

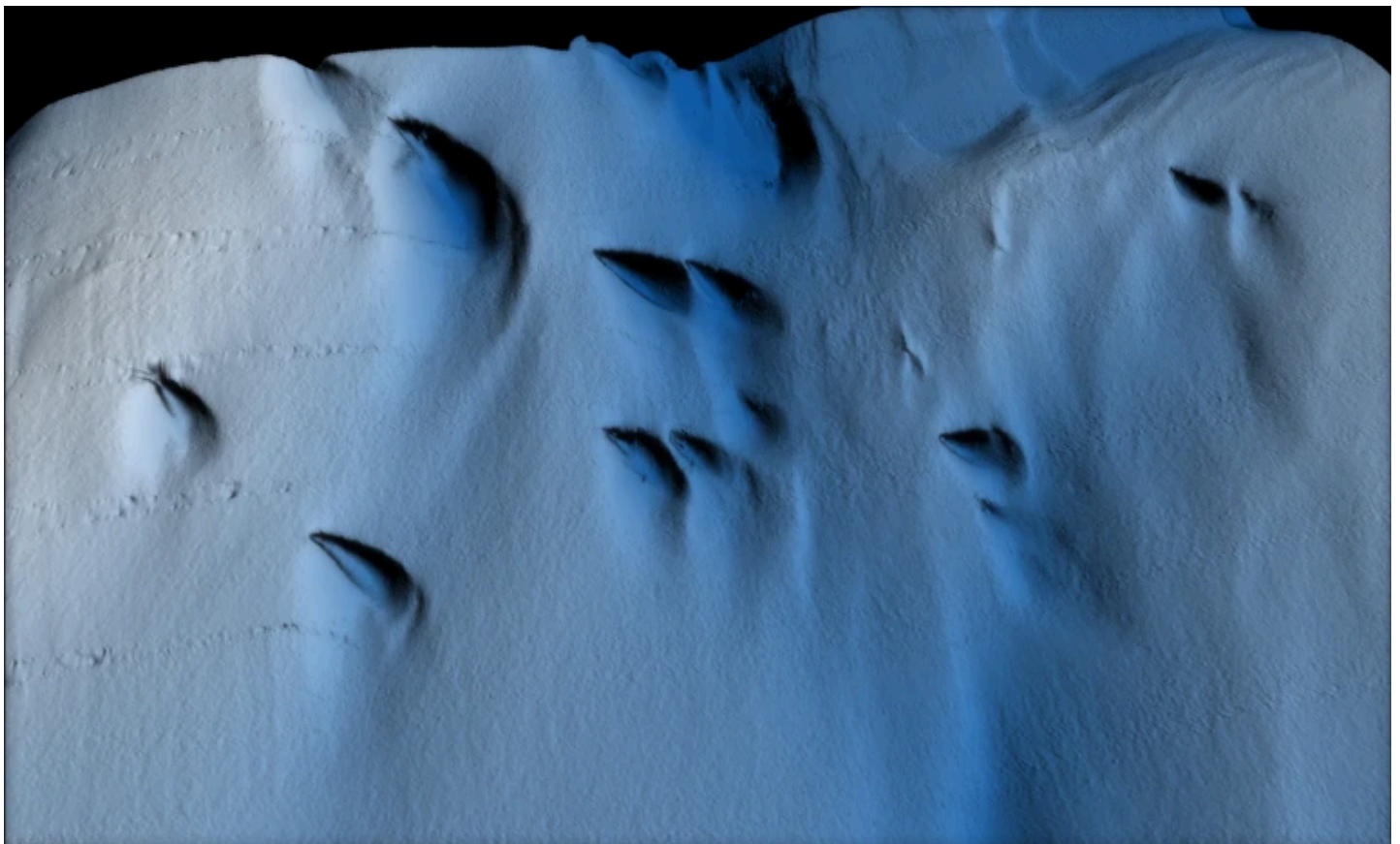
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NEWS | 31 July 2024

# First map of an ice shelf's bottom reveals mysterious melt patterns

**High-resolution images of the underside of a formation in Antarctica could help researchers to refine projections of sea-level rise.**

By [Alix Soliman](#)



A visualization of the underside of Dotson Ice Shelf, showing mysterious teardrop-shaped areas of melting. Credit: Filip Stedt/University of Gothenburg

The first detailed map of [the underside of an ice shelf](#) reveals melted areas that have an unexpected shape: teardrops<sup>1</sup>. The data, published today in *Science Advances*, could help researchers to better understand [how ice is affected when scoured by ocean currents](#) and might lead to more accurate [predictions of sea-level rise](#).

Although [remote-operated submersibles have ventured under ice shelves](#), none has produced a fine-resolution ice map before. “It’s a little bit like the holy grail in Antarctic oceanography,” says Anna Wåhlin, an oceanographer at the University of Gothenburg in Sweden and the first author of the paper. “We had to revise our mental images of the ice completely when we got these data.”

## Pings paint a picture

[Ice shelves float atop seawater](#), fed by tributary glaciers on land that flow towards the ocean. The study describes the belly of the [Dotson Ice Shelf](#), a part of the [West Antarctic Ice Sheet](#), which could cause an average sea-level rise of 3.2 metres if it were to suddenly collapse<sup>2</sup>. If Dotson breaks away, the land-based glaciers could become destabilized and their flow out to sea could accelerate, Wåhlin and others say.

In 2022, Wåhlin and her colleagues sent a robotic submersible equipped with sonar to map about 20% of the ice shelf. The craft repeatedly fired pings from 450 sonar beams, which echoed off the shelf and back to the submersible as it moved in a lawn-mower pattern back and forth under the ice for 27 days. The team also measured ocean currents and the temperature and salinity of the water.

The researchers discovered more than 75 teardrop shapes carved into the bottom of the ice shelf, ranging from 20 to 300 metres wide and averaging 14 metres deep. The teardrops were observed only on the western side of the shelf. That portion of the shelf is thinner and is battered by faster currents than is the shelf’s eastern side.



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“We know there’s a big risk” to sending expensive equipment under hundreds of metres of ice, Wåhlin says.  
“That’s why we don’t have these data until now.”

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## References

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  2. Bamber, J. L., Riva, R. E. M., Vermeersen, B. L. A. & LeBrocq, A. M. *Science* **324**, 901–903 (2009).
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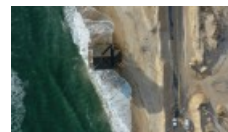
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