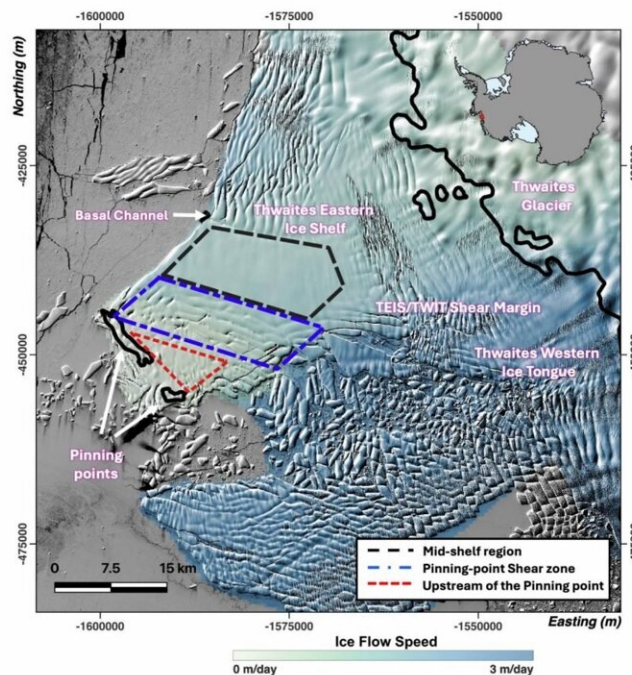


Cracks in Antarctic 'Doomsday Glacier' ice shelf trigger accelerated destabilization

November 7 2025



An image showing ice flow speed at the Thwaites Glacier in West Antarctica.
Credit: University of Manitoba

Thwaites Glacier in West Antarctica—often called the "Doomsday Glacier"—is one of the fastest-changing ice–ocean systems on Earth, and its future remains a major uncertainty in global sea-level rise projections. One of its floating extensions, the Thwaites Eastern Ice Shelf (TEIS), is partially confined and anchored by a pinning point at its

northern terminus.

Over the last two decades, TEIS has experienced progressive fracturing around a prominent shear zone upstream of this pinning point.

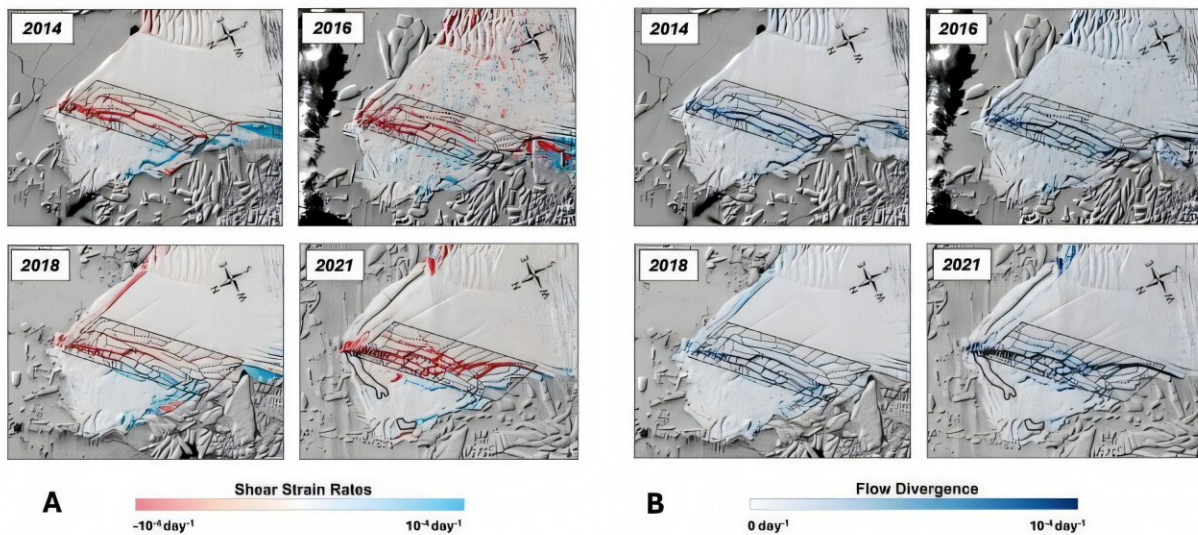
A [new study](#) published in the *Journal of Geophysical Research: Earth Surface* provides comprehensive details on how progressive disintegration has been taking place over the last two decades.

The study was published by the Center for Earth Observation Sciences and led by Debangshu Banerjee, a recent graduate student from the Center for Earth Observation Science (CEOS), together with Dr. Karen Alley (Assistant Professor, CEOS) and Dr. David Lilien (Assistant Professor, Indiana University Bloomington and former Research Associate at CEOS).

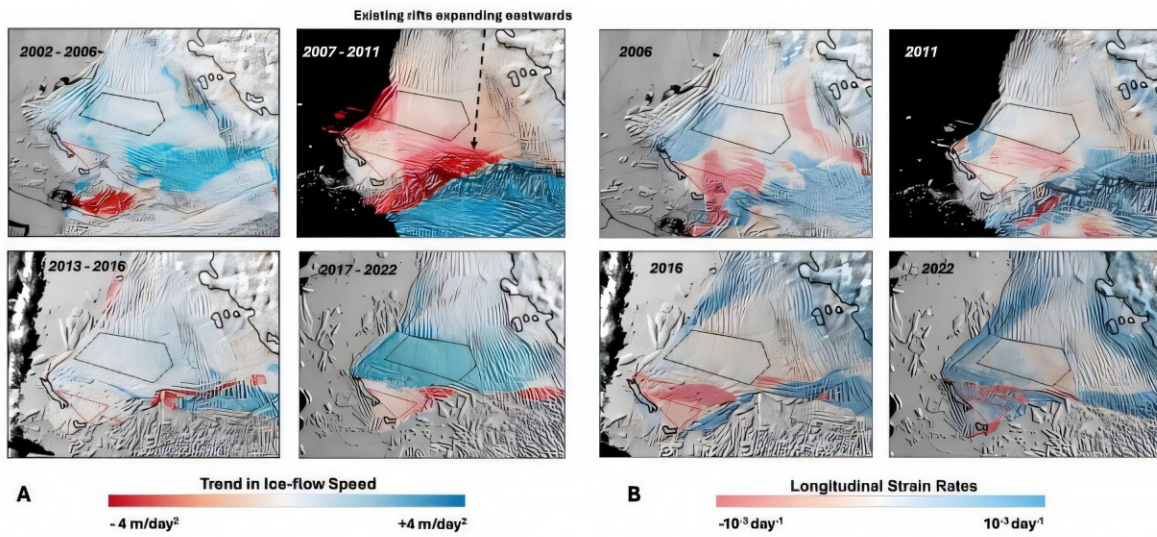
Tracking fractures and ice shelf weakening

The research is part of the TARSAN (Thwaites-Amundsen Regional Survey and Network) project, one of the components of the International Thwaites Glacier Collaboration (ITGC)—a major U.S.–U.K. research initiative studying the processes driving change in the Thwaites Glacier of West Antarctica. Renowned glaciologists Dr. Ted Scambos, Dr. Martin Truffer, Dr. Adrian Luckman, and Dr. Erin Pettitt have also been a part of this research.

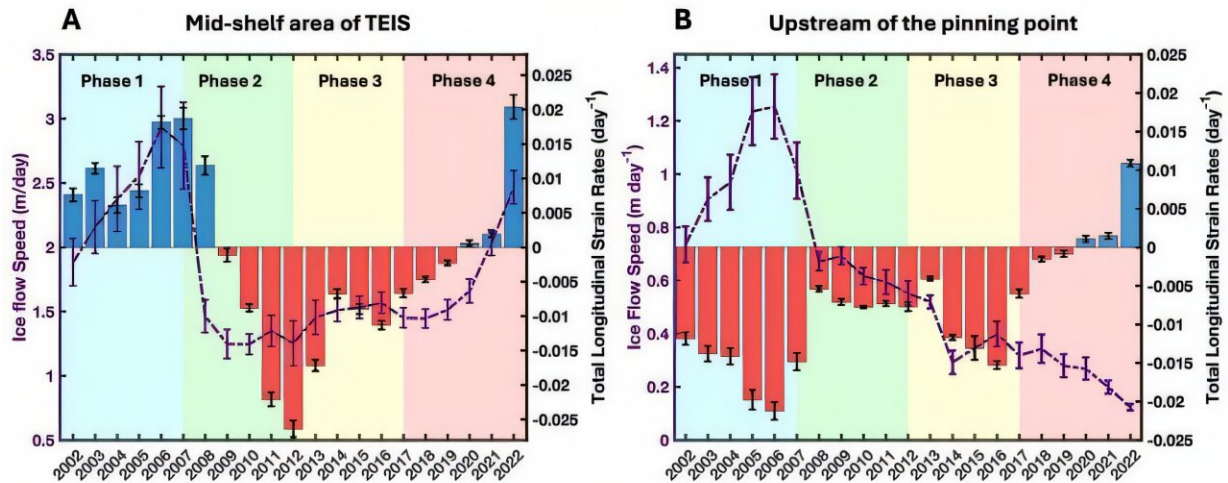
Drawing on two decades (2002–2022) of [satellite imagery](#), ice-flow velocity measurements, and in-situ GPS records, the team traced the evolution of fractures within the TEIS shear zone and their connection to changes in ice dynamics. The analysis revealed that the gradual development of these fractures led to the shelf's progressive detachment from its pinning point, causing accelerated flow upstream and a loss of mechanical stability.



A series of diagrams showing the shear strain rates and flow divergence of the Thwaites Glacier from 2014 to 2021. An image showing ice flow speed at the Thwaites Glacier from 2014 to 2021. Credit: *Journal of Geophysical Research: Earth Surface* (2025). DOI: 10.1029/2025jf008352



A series of diagrams showing a trend in ice-flow speed and the strain rates from 2006 to 2022. Credit: *Journal of Geophysical Research: Earth Surface* (2025). DOI: 10.1029/2025jf008352



Two graphs that show the mid-shelf area of TEIS and the upstream pinning point from 2002 to 2022. Credit: *Journal of Geophysical Research: Earth Surface* (2025). DOI: 10.1029/2025jf008352

The study identifies four distinct stages in this weakening process and offers two key insights. First, the fractures developed in two phases: an initial propagation of long, flow-parallel fractures, followed by shorter fractures oriented perpendicular to the direction of ice flow.

Second, the researchers found evidence for a positive feedback mechanism between fracture-induced damage and ice acceleration—an amplifying cycle that hastened the shelf's disintegration in recent years.

The research highlights how the pinning point, once a major stabilizing force for the TEIS, has gradually transitioned into a destabilizing agent through four distinct stages. This pattern of ice-shelf disintegration may

serve as a warning for other Antarctic ice shelves that are currently showing similar signs of weakening.

The continued loss of these floating ice shelves could have significant implications for the Antarctic Ice Sheet's future contribution to global sea-level rise.

More information: Debangshu Banerjee et al, Evolution of Shear-Zone Fractures Presages the Disintegration of Thwaites Eastern Ice Shelf, *Journal of Geophysical Research: Earth Surface* (2025). [DOI: 10.1029/2025jf008352](https://doi.org/10.1029/2025jf008352)

Provided by University of Manitoba

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