

## **Not My Fault: A fuss over earthquakes in South Carolina**

Lori Dengler/For the Times-Standard  
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<https://www.times-standard.com/2022/07/02/lori-dengler-the-2022-mid-year-earthquake-report/>

Six earthquakes have been reported by the USGS in South Carolina in the past month. I hadn't noticed them because they were all in the magnitude 1 range, below my reporting criteria for Cal Poly Humboldt's daily earthquake hotline recording (707-826-6020). Yesterday my ears perked up when National Public Radio (NPR) deemed the sequence worthy of a five-minute segment on All Things Considered (<https://www.npr.org/2022/08/26/1119072597/scientists-swarm-earthquakes-hitting-south-carolina-town-elgin> ).

In the last eight months, 76 earthquakes have been recorded near the town of Elgin, South Carolina. The earthquakes, tightly clustered in a zone about five miles long and two miles wide, began with a magnitude 3.3 last December 27. That earthquake has been followed by four more in M3s, including three that struck over a four-day period at the end of June.

The June spurt of activity caused me to label the Elgin sequence as "the most intriguing sequence" of 2022 in my mid-year earthquake report (Not My Fault 7/2/22). But no more M3s occurred since then and I paid the area no further attention until the NPR story. Why did they deem it newsworthy?

NPR interviewed South Carolina's State Geologist South Carolina's state geologist, Scott Howard who labeled it a seismic swarm. Earthquake swarms consist of a series of earthquakes within a small magnitude range that persist for days, weeks, or months with no clear largest event. Swarms are very common in Southern California south of the Salton Sea where bursts of earthquake activity can produce hundreds of quakes over days or weeks.

Seismologists have a good understanding of the Southern California swarms. The region between the Salton Sea and the Gulf of California marks the transition between the San Andreas fault zone and the spreading center in the Sea of Cortez. It features California's highest heat flow values and geothermal activity. These geothermal fluids migrate and constantly change the pattern of pore pressures beneath the surface making it easier for earthquakes to occur.

Where there are swarms, fluids are probably involved but exactly how that works in South Carolina is unclear. The Elgin quakes are all very shallow – between one and four miles deep. Swarm activity has been sporadic. There were 17 earthquakes in the first month, only 6 in the next three months, 9 in May, 16 in June, and 24 in July. The numbers appear to be increasing but there has been no corresponding increase in magnitudes. State Geologist Howard suggested rainfall could play a role, but that seems unlikely to me given the swarm duration.

We can rule out drilling waste fluid disposal as earthquake cause. While at first glance the episodic behavior of the Elgin swarm is similar to current earthquake activity in West Texas, there are no disposal wells anywhere in the State. The reason is simple – South Carolina has limited oil and gas reserves and there is no hydrocarbon resource extraction anywhere in the State.

I surmise that the reason NPR picked up this story is because many of the Elgin quakes have been felt and are in an area where felt earthquakes are not common. According to USGS Did You Feel It reports, even the tiny magnitude 1.5s were reported felt. The largest earthquake in the swarm to date was a M3.6 on June 26. It was felt throughout South Carolina and by a few as far away as Massachusetts more than 700 miles away. For Californians, this may seem bizarre. Our M2s are almost never felt. The furthest felt report for our 3.9 near Petrolia on August 2 was from Oroville, 170 miles away.

It's not because Californians are blasé to weak shaking and don't bother to fill out USGS felt reports. Accelerometers that measure ground accelerations confirm that western earthquakes just don't pack the wallop of their eastern counterparts. The bedrock in Western North America is warmer than the Midwest or East, damping seismic vibrations more quickly. The August quakes near Elgin had magnitudes between 1.5 and 1.8 and all were reported felt.

There were a few things that NPR treatment left out. First, swarms are not unusual in South Carolina. Since 2000, at least five other swarms have occurred in the State. A cluster near Charleston has produced 150 earthquakes since 2000, including eight in the M3 range. Like the current Elgin swarm, many of the swarms have persisted over months and produce quakes that are felt. None have led to larger, damaging earthquakes.

The biggest omission was that large damaging earthquakes have occurred in South Carolina's history and certainly will happen again. In the evening of September 31, 1886, an

earthquake (~ M7) ripped a fault only nine miles from Charleston. In 1886, much of Charleston's downtown featured tall brick buildings. These were particularly susceptible to collapse and contributed to most of the sixty reported deaths and \$5-6 million in 1886 dollars (at least \$160 million today). The earthquake was felt over much of the East and Midwest including New Orleans, Boston, Chicago, and Milwaukee. Structures on filled ground were particularly susceptible to liquefaction damage. Aftershocks continued in the Charleston area for over thirty years, some large enough to cause additional damage.

Although there were no instrumental recordings of the 1886 earthquake, it garnered much scientific attention at the time and continues to be revisited by seismologists and engineers since then. Is there anything known about that earthquake that suggests the current Elgin swarm is leading to something much bigger? From all the media accounts, it appears there were no foreshocks or buildup in earthquake activity prior to the rupture. Given the location close to a populated area, if the earthquake had been preceded by M2s or 3s, they would certainly have been noted.

What next in Elgin? Most likely continued episodic behavior that will stop in the next few months. But Mother Nature still has the cards up her sleeve and could surprise us. And someday, there will be a repeat of an 1886 event.

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