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Not My Fault: Earth Science in the news and the National Earthquake Hazards Reduction Act reauthorized

Lori Dengler/For the Times-Standard
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It's been a busy week in the geoscience world. I'll quickly hit three highlights.

First, the American Geophysical Union just concluded its weeklong annual conference in Washington DC. AGU is the largest organization of earth scientists on the planet, covering issues from the earth's core to outer space. I could spend many weeks' worth of columns on the work presented and barely scratch the surface. I didn't attend in person this year but have been reading abstracts and summaries of the research presented. I have been most interested in the sessions on recent earthquakes and the reports from reconnaissance teams.

The deadliest earthquake and the largest and deadliest tsunami of 2018 to date was the September 28th M 7.5 on the Indonesian Island of Sulawesi. The official death toll currently stands at 2,256, and more than a thousand people are still missing. One of the surprises of this earthquake was the size and strength of the tsunami. While an earthquake of this size is quite capable of producing a large tsunami nearby, this quake wasn't the sort expected to cause such large surges. The faulting was strike-slip, meaning the ground displacement was horizontal. To produce a big tsunami, one needs vertical movement.

AGU featured a number of papers about the Palu earthquake (named for the city closest to the epicenter). Survey teams reported on the characteristics of the tsunami and measured water heights. It was an unusual tsunami. Eyewitnesses reported two surges, the first arriving only three minutes after the earthquake. Within Palu Bay, the water heights reached 30 to 35 feet and penetrated over a quarter of a mile inland in some areas. But teams could find no evidence of the tsunami on the west coast of Sulawesi outside of the Bay. To explain the short arrival time and rapid decay of water heights, the source had to be within the Bay.

One AGU study reported results of a seabed survey of the Bay. An Indonesian team conducted a bathymetric survey and compared depths measured before the earthquake and afterwards. Almost all of the seafloor within the Bay in the post earthquake survey had dropped. It's not clear if the subsidence was related to fault movement or lateral spreading and liquefaction. There is also evidence of several underwater landslides. Both the slides and the subsidence may have combined to produce the tsunami. The depth and shape of the Bay also contributed to impacts, focusing the tsunami along its narrow channel.

The take-home lesson for Californians – if the conditions are right, strike-slip earthquakes can produce significant tsunamis. The geometry of Palu Bay is not unlike Tomales Bay and landslides can be triggered by shaking anywhere along the coast. Any strong earthquake regardless of the type of faulting can produce a tsunami that can arrive within minutes. Shaking that last a long time is your trigger to get to high ground as quickly as you can.

Second, a felt earthquake in the East always gets the attention of the media. On December 9th, a M 4.4 earthquake occurred in Eastern Tennessee. Earthquakes of this size in California generally will get a merit a second page story but this was the third largest earthquake in Tennessee's history (M5 in 1865, M4.7 in 1973) and was felt not only in Tennessee but also in neighboring parts of Alabama, Mississippi, Georgia, North Carolina, Virginia and Kentucky. It knocked items from shelves in Decatur, Tennessee but otherwise did little harm.

Inevitably, social media was ablaze with reports that the earthquake was in Georgia or North Carolina and heralded more shaking. "How likely is an earthquake in the Midwest, the South? The Big One could be coming," announced USA Today (12/12). Newspapers in nearby states pondered the likelihood of earthquakes in Florida, Kentucky, Georgia and elsewhere.

The Decatur earthquake may have shocked many who felt it, but was no surprise to seismologists. It was a shallow stride-slip earthquake within the East Tennessee Seismic Zone that stretches from northeastern Alabama to southwestern Virginia. Small earthquakes are relatively common in this zone – more than 1000 earthquakes in the magnitude 2 – 3 range have been recorded in the region in the past 30 years. They are tectonic earthquakes, caused by natural earth stresses, and not associated with waste fluid injection like most small earthquakes in Oklahoma, Kansas and Nebraska.

What does the Decatur earthquake mean? Earthquakes can and will happen anywhere. There is geologic

evidence of larger earthquakes in past and some day the South, the Midwest or the Eastern part of the United States will experience a major tremor, but there is nothing about the recent earthquake that suggests it is any more likely now than it was a few months ago.

Third, last Wednesday, President Trump signed a reauthorization of the National Earthquake Hazards Reduction Program. NEHRP, originally funded in 1977, facilitates research, planning, and mitigation efforts among States, Research Organizations and Federal Agencies. Unlike winter storm and hurricane programs, NEHRP is not a permanent fixture of the federal budget and requires reauthorization every five years. It's been in limbo since the last authorization expired in 2009, still funded but a weaker player in interagency coordination. The new authorization specifically mentions earthquake warning and awareness development and a comprehensive assessment of the Nation's earthquake risk reduction strategy.

Preparedness tip: The recent storms have brought spectacular waves to the coast. Enjoy the activity from a safe viewing spot such as Trinidad Head or Elk Head. Keep away from beaches and the Jetty when high surf warnings are in place. Check with weather.gov/eureka to see if high surf warnings are in place.

Lori Dengler, PhD, is an emeritus professor of geology at Humboldt State University, and an expert in tsunami and earthquake hazards. For questions or comments about this column and requests for free copies of the preparedness magazine "Living on Shaky Ground," leave a message at (707) 826-6019 or email Kamome@humboldt.edu

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