

# Deep ocean warming as climate changes

May 17 2022

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The subtropical North Atlantic. Credit: Marie-Jose Messias

Much of the "excess heat" stored in the subtropical North Atlantic is in the deep ocean (below 700m), new research suggests.

Oceans have absorbed about 90% of warming caused by humans. The study found that in the subtropical North Atlantic (25°N), 62% of the

warming from 1850-2018 is held in the deep ocean.

The researchers—from the University of Exeter and the University of Brest—estimate that the deep ocean will warm by a further 0.2°C in the next 50 years.

Ocean warming can have a range of consequences including [sea-level rise](#), changing ecosystems, currents and chemistry, and deoxygenation.

"As our planet warms, it's vital to understand how the [excess heat](#) taken up by the ocean is redistributed in the ocean interior all the way from the surface to the bottom, and it is important to take into account the deep ocean to assess the growth of Earth's 'energy imbalance'," said Dr. Marie-José Messias, from the University of Exeter.

"As well as finding that the deep ocean is holding much of this excess heat, our research shows how [ocean currents](#) redistribute heat to different regions.

"We found that this redistribution was a key driver of warming in the North Atlantic."

The researchers studied the system of currents known as the Atlantic Meridional Overturning Circulation (AMOC).

AMOC works like a conveyor belt, carrying [warm water](#) from the tropics north—where colder, dense water sinks into the [deep ocean](#) and spreads slowly south.

The findings highlight the importance of warming transferring by AMOC from one region to another.

Dr. Messias said excess heat from the Southern Hemisphere oceans is

becoming important in the North Atlantic—now accounting for about a quarter of excess heat.

The study used temperature records and chemical "tracers"—compounds whose make-up can be used to discover past changes in the ocean.

The paper, published in the Nature journal *Communications Earth & Environment*, is entitled: "The redistribution of anthropogenic excess heat is a key driver of warming in the North Atlantic."

**More information:** The redistribution of anthropogenic excess heat is a key driver of warming in the North Atlantic, *Communications Earth & Environment* (2022). [DOI: 10.1038/s43247-022-00443-4](https://doi.org/10.1038/s43247-022-00443-4)

Provided by University of Exeter

Citation: Deep ocean warming as climate changes (2022, May 17) retrieved 27 April 2024 from <https://phys.org/news/2022-05-deep-ocean-climate.html>

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