

Unexpected earthquakes within continental plates pose challenges

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Earthquakes that occur on "passive" continental margins, such as the August 2011 magnitude 5.8 Mineral, Virginia, earthquake, surprise people because they expect earthquakes to occur only on plate boundaries. But, in fact, large and damaging intraplate earthquakes occur fairly regularly on passive margins around the world. For instance, in North America the approximately magnitude 7 Charleston earthquake shook South Carolina in 1886, causing severe damage and about 60 deaths, and the 1929 magnitude 7.2 earthquake on the Grand Banks of Newfoundland, Canada, caused a tsunami, a large landslide, and 28 fatalities.

Although they are fairly common, these earthquakes are not well studied, and their specific geologic settings and causes are unclear. Wolin et al. review what is known about these earthquakes and describe some of the challenges. They note that these quakes, which occur both onshore and offshore, are thought to be caused by reactivation of ancient faults created by previous continental collision and breakup. Stresses causing passive margin earthquakes could be due to plate- wide forces, [glacial isostatic adjustment](#), local stresses, or other factors, but no comprehensive model explains all of these earthquakes. [Aftershocks](#) of passive margin earthquakes can occur for hundreds of years.

One challenge is that because large intraplate events occur infrequently and small events are not well recorded, it has been difficult for scientists to collect enough data on passive margin quakes to form a complete understanding. However, GPS is making it possible to track tiny crustal

deformations as small as one millimeter per year (0.038 inches per year), so scientists can identify areas where strain is building. The authors conclude that it is important to continue research on these quakes, integrating seismic, geodetic, and geological techniques, to learn more about the mechanisms causing passive margin earthquakes and to improve hazard assessment.

More information: Mineral, Virginia, earthquake illustrates seismicity of a passive-aggressive margin, *Geophysical Research Letters*, [doi:10.1029/2011GL050310](https://doi.org/10.1029/2011GL050310) , 2012

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