

Not My Fault: Small quake made waves on the east coast

Lori Dengler/For the Times-Standard

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Last Thursday an earthquake made the news. The New York Times, Washington Post and other major media outlets covered it closely. It wasn't the largest quake of the year. It caused no damage. Its claim to fame was that as many as 55 million people might have felt it, according to a USGS estimate, and they all were on the East Coast.

The earthquake had the mighty magnitude of 4.1 and it was centered in Delaware. There have been 76 earthquakes of this size or larger in the lower 48 this year, including 11 in or offshore of Humboldt and Del Norte Counties but none of the others received such media attention. The Delaware quake was only six miles from Dover, Delaware's capitol. Over 16,000 people responded to the "Did You Feel It" web site and felt reports ranged from Virginia to Connecticut and inland to Pennsylvania. I was pleased to see that it even shook Washington DC up a little bit.

It might not have been very large by California standards, but this was an unusual earthquake. According to the USGS earthquake catalog, it is the largest magnitude earthquake in Delaware's history edging out an M 3.8 back in 1973. The instrumental record of earthquakes only goes back to the beginning of the 20th century and there are a few descriptions of earlier earthquakes. Back in 1871, the Delaware Geological Survey reports an earthquake that caused some damage and may have been a little bit larger.

To get a feel for just how unusual last Thursday's earthquake was, I used the USGS catalog search (<https://earthquake.usgs.gov/earthquakes/search/>) and found about 4,200 earthquakes of magnitude 4 or larger in the lower 48 states since 1980. 94% were centered in the western third of the country, our own North Coast region contributing about a fifth of the total. The middle third of the country from the base of the Rockies to the Indiana-Illinois border added 183 quakes (4.4%), and the eastern third a paltry 77, less than 2% of the total.

The differences between east and west coasts go far deeper than culture and accents. Geologically speaking, it really is a different world. Many coastal regions are dynamically active. We live on the Pacific Rim where

more earthquakes and volcanoes occur than anywhere else in the world. But there are exceptions. Most of the American, African and European coastlines around the Atlantic Ocean are what geologists call passive margins, far from plate boundary action. It all has to do with proximity to tectonic plate boundaries. Thursday's 4.1 was about 2000 thousand miles away from the Mid-Atlantic ridge, the nearest plate interface.

The relative rareness of last Thursday's earthquake was not the only thing that distinguished it from west coast tectonics. One would think that a magnitude 4.1 earthquake would be felt more or less the same way regardless of where you are, but this isn't true. The Delaware quake was felt over a much greater area than a similar-sized earthquake in the western part of the country. And it's not just because folks in the east are less familiar with tremors.

The crustal rock that makes up the eastern bedrock is older and colder than the western part of the continent. This has consequences when it comes to earthquake shaking. Vibrations travel more efficiently in colder material, losing less oomph as they travel outward from the earthquake source. As a result, eastern quakes get more bang for the buck, so to speak. The Delaware 4.1 was felt by some more than 100 miles from the epicenter. For comparison, a 4.1 near Redway in 2010 had a felt radius of about 25 miles.

The difference in felt area and impacts is even more pronounced for larger earthquakes. The great 1811 New Madrid earthquake centered in SE Missouri had a magnitude of about 7.8. It was felt as far away as Maine more than 1200 miles away and was strong enough to ring church bells in Washington DC, a distance of 750 miles. The 1906 San Francisco earthquake had a similar magnitude but its felt area was only about 400 miles from the causative fault.

While today's tectonic plate arrangement may favor the Pacific Rim and the western part of the Americas, this hasn't always been the case. The size and arrangement of plates on the earth's surface is constantly changing. Around 480 million years ago, what is now the east coast was part of a giant collision with two great plates slamming into one another to form the Appalachian Mountains, which were the Himalayans of their time. Speed the clock up 20 million or so years into the future and the picture will again change as the spreading Atlantic Ocean will become so large that the oldest ocean crust along the east coast will founder and begin descending in a new subduction zone that will spawn east coast

volcanoes. And then there will be some really some really big shakers for people to get excited about.

The Delaware earthquake, while small, is an important reminder that not all quakes are near plate boundaries. There is no part of the United States, or the world for that matter, that earthquakes can't happen and even our east coast friends and relatives should pay attention to them.--

Lori Dengler is an emeritus professor of geology at Humboldt State University, an expert in tsunami and earthquake and co-author of "The Extraordinary Voyage of Kamome," proceeds from which support the Japanese-Crescent City student exchanges and outreach efforts. Questions or comments about earthquakes or this column can be sent to Kamome@humboldt.edu or (707) 826-6019.

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