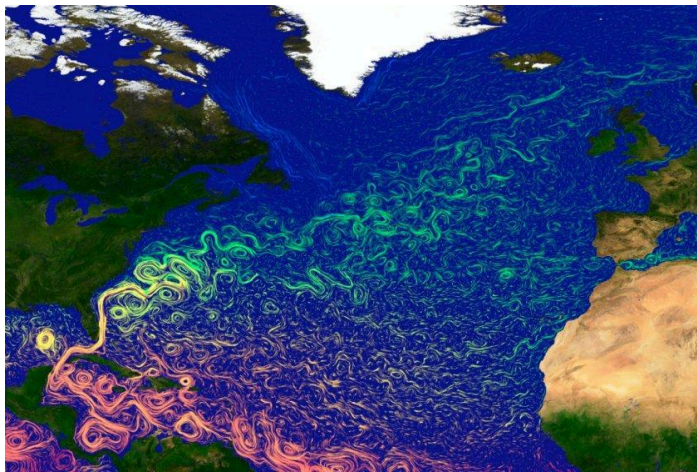


Satellites show some of the strongest evidence the AMOC is weakening

The crucial Atlantic current system that brings warmth to Europe has slowed 14 per cent in 30 years, according to an analysis of how much heat the ocean is releasing to the atmosphere

By [Alec Luhn](#) on October 26, 2026



Warm water flows from the Caribbean Sea towards the north Atlantic, where it releases heat.
KARSTEN SCHNEIDER/SCIENCE PHOTO LIBRARY

Satellite measurements suggest the Atlantic Meridional Overturning Circulation (AMOC) has been transporting less heat towards Europe, providing some of the strongest evidence yet of a slowdown in these ocean currents, which keep Europe's climate mild.

The AMOC system of currents, which includes the Gulf Stream, brings warm, salty water from the Gulf of Mexico to the north Atlantic, where it cools and sinks, returning south along the sea floor.

As it cools, the water releases heat into the atmosphere. But based on the satellite data, [Richard Allan](#) at the University of Reading, UK, and his colleagues calculated that the heat flux out of the north Atlantic has decreased 18 per cent in 40 years.

Because the AMOC's flow varies from year to year, the scientists used the first decade of data to estimate an average flow. They compared this to the following decades to find the circulation has declined 14 per cent in 30 years.

"We expect the AMOC to deliver heat northwards, and then that heat to come out of the top of the ocean into the atmosphere, and so if one of those things is changing, we expect the other one to change," says [Neil Fraser](#) at the Scottish Association for Marine Science, who wasn't involved in the study. "This is some of the strongest evidence so far that the AMOC has weakened over the last 40 years."

Climate models suggest the surge of fresh water from the melting Greenland ice sheet will dilute the salty water of the AMOC and slow its sinking, weakening the circulation. Some research suggests the AMOC could collapse as soon as 2060, [plunging](#) Europe into "ice age" winters with stronger storms and widespread drought.

Ocean buoys across the Atlantic have measured changes in water pressure corresponding to about a [10 per cent decline](#) in AMOC strength since 2004, but because its flow can sometimes ebb for decades at a time, this doesn't prove a long-term trend.

Scientists have looked for indirect evidence, like the "[cold blob](#)" in the north Atlantic, the only area of the world that has cooled since the 1800s. A 2018 analysis of these declining sea-surface temperatures estimated the AMOC had weakened [15 per cent](#) since the 1950s.

But sea-surface temperatures could also be decreasing due to a shift in jet stream winds or increased shading by clouds. Heat flux from the north Atlantic to the atmosphere can be a better indicator as it is "one step closer to the thing that drives AMOC", says [David Thornalley](#) at University College London.

Last year, a [study](#) calculated this heat flux from atmospheric reanalyses, which are essentially computer models that are nudged to match the spotty real-world observations on record. But the results didn't show any decline in AMOC strength between 1963 and 2017.

The new study, which is undergoing peer review, is the first to estimate AMOC weakening with heat fluxes calculated in part from satellite measurements, according to Allan. For decades, the ratio between how much solar energy Earth receives and how much heat energy it radiates back into space has been growing more positive. The researchers combined satellite measurements of this energy imbalance with reanalyses and models to figure out how much less heat the north Atlantic has been releasing to the atmosphere.

"The resulting inferred net air-sea flux is of demonstrably better quality than other estimates, making this estimate more suitable to infer AMOC changes," says team member [Michael Mayer](#) at the University of Vienna.

And because satellite measurements can be updated regularly, this method, if it holds up to scrutiny, could someday “provide a new early warning method for detecting changes in this vital current”, says Allan. The UK is investing £81 million in research to build an [early warning system](#) for AMOC collapse by 2030, although this study isn’t part of the initiative.

[Stefan Rahmstorf](#) at the University of Potsdam, Germany, argues that heat flux isn’t necessarily a better indicator of AMOC changes than sea-surface temperatures, which can be directly measured. But he says the two build on each other to increase concern that the AMOC could be approaching a tipping point.

Another recent study, which examined reanalyses of the ocean rather than the atmosphere, similarly found the AMOC has [weakened 15 per cent](#) in 30 years.

“The strongest evidence is the combination of several different lines of evidence, all pointing to a slowing AMOC,” says Rahmstorf.

Reference:

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