height of just over six feet. There is a cautionary tale in this tsunami. Magnitude 7 is not a very large earthquake from a tsunami perspective and yet this earthquake produced higher water levels than the two much larger Alaska earthquakes. The October 30th tsunami appears to have been amplified by the shape of the seafloor and Turkish coastline. The communities affected were less than 20 miles from the epicenter and everyone felt the earthquake. It took only ten to 15 minutes for the tsunami to arrive. It is another cautionary tale that when you feel an earthquake, you should always think tsunami and head to higher ground as soon as you can.

The October 30 Aegean Sea earthquake was also the deadliest of 2020. In addition to the tsunami death, it killed 118 people from shaking-related damage. I wrote about the complex tectonic setting and the seismic vulnerabilities of the region before (11/8/2020). It is no surprise that a number of the damaged structures were unreinforced stone a brick buildings built decades to centuries ago. But post earthquake reconnaissance studies revealed that some of the collapsed structures were built in the 1990s long after earthquake-resilient design was required in Turkey. A report by an Izmir Earthquake Research Center points to sloppy construction and poor code enforcement as the culprits. Another reminder that earthquake engineering design is only as good as what gets put into practice.

While the global activity level was lower than the recent average in 2020, US activity was up both in the contiguous 48 states and Alaska. Nearly 3000 earthquakes of magnitude 3 or larger were recorded in Alaska and the Aleutian Islands, about 1000 more than the average over the past two decades. The reason is no surprise – the July 22 M7.8 and its vigorous aftershock sequence. Fortunately the earthquake activity was concentrated in sparsely populated areas.

Nearly 1500 earthquakes of magnitude 3 or larger were tallied in the lower 48 states, slightly below last year and about 50% above the average over the past two decades. 2019 was high because of the Ridgecrest M7.1 and aftershocks. 2020 saw increased activity in the western US: M6.5s in Central Idaho and Western Nevada, 5s in Utah, Central California and Texas. Aftershocks are still being recorded from many of these earthquakes and also from the Ridgecrest earthquake. So far the activity has been centered away from populated areas and the impacts relatively modest.

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<https://www.times-standard.com/2021/01/03/lori-dengler-earthquakes-and-tsunamis-how-did-2020-stack-up/>

There were US earthquake deaths in 2020, but not in Alaska or the lower 48. Fourteen earthquakes of magnitude 5 or larger were located along the coast and just offshore of SW Puerto Rico. The sequence began on December 28 with a 4.7 and over the next ten months has produced 118 earthquakes of magnitude 4 or larger including a 6.4 on January 7th and 14 earthquakes in the M5 range. Four deaths and nine injuries were attributed to the 6.4 and aftershocks in January.

I am guilty of ignoring Puerto Rico in my annual summaries, but it is the second most seismically active region of the United States (following Alaska), reporting about five times as many earthquakes every year on average as California. Like California, it sits in a complex tectonic environment with a transform plate boundary and major subduction zone nearby. I resolve to pay more attention in 2021.

What does all this mean for earthquake activity in 2021? We will have earthquakes in the coming months. Just because 2020 was relatively quiet doesn't mean there will be more quakes (or fewer) this year. There will be surprises and I hope impacts will continue to be low. But the only way to minimize impacts is to build resilient communities, invest in sciences and engineering, enforce building codes, Drop Cover and Hold On when the ground shakes, and be sure to head to high ground if you are on the coast. I am fond of saying we are one day closer to the next great temblor today than we were yesterday.

Note: Primary source of earthquake information (<https://earthquake.usgs.gov/>), tsunami information ([https://www.ngdc.noaa.gov/hazard/tsu\\_db.shtml](https://www.ngdc.noaa.gov/hazard/tsu_db.shtml)).

Impact information from [https://en.wikipedia.org/wiki/List\\_of\\_earthquakes\\_in\\_2020](https://en.wikipedia.org/wiki/List_of_earthquakes_in_2020).

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