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Not My Fault: Some days really are longer, but can they cause quakes?

Lori Dengler/For the Times-Standard
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The headlines are alarming. "Earth's slowing rotation could cause huge quakes in 2018" (New York Post Nov. 21), "Deadly earthquakes could hit a BILLION people next year because of Earth's slowing rotation" (Daily Mail Nov. 25). Is there any science behind these claims and what do they really mean?

Yes there are measurable changes in the length of the day. But to clear up any misconceptions, these changes are TINY. Contrary to science fiction, rotation doesn't stop or spin in reverse. But both the rate of rotation and the direction of the rotation axis have changed in the past and are changing now.

There are a number of ways in which the rotation rate changes. There is a long slow steady decrease in the rate of rotation caused by the viscous drag of tidal attraction. In the In the Silurian Period more than 400 million years ago, there were about 420 days to the year and 21 hours to the day. The process continues today. It's not your imagination – the workday really is getting longer. But don't go demanding your boss give you a pay increase just yet. The amount is miniscule – in the neighborhood of .003 seconds per century.

But it is shorter-term fluctuations that may possibly be of interest to seismicity. Once astronomers could get precise measurements of rotation rates they noticed fluctuations on the scale of years to decades. This is an unusually short period by geologic standards and hard to explain. Then several scientists noted that the strength of the earthquake magnetic field fluctuated with a similar period and proposed the phenomena were linked. Magnetic field variations from the earth's core exerted tiny torques on the earth's mantle sometimes causing the rotation to become a tiny bit faster and at other times a tiny bit slower. When the speed increases, it causes a tiny acceleration – less than a thousandth of a millisecond a day. Slowing causes a similar amount of deceleration.

I learned about this in my graduate geophysics classes but hadn't thought about it until I heard about Rebecca Bendick and Roger Bilham's presentation at the annual meeting of the Geological Society of America in Seattle last month. Bilham and Bendick are among a number of seismologists trying to explain clustering of earthquake activity. They asked if earthquake activity could be related to these slight changes in rotation rates.

As a proxy for earthquake rate, they took the total number of magnitude 7 and larger earthquakes per year, arguing that this record would be fairly complete going back to the beginning of seismic instrumentation at the beginning of the 20th century. The number varies by a factor of four from lows of 6 to a high of 25. It doesn't vary randomly but over a ten or 15 year period the numbers seem to be consistently low or high. Between 1992 and 2001, the number varied between 14 and 23 while in the entire 1980s the range was only between 6 and 14.

When Bendick and Bilham compared quake rate with changes in the length of day, the correlation looked pretty good. Periods of higher than average activity appeared to line up with periods of slowing rotation rate. They proposed a mechanism for the apparent linkage. When the earth slows, the Earth's mantle shrinks in radius a tiny bit, reducing its equatorial circumference by at most an inch. This tiny shrinkage exerts slightly more compression on the outermost part of the earth where earthquakes occur. They reasoned, a tiny bit more compression can cause an uptick in earthquakes – particularly those on plate boundaries where the largest effects would likely occur.

What do I think? Intriguing and worthy of further study, but by no means proven. The data set is short and I'm not yet convinced that there is a causative correlation. The two largest earthquakes we've recorded during the seismograph age, the 1960 M 9.5 Chile and 1964 M 9.2 Alaska, earthquakes were associated with lows in both deceleration and earthquake numbers. The authors readily admit that their analysis does not take into account the energy released in earthquakes. In their analysis, M 7s and M 9s count the same event though the 9 releases close to 1000 times more energy.

When it comes to claims of potential impacts, both the authors of the study and I agree that the sensationalists in the media are completely out of line. At first glance it may seem logical that more M 7 and larger earthquakes should mean more impacts. But when I compared casualties per years to earthquake numbers, the results were all over the map. 1996 and 2010 both had 22 M7s, near the peak. But in '96 only 419 deaths were attributed to earthquakes and 2010 over 300,000. The highest death toll of the past century was in 1976 when the number of M7s was right at 14, the average. And it's not

just the big earthquakes that can cause damage. There are about ten times more earthquakes in the M6 range every year than 7s. When close to populated areas, they can have significant impacts.

I'll stick my neck out and make a forecast. There will be earthquakes next year and unfortunately, some will be deadly. But worrying about whether the day is getting a wee bit shorter or longer is not going to make any difference. What can make a difference is building better buildings, reinforcing older ones and making sure our community is as resilient as it can be.

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