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Geologists could be studying reasons behind earthquake for years

Scientists explain differences between East and West Coast quakes

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By Frank D. Roylance, The Baltimore Sun
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Geologists say Tuesday's magnitude-5.8 earthquake in Central Virginia released forces that have probably been building for tens of thousands, or perhaps millions of years.

And the event may not be over.



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"Aftershocks are always a possibility, and they're pretty common," said Jeffrey Halka, director of the Maryland Geological Survey.

The Maryland Emergency Management Agency quoted geology experts saying that for 24 hours after a quake there is a 10 percent chance of an aftershock of a similar magnitude.

Happily, Halka said, most aftershocks are not noticeable. One aftershock in Virginia, measured at 2.8 on the Richter scale, was detected at 2:46 p.m. — almost an hour after the initial shock.

One thing seems certain. For a geologically quiet region, it was an earthquake to remember.

"This is a significant earthquake," said Michael Scott, professor of Geography and Geoscience at Salisbury University on Maryland's Eastern Shore. "This would be a significant earthquake anywhere. The fact that it happened in the middle of Virginia is pretty rare."

In fact, it was the strongest quake on the planet Tuesday, one of five with a magnitude of 5.0 or more. In all, the USGS reported about 30 quakes around the globe Tuesday of magnitude 2.5 or more. That's about the average for the past three days. Tuesday's tremors included 15 in Virginia, Oklahoma, Colorado, Alaska and Nevada.

Virginia's shakeup is likely to keep the region's geologists busy for many years

"We still have a lot more to learn about why this happened, where it happened," Scott said. But there are several forces that are likely to figure into the answers.

First, the East Coast is not like the West Coast, where there are many large and active fault systems, with continental plates scraping against each other or diving beneath one another.

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Here, the faults are far more ancient, remnants of mountain-building up and down the Appalachians, some 460 million to 250 million years ago. And they move very little if at all, making them difficult to study and map.

And because there are fewer faults ready to move and release energy, seismic waves from a magnitude-5.8 quake in the Eastern United States are transmitted 10 times farther away than the energy from a 5.8 quake on the fault-riddled West Coast, according to the USGS.

But as quiet as these Eastern faults typically are, there are forces at work on them that periodically do cause tremors.

"In simplest terms," Scott said, "the **Atlantic Ocean** is getting larger. It's spreading from a crack in the middle of it, which continues to spew new stuff."

The crustal plate on the west side of that crack is moving west, putting pressure on crust within the continental U.S.

Another factor is the "rebound" of the Earth's crust under our feet.

During the last Ice Age, some 18,000 years ago, the crust to our north was buried beneath a mile of ice. The glaciers depressed the rocks beneath them, while those to the south bulged up, like a seesaw.

Once the ice melted, Scott said, the weight was removed, the crust to the north began to rebound, while the crust to the south sank. That sinking motion is responsible for a portion of sea-level rise in the Chesapeake, and for occasional Earth tremors in the region.

Those forces build up over time, and when they exceed the ability of the rocks to withstand them, something snaps, the energy is released into the rock in waves, and we feel a quake.

Precisely what happened Tuesday afternoon isn't yet clear.

"There will probably be a lot more information in the weeks and months ahead," Scott said. "Geologists will take a really close look at this one, because we haven't had an earthquake like this."

What is known is that the epicenter of the quake, where the rocks snapped, was shallow, just 3.7 miles beneath the surface near Mineral, Va. And that, too, can help explain why it was felt so strongly over so many states.

Scott said shallow quakes send seismic waves rippling through the surface rocks like waves launched by a pebble dropped into a pond. In this case they reached as far as New England.

"If you released the same energy at the bottom of the pond, you would not see as many waves on the surface," he said. "We call that attenuation."

As starting as the earthquake was for many Marylanders, the scientists who study them were both startled and delighted.

"We were sitting in our computer lab, setting up for school's opening next week, when the flat-screen monitors began to sway back and forth," Scott recalled. "I looked at my students and said, 'This is an earthquake!' They couldn't believe it."

After checking for damage (some cracked wallboard), Scott said, "We were going around cheering. It's not a rational reaction, but you can't help it when you study these things."

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