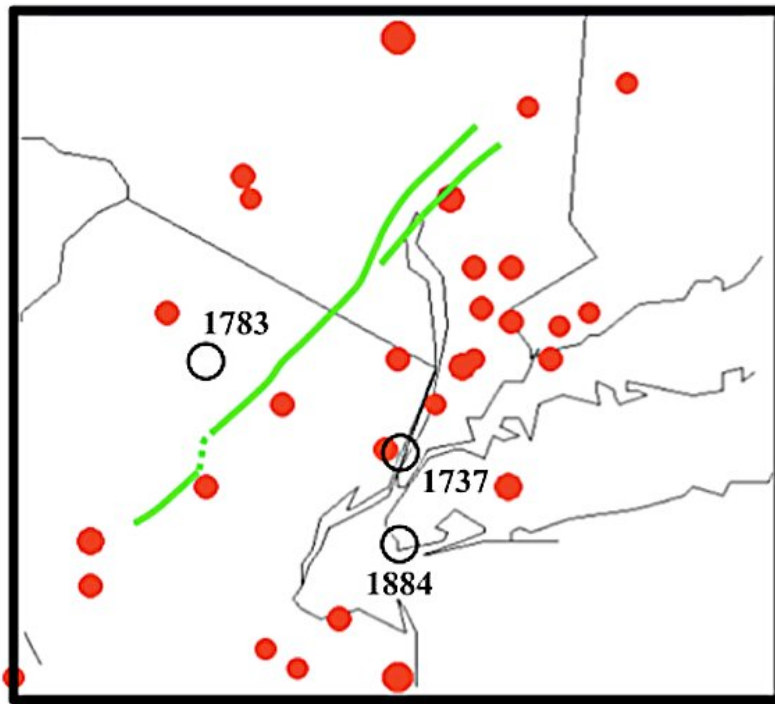
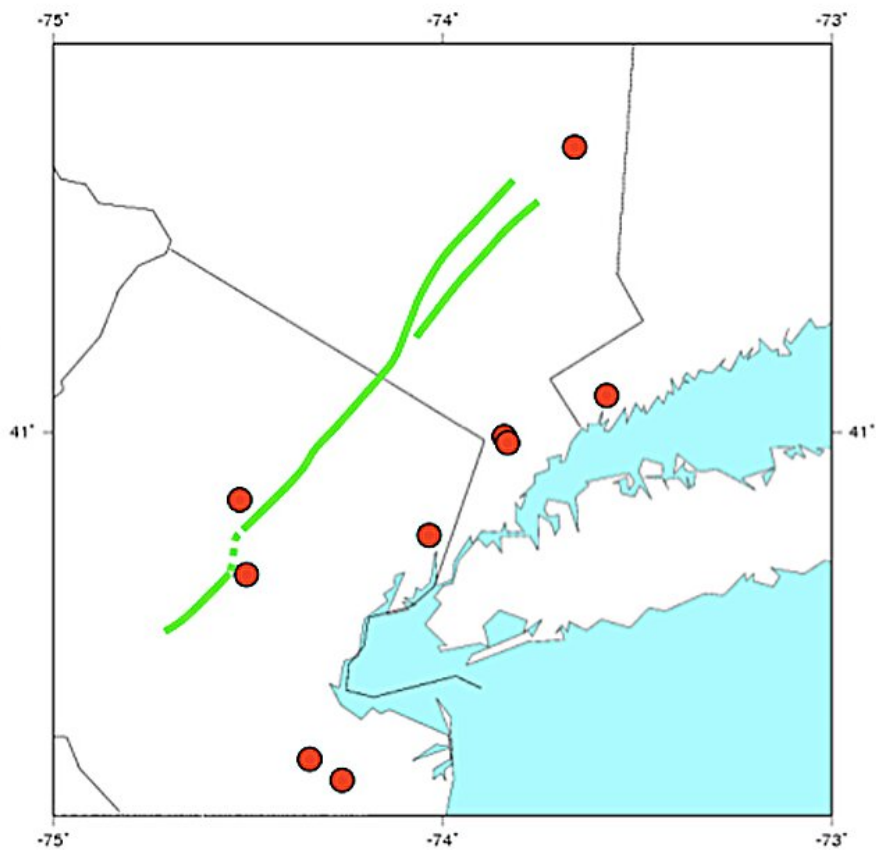


What causes earthquakes in the Northeast, like the magnitude 4.8 that shook New Jersey? A geoscientist explains

April 8 2024, by Gary Solar



USGS (1924-2006, $M \geq 3$)



NEIC (1975-2010, $M \geq 3$)

The Ramapo Fault, in green, is a major fault zone in New Jersey. The red dots indicate earthquakes of magnitude 3 or higher, reported by the U.S. Geological Survey and National Earthquake Information Center. Credit: [Alan Kafka/Wikimedia](#)

It's rare to feel earthquakes in the U.S. Northeast, so the [magnitude 4.8 earthquake](#) in New Jersey that shook buildings in New York City and was felt [from Maryland to Boston](#) on April 5, 2024, drew a lot of questions. It was one of the [strongest earthquakes on record](#) in New Jersey, though there were few reports of damage. A smaller, [magnitude 3.8 earthquake](#) and [several other smaller aftershocks](#) rattled the region a few hours later. We asked [geoscientist Gary Solar](#) to explain what causes earthquakes in this region.

What causes earthquakes like this in the US Northeast?

There are many [ancient faults](#) in that part of New Jersey that extend through Philadelphia and along the Appalachians, and the other direction, past New York City and into western New England.

These [are fractures](#) where gravity can cause the rock on either side to slip, causing the ground to shake. There is no active tectonic plate motion in the area today, but there was [about 250 million to 300 million years ago](#).

The [earthquake activity](#) in New Jersey on April 5 is similar to the [3.8](#)

[magnitude earthquake](#) that we experienced in 2023 in Buffalo, New York. In both cases, the shaking was from gravitational slip on those ancient structures.

In short, [rocks slip](#) a little on steep, preexisting fractures. That's what happened in New Jersey, assuming there was no man-made trigger.

How dangerous is a 4.8 magnitude earthquake?

Magnitude 4.8 is pretty large, especially for the Northeast, but it's likely to have [minor effects](#) compared with the much larger ones that cause major damage and loss of life.

The [scale used to measure earthquakes](#) is logarithmic, so each integer is a factor of 10. That means a [magnitude](#) 6 earthquake is 10 times larger than a magnitude 5 earthquake. The bigger ones, like the magnitude 7.4 earthquake in Taiwan a few days earlier, are associated with active plate margins, where two tectonic plates meet.

The vulnerability of buildings to a magnitude 4.8 earthquake would depend on the construction. The [building codes](#) in places like California are very strict because California has a major plate boundary fault system—the [San Andreas system](#). New Jersey does not, and correspondingly, [building codes](#) don't account for [large earthquakes](#) as a result.

How rare are earthquakes in the Northeast, and will New Jersey see more in the same location?

Earthquakes are actually [pretty common](#) in the Northeast, but they're usually so small that few people feel them. The vast majority are magnitude 2.5 or less.

The rare large ones like this are generally not predictable. However, there will likely not be other large earthquakes of similar size in that area for a long time. Once the slip happens in a region like this, the gravitational problem on that ancient fault is typically solved and the system is more stable.

That isn't the case for active plate margins, like in Turkey, which has had devastating earthquakes in recent years, or [rimming the Pacific Ocean](#). In those areas, tectonic stresses constantly build up as the plates slowly move, and earthquakes are from a failure to stick.

This article, originally published April 5, 2024, has been updated with several smaller aftershocks felt in the region.

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