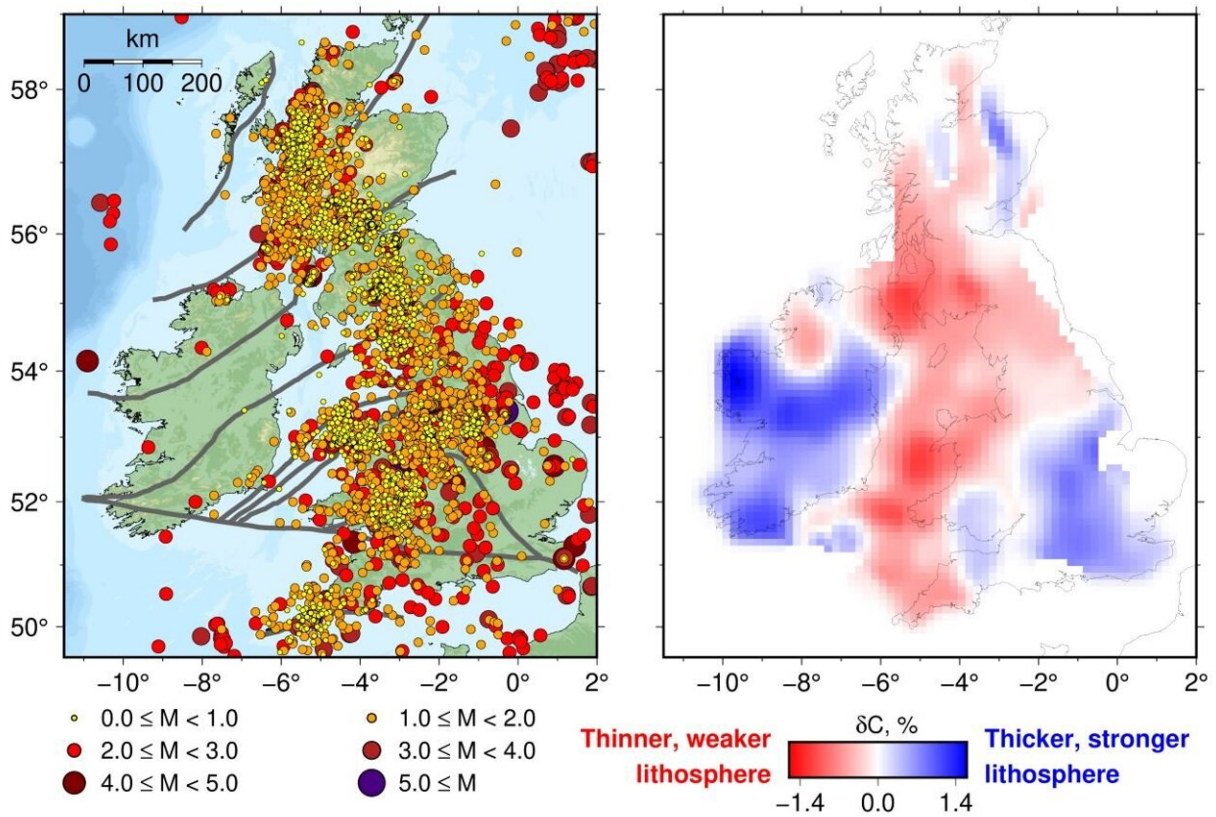


Why earthquakes happen more frequently in Britain than Ireland

June 8 2023



Earthquake occurrences across Britain and Ireland (left) correspond to differences in lithosphere thickness (right). Credit: Sergei Lebedev

Researchers from the University of Cambridge and the Dublin Institute for Advanced Studies have discovered that variations in the thickness of

tectonic plates relate directly to the distribution of earthquakes in Britain, Ireland and around the world.

The [study](#), published in *Geophysical Journal International*, also solves an enduring mystery as to why small earthquakes happen frequently in Britain but are almost completely absent from neighboring Ireland.

The researchers produced a computer-generated image of Earth's interior using a technique called seismic tomography, which works in a similar way to a medical CT scan. The data they collected revealed variations in the thickness of the solid outer part of Earth, also known as the lithosphere, across Ireland and Britain.

"Earthquake locations are surprisingly uneven across Britain and Ireland," said Sergei Lebedev, lead author of the research Cambridge's Department of Earth Sciences. "We can now explain this disparity, which has puzzled scientists for over a century."

The researchers found that the lithosphere is thin and weak beneath western Britain, meaning that the rocks can bend easily—triggering earthquakes across this region. In contrast, Ireland sits on top of thick and strong lithosphere, explaining the lack of earthquakes.

Even though the UK is located far from the nearest plate boundary, where most earthquakes happen across the world, minor tremors still a relatively common occurrence. According to the BGS, the UK is rattled by between 200 and 300 small to moderately-sized tremors every year, mostly occurring along the western side of mainland Britain. Less than 30 out of these earthquakes are strong enough to be felt, although on rare occasions they can cause more damage.

Earthquakes in the UK don't reach the magnitude seen in other parts of the world, said Lebedev, "But we still need to understand why they

happen where they do so that engineering projects can consider seismic hazards."

Although [small earthquakes](#) are fairly common in western Britain, adjacent Ireland is almost completely free of seismic activity. That contrast was first noticed by Irish seismologist Joseph O'Reilly who, back in 1884, mapped out the location of historic earthquakes across Britain and Ireland.

Ever since, scientists have been trying to understand why earthquakes happen in Britain but not in Ireland. One theory is that the earthquakes might be concentrated in localized areas of land that are shifting more than others after the ice sheets that covered Britain melted about 12,000 years ago. But this, and other theories, "Don't fully explain the location of seismic activity we see," said Lebedev.

The researchers deployed a network of seismometers across Ireland, meaning they could measure how seismic waves released by earthquakes traveled through Earth and get a detailed look at the crust below.

They found that the distribution of earthquakes across Britain and Ireland closely matched the thickness and strength of the tectonic plate below. "The properties of the lithosphere are clearly controlling the location of earthquakes. We didn't expect that link to be quite so striking," said Lebedev.

In Ireland, the researchers found that the lithosphere was stronger and thicker than beneath the more seismically active parts of western Britain. That added strength means the tectonic plate doesn't buckle, "It deforms easily in this area, resulting in fewer earthquakes in Ireland," said Lebedev.

"The thin, weak lithosphere running down the length of western Britain

clearly explains why it experiences more earthquakes," said Lebedev. That difference means the tectonic plate can crumple and break, activating ancient faults near the surface and causing tremors.

The team's results also help explain more localized patterns in earthquake locations in Britain and Ireland. For instance, the one location in Ireland where earthquakes do occur—in Co. Donegal—sits on top of a blob of weak lithosphere. In Britain, there are patches of stronger tectonic plate beneath eastern Scotland and south-eastern England where fewer quakes happen.

Commenting on the discovery, Professor Chris Bean, from the Dublin Institute for Advanced Studies said, "These research findings are highly significant as they show that even within the same plate, local details are important. We now have the reasoning behind why more earthquakes are occurring in Britain than in Ireland, and new insight into where the likelihood of occurrence is higher."

Aside from understanding the puzzling distribution of earthquakes in Britain and Ireland, the results also help understand the forces shaping [earthquake](#) distributions in the middle of other tectonic plates. The researchers now plan on investigating earthquakes in Africa and other continents, which also seem to be concentrated in areas where the [lithosphere](#) is thinner and mechanically weaker.

More information: Sergei Lebedev et al, Seismicity of Ireland, and why it is so low, *Geophysical Journal International* (2023). [DOI: 10.1093/gji/ggad194](https://doi.org/10.1093/gji/ggad194)

Provided by University of Cambridge

Citation: Why earthquakes happen more frequently in Britain than Ireland (2023, June 8)
retrieved 17 July 2024 from <https://phys.org/news/2023-06-earthquakes-frequently-britain-ireland.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.