

Thawing permafrost helped trigger ancient Icelandic landslides, new research shows

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Researchers investigated the role of thawing permafrost in past landslides around Eyjafjörður, Iceland's longest fjord. Credit: Bjarki S., Wikimedia Commons, CC BY-SA 3.0

When glaciers and ice sheets melt, they can destabilize slopes and reactivate faults, which in turn can trigger landslides and reshape the surface of Earth over long periods of time. Researchers can monitor some locations in real time to determine which combinations of factors

lead to landslides, but understanding what triggered landslides thousands of years ago is more difficult.

Adam Booth and Halldór Pétursson looked to the slopes around Eyjafjörður, a fjord in north central Iceland, to uncover the triggers behind [landslides](#) that occurred in the wake of the retreat of the Icelandic ice sheet about 13,000 years ago. The work is [published](#) in the *Journal of Geophysical Research: Earth Surface*.

The team mapped 676 postglacial, deep-seated landslides around the fjord using stereo [satellite imagery](#) with 2-meter resolution. The [bedrock](#) in the study area consists mainly of Tertiary flood basalts between 2 and 30 meters thick, interlayered with sedimentary and localized [volcanic deposits](#). They found that the landslides were not spread evenly across the 268-square-kilometer study area but instead clustered in areas within 2.6 kilometers of major Tertiary bedrock structures and along the margins of high-elevation permafrost.

Areas where landslides occurred recently tend to have sharply defined surface features, whereas older sites are often smoother because of erosion. So the researchers used the roughness of the landslide deposits, calibrated to 17 already-dated landslides from just west of their study area, as a proxy for determining the timing of the landslides around Eyjafjörður.

They found that about 90% of landslides in the Eyjafjörður area did not occur immediately following deglaciation. Instead, they were delayed by several thousand years, until permafrost began thawing.

The researchers say their findings indicate that thawing permafrost was an important trigger of landslides in Eyjafjörður. They note that this pattern may have important implications for future landslides as warming continues and [permafrost](#) degrades.

More information: Adam M. Booth et al, Permafrost and Structural Controls on Holocene Bedrock Landslide Occurrence Around Eyjafjörður, North-Central Iceland, *Journal of Geophysical Research: Earth Surface* (2025). [DOI: 10.1029/2024JF007933](https://doi.org/10.1029/2024JF007933)

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