Not My Fault: Killer quakes weren’t the biggest

Lori Dengler, Times Standard, 1-4-17

A friend recently asked me if I thought the increase in earthquake activity this year was caused by climate change. My response — whoa there! First, what makes you think that earthquake activity was on the rise?

Earthquakes have made the news in the last couple of months — a magnitude 7.9 and a 7.8 in the Solomon Islands, an M7.8 in New Zealand, the North Coast M6.5, and a series of mid- to upper M5s in Western Nevada. When earthquakes become media stories or you feel one, it heightens the perception that earthquake activity has increased.

So what is the earthquake story of 2016 and how does the past year stack up against previous years? There is no such thing as a “typical earthquake year,” but it is possible to come up with long-term average annual numbers: one M8, 15 M7s and 134 M6s. But these numbers can vary considerably from year to year — there were 23 M7s in 1999 and only five in 1986. Most of these earthquakes don’t make the news because they are located in remote areas with little impact on people.

2016 fits within normal range for numbers with no M8s, 17 M7s and 127 M6s, but a lower-than-average-energy release. Earthquakes release a lot of energy — the annual global average is around 10 to the power of 25 ergs, a number that is hard for most people to wrap their heads around. Comparing this to something familiar — it’s nearly four times more than the largest nuclear weapon ever tested (67-megaton Tsar Bomba in 1961) and about the equivalent of the U.S. annual electrical energy consumption. Last year’s earthquakes released only about a third as much as the average, the least in the past five years and the second smallest of the past 15. The reason? No magnitude 8 or 9 quakes this year. When it comes to energy, big quakes are much more important than smaller ones — each increase of one on the magnitude scale equates to over 30 times as much energy released.

Some of these earthquakes did have an impact. There were 33 fatal earthquakes in the year with a total death toll of 1,339. The deadliest was the April 16 M7.8 Ecuador quake with 676 casualties. That earthquake, along with the M6.2 Italy, M6.4 Taiwan, and M6.5 Sumatra caused over 80 percent of the 2016 casualties. But compared to other years, we got off fairly lightly. The average annual earthquake toll since 1970 is close to 30,000.

While size is important, location matters more. The largest magnitude earthquake of the year — M7.9 in the western Solomon Islands on Dec. 28 — caused no deaths. On the flip side, a third of the fatal quakes were only in the magnitude 4 to 5 range. The primary cause of casualties was collapse of poorly built structures. An M4.4 in Poland damaged a mine, causing eight deaths. The August Italy quake was only M6.2, smaller than the December M6.5 North Coast temblor, but its shallow depth close to ancient hill towns damaged the stone and brick buildings, killing 299 and making it the second-deadliest earthquake of the year.

The absence of really large earthquakes this year meant fewer tsunamis, and no deadly ones. Thirteen tsunamis were recorded in 2016 but only two produced water heights greater than a foot. The only tsunami damage was caused by the November M7.8 New Zealand earthquake where a 13-foot surge destroyed a historic structure at Pigeon Bay. Water heights were amplified by the shape of the bay — nowhere else did the tsunami exceed 3 feet.

Closer to home, the champion U.S. earthquake producer was Alaska, topping the chart with an M7.1, four M6s and over 400 in the magnitude 4 and 5 range. Alaska is always the winner in the numbers and energy game — accounting for about 85 percent of the U.S. earthquake energy release almost every year. Fortunately, most of these earthquakes are remote and don't cause damage. In the lower 48, California won the energy release game — with about 10 percent of the seismic energy total and the largest non-Alaska quake of the year, our Dec. 8 M6.5 offshore of Cape Mendocino. But for the third year in a row, Oklahoma was the felt earthquake champ with 622 quakes in the magnitude 3 or larger range. California was a distant second with 192.

There is scientific consensus that Oklahoma seismicity is primarily caused by the injection of drilling waste fluids. Most of these human-caused quakes are small — in the 2 to 3 range, but 2016 saw three Oklahoma earthquake in the magnitude 5 range including an M5.8 in August, the largest magnitude earthquake every recorded in the state. The good news for Oklahoma is that 2016 was well below the 863 felt quakes of 2015 — a reduction that may reflect new regulations on the rate at which fluids can be injected.

So to answer my friend's question — no increase of seismic activity due to climate change or any other source this year. The planet was relatively lucky, casualties and damage well below other recent years and most of it caused by what we have known for a long time. Bad buildings and weak construction fare poorly in earthquakes. It's a good reminder that this is one area where government regulations and enforcement of seismic design codes really does make a difference, especially when you live on shaky ground.