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Not My Fault: What shook and made waves this past year

Lori Dengler/For the Times-Standard
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A year is an arbitrary unit of time, but January requires reflection and annual summaries. I admit to being addicted to data. Few things bring me the pleasure as downloading, sorting, and looking at epicenters, magnitudes, casualty numbers from every side to see what stories emerge. Here is my brief take on the planet's seismicity of 2017.

By the numbers - the USGS reported 157 earthquakes of magnitude 6 or larger in the world, just about average. However, only nine made it to 7 or larger, just about half the typical number. Earthquake energy is logarithmic – each unit of magnitude increase releases over 30 times more energy. The paucity of 7s was reflected in energy numbers. 2017 was the second lowest in terms of seismic energy release of the past 15 years.

Quakes did make an impact. The M8.2 off the coast of Chiapas Mexico on September 8 was the largest of the year. It has also topped the list of Mexican quakes recorded in instrumental times. More than 5 million people experienced strong to very strong shaking. It did caused damage – at least 41,000 homes and buildings damaged and nearly 100 deaths. But it wasn't as bad as it could have been. The 1985 M 8 Michoacan earthquake caused thousands of buildings to collapse in Mexico City and killed as many as 10,000. The difference? This year's earthquake was a bit deeper and not as 'favorably' oriented towards Mexico City.

A much smaller earthquake a week later did more damage. The M 7.1 Puebla earthquake was more than 40 times weaker than the 8.2 but killed at least 370 people, causing major damage in Puebla, Mexico's fourth largest city, and collapsing 44 buildings in Mexico City, a distance of more than 70 miles away. Why was the smaller quake worse? With earthquakes it's all about location and the characteristics of ground motion. Many more buildings and people were exposed to very strong ground motion from the 7.1 than the larger quake.

The deadliest earthquake in 2017 occurred on November 12 near the Iran-Iraq border. The death toll from the M 7.3 temblor currently stands at 630, most of the damage and deaths on the Iran side of the border where access is prohibited and little detailed information is available on the cause of the structural damage. Media stories widely reported than many of the collapsed buildings were of newer construction and pointed fingers at shoddy construction methods and poor building code enforcement.

For people in the epicentral areas of these earthquakes, the damage was catastrophic and it will take years to recover. From the perspective of previous years, 2017 was comparatively benign. The long term USGS casualty estimate for the 20th century is 10,000 deaths per year. Deadly quakes in China, Indonesia, Haiti and elsewhere have raised that average to about 30,000 over the past few decades. This year's 1,235 deaths is the 14th lowest of the past 50 years, a notch below last year's 1,329.

Like last year, the lower number of very large earthquakes correlates to fewer damaging tsunamis. NOAA reported 17 tsunamis this year. No surprise that the largest quake of the year, the M 8.2 in Mexico, caused a tsunami. It reached heights of near six feet on the Mexico coast and was detected as far away as Fiji. Fortunately, no damage was reported.

Earthquakes cause the overwhelming majority of damaging tsunamis in the historic record. This year was an exception. The largest and deadliest tsunami of 2017 was on in Greenland on June 17, when a landslide plunged into a fjord producing waves that reached nearly 300 feet high, destroying much of the village of Nuugaatsiaq and killing four people.

The only other deadly tsunami of the year hit Iran's southern port city of Dayyer on the Persian Gulf in March. Surges reached nine feet in Dayyer, killing two and destroying 80 houses.
The cause is thought to be rapid, large areal scale fluctuations in atmospheric pressure. These weather-caused tsunamis are called meteotsunamis and account for only about 3% of the historic tsunamis in NOAA's tsunami database.

There has been much discussion among both scientists and in the media about how climate change is affecting natural disasters. There is plenty of data supporting the premise that a warmer atmosphere and ocean drives more significant weather-related events such as typhoons, hurricanes, flooding and landslides. Earthquakes are caused by the forces driven by heat deep within the earth and aren't affected by conditions on the earth's surface or in the atmosphere.

The tsunami story usually parallels the earthquake one. If earthquakes aren't affected by weather, tsunamis shouldn't be either. But this year's tsunami data indicates there is more to the story. There were fewer earthquake-caused tsunamis in 2017 than typical and none did damage. But there were two meteotsunamis and two landslide ones. Many climate change models predict larger, more robust storm systems. This could mean more weather-system caused tsunamis. Landslide probability also correlates to greater storm intensity. The narrow fjords of Greenland are particularly vulnerable as ice melts, destabilizing slopes, and making tsunamis more likely.

Note: Earthquake statistics from the USGS https://earthquake.usgs.gov/. Tsunami data provided by NOAA's National Centers for Environmental Information https://www.ngdc.noaa.gov/

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