

Unprecedented ocean heating shows risks of world 3C warmer

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Record-high ocean temperatures observed in 2023 could become the norm if the world moved into a climate that is 3°C warmer than pre-industrial levels, according to a new study.

From March 2023, the North Atlantic began to show extremely warm temperatures far exceeding anything seen in the past 40 years. As of August 2023, the North Atlantic was about 1.4°C warmer than the 1982–2011 average.

Analysis of climate model projections showed that last year's extreme ocean conditions were similar to what scientists expect to be the average if [global warming](#) reaches 3°C of [warming](#). Currently, [global temperatures](#) have risen by about 1.2°C above pre-industrial levels.

New research, [published](#) this month in the *Bulletin of the American Meteorological Society*, examines the causes of the record-breaking ocean temperatures witnessed in 2023.

Dr. Till Kuhlbrodt, of the University of Reading, led the study. He said, "The extraordinary heat in the North Atlantic and missing sea ice in the Southern Ocean in 2023 tell us the oceans are sounding an alarm. We urgently need to understand exactly why parts of the ocean are warming rapidly so we can prepare for more frequent weather disruption across the planet. How often we get hit by more of these extremes hangs on figuring out what's driving the Atlantic and Southern Oceans into uncharted territory."

Climate connection?

The study highlights that Earth's energy imbalance is likely a key driver of extreme ocean temperatures, as the planet is currently absorbing more than 1.9 watts per square meter more [solar energy](#) than it radiates back to space as heat. Across Earth, over a time span of one year, this is equivalent to roughly 300 times the global annual consumption of electric energy.

This imbalance has grown fast over recent decades mainly due to heat-

trapping gases from human activity. This increasing energy surplus is propelling ocean warming, with more than 90% of the excess energy accumulated by Earth being funneled into the oceans.

Since 2016 the Atlantic Ocean has warmed faster than other ocean basins in the top 100 meters of ocean. This enhanced Atlantic warming may be linked to record low levels of sea ice in the Southern Ocean, the researchers suggest.

The rapid Atlantic warming has coincided with a sharp decline in sea ice cover surrounding Antarctica. In 2023, Antarctic winter sea ice extent reached by far the lowest levels since satellite monitoring began in the late 1970s.

The researchers emphasize the need to quantify how much the rapid Atlantic warming is impacting sea ice cover. Reliably attributing the oceanic and sea ice extremes will ensure [climate models](#) can accurately predict future extremes, which will inform mitigation policies and resilience measures across the globe.

Dr. Kuhlbrodt added, "We need more data from the Atlantic to conclusively tie the warming and disappearing ice trends to a shift in the pattern of ocean currents, but the signals point to a hidden climate connections between the poles."

More information: Till Kuhlbrodt et al, A glimpse into the future: The 2023 ocean temperature and sea-ice extremes in the context of longer-term climate change, *Bulletin of the American Meteorological Society* (2024). [DOI: 10.1175/BAMS-D-23-0209.1](https://doi.org/10.1175/BAMS-D-23-0209.1)

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