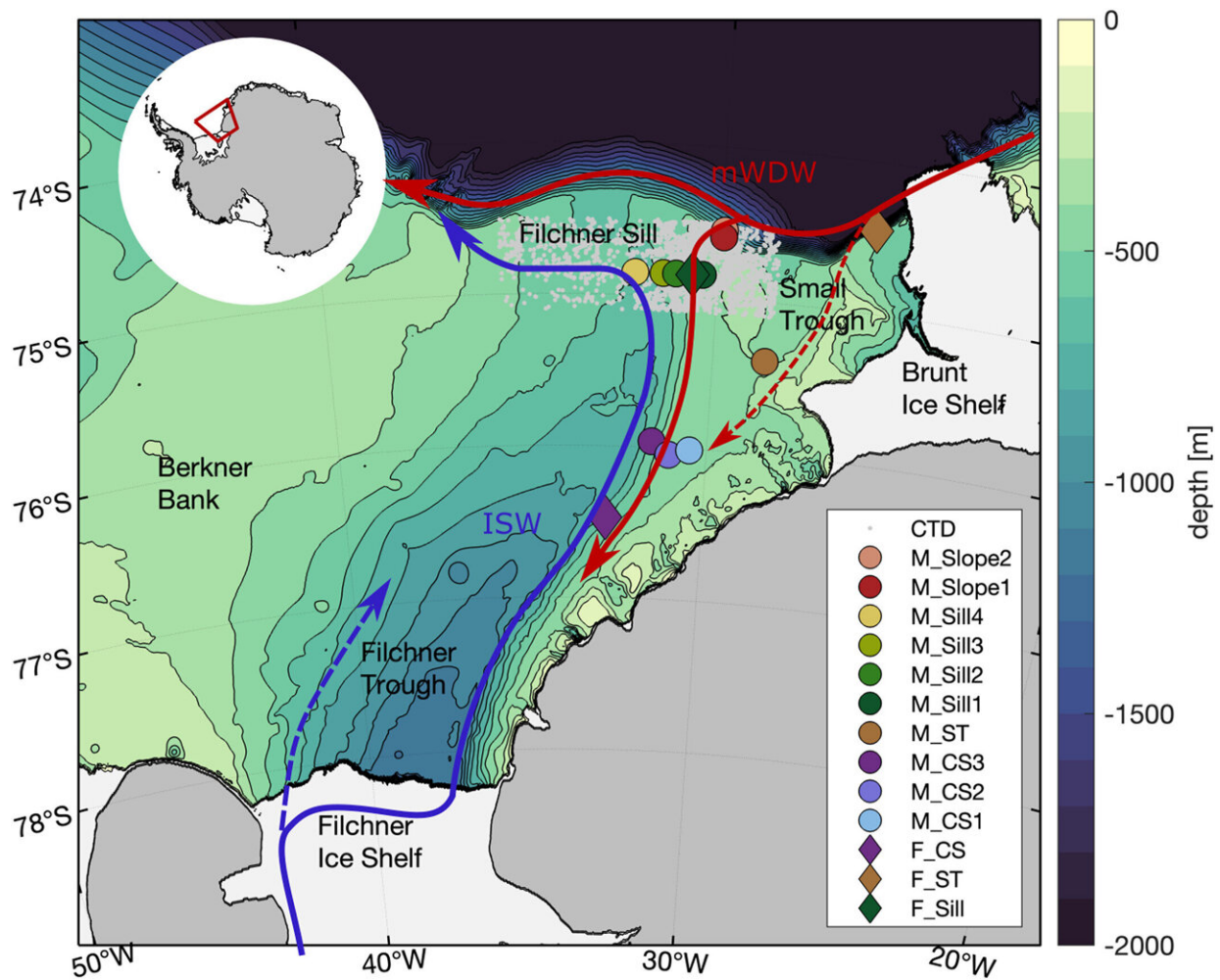


Warm seawater encroaches on major Antarctic ice shelf, raising sea level concerns

January 8 2025, by Sarah Stanley



Overview map of the Filchner Trough region in the eastern part of the southern continental shelf in the Weddell Sea. Credit: *Journal of Geophysical Research: Oceans* (2024). DOI: 10.1029/2023JC020700

The vast Antarctic Ice Sheet holds more than half of Earth's freshwater. In several places around the continent, the ice extends over the ocean, where it forms large floating shelves. Observations suggest many of these ice shelves are thinning as they melt from below, with implications for ocean dynamics, global sea level, and Earth's climate.

For now, the Filchner-Ronne Ice Shelf—one of Antarctica's biggest, extending over the Weddell Sea—appears to be relatively stable, thanks to near-freezing currents circulating over the [continental shelf](#) beneath it. However, [climate models](#) predict that shifting [ocean currents](#) may bring warmer water to the continental shelf in the future.

To gain a clearer picture of the Filchner-Ronne Ice Shelf's future, Steiger analyzed [water temperature](#) and velocity data from 2017 to 2021. The data were captured by sensors attached to bottom moorings along the seafloor and subsurface floats near the [ice shelf](#). The findings are [published](#) in the *Journal of Geophysical Research: Oceans*.

Prior research had already shown that during summer, relatively warm seawater rises from middle depths in the nearby ocean up to the continental shelf, then along the undersea Filchner Trough toward the edge of the ice shelf. However, most of these observations have been limited to single-site or single-year data.

In this study, researchers found that the summertime flow of warm water occurs not just along the Filchner Trough but also along a second, smaller trough to the east and that the relative importance of each path varies from year to year. During warmer-than-average years, the warm water flows more rapidly across the continental shelf.

The analysis also highlights two summers, 2017 and 2018, when both anomalously warm inflows and anomalously low amounts of floating sea ice occurred. The researchers suggest that scant ice cover alters ocean

dynamics, causing warm water to rise and more readily surge onto the continental shelf.

It is not clear whether the warmer flows of 2017 and 2018 actually reached the edge of the Filchner-Ronne Ice Shelf itself. However, researchers did observe warmer waters meeting the ice in summer 2013, and previous research suggested this warm water movement was associated with wind patterns. Ongoing observation could help clarify the precise drivers of year-to-year differences in this warm water flow.

More information: N. Steiger et al, Observed Pathways and Interannual Variability of the Warm Inflow Onto the Continental Shelf in the Southern Weddell Sea, *Journal of Geophysical Research: Oceans* (2024). [DOI: 10.1029/2023JC020700](https://doi.org/10.1029/2023JC020700)

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