PAPER CHECK · OCEAN CIRCULATION

The North Atlantic is losing less heat; the 14% AMOC slowdown is inferred, not measured

A Met Office–led preprint finds that the heat the Atlantic between 26.5°N and 70°N loses to the air fell by about 18% from 1985 to 2023, and infers through climate models that the overturning circulation, the AMOC, slowed by 14.2 ± 13.9% over 30 years [1 p. 4]. The fall in heat loss reproduces in the public data but rests on one method; the AMOC figure is an estimate whose range runs from almost nothing to 28%, in a study still under review [6][3]. New Scientist reported a 14% slowdown and "some of the strongest evidence" that the AMOC is weakening [2].

By Fact-Checked Science · Published October 29, 2026

OUR ANALYSIS marks our own reasoning and calculations, including our re-run of the public heat-flux data and of the RAPID record and our arithmetic on the preprint's numbers; the verdicts are our assessment. Everything else comes from the numbered sources. For the preprint [1], p. gives a page of Research Square's 37-page PDF, counting its two cover pages, Fig. a Figure and Table a table; for the New Scientist article [2], ¶ counts the paragraphs of its text after the standfirst and the photo caption, skipping the "Read more" link, the advertisement and newsletter labels and the closing reference line.

A real fall in heat loss; an AMOC slowdown inferred from climate models, with a range that starts near zero

OUR ASSESSMENT

0.3–28%
the 95% range of the overturning's fall over the last 30 years in the preprint, 14.2 ± 13.9%, inferred from the heat loss through climate models rather than measured [1 p. 4][3 p. 11]

−0.038
PW a decade: the fall in heat loss we find in the public, earlier version of the same heat-flux data, 1985–2016, against −0.036 in the preprint's matching version for 1985–2023, by our analysis [6][3 Fig. 1]

−0.89
Sv a decade: the overturning's measured trend at 26.5°N over 2005–2023, as the preprint gives it; our re-run of the same RAPID release gets the same, ±1.54, a range that includes zero [1 Fig. A1][4]

THE CLAIMS

TRUE
Heat loss fell about 18%
The preprint: "from 1985 to 2023 the heat lost by the Atlantic ocean between 26.5°N and 70°N reduced by about 18 ± 10% (95% confidence interval)" [1 p. 4]

Three versions of the estimate, built with three reanalyses, all show the fall, and the arithmetic reproduces [1 p. 7]. So does the public, earlier version of the same data: our re-run gives −0.038 ± 0.021 PW a decade for 1985–2016, against −0.036 ± 0.017 for the preprint's ERA5 version [6][1 Fig. 1]. But it rests on one method, and its ±10% counts only the spread of three related estimates [1 p. 7]. The surface fluxes the same reanalyses compute themselves show no fall [1 Fig. 1], though the authors, citing others, consider those unreliable for trends [1 p. 4][1 p. 14]. The fall came by about 2005; the heat loss shows no trend since. See section 2.

UNCONFIRMED
AMOC fell 14.2 ± 13.9%
The preprint: "we calculate the AMOC at 26.5°N reduced by 14.2 ± 13.9% over the last 30 years" [1 p. 4]

The overturning was not measured. The figure converts the fall in heat loss through a relation found in climate models, and the 14.2% is the heat loss's own change over those years [1 p. 10][1 p. 11]. Its 95% range runs from 0.3% to 28%. The study is still in peer review [3], the direct record at 26.5°N covers only the last 20 of the 30 years [4], and two peer-reviewed reconstructions over overlapping years found no decline [7 Abstract][10 Abstract], while RAPID's shorter direct record shows a decline of similar size that is not significant on its own [4][1 Fig. A1]. See section 3.

OVERSTATED
More robust than other proxies
The preprint: "These findings are probably more robust than those from other AMOC proxies, because the reduction in heat loss is the fundamental mechanism for AMOC weakening under global warming." [1 p. 4]

The mechanism has support in model experiments, and a 2025 model study found heat fluxes, not sea temperatures, track the overturning on decadal timescales [12 Abstract][7 Abstract]. But a heat-flux proxy is only as good as its heat fluxes: with the reanalyses' own, that 2025 study found no decline since the 1960s [7 Abstract]. The climate models behind the conversion simulate the key region poorly [1 p. 12], and the paper does not test its estimate against any other proxy's over the same years. See section 5.

OVERSTATED
Slowed 14 per cent in 30 years
New Scientist's standfirst: the Atlantic current system "has slowed 14 per cent in 30 years" [2 standfirst]

The standfirst credits it to an analysis of the ocean's heat loss but gives the preprint's central estimate alone, as if it were a measured slowing. The article leaves out its ±13.9%, which reaches almost to zero, and never says the AMOC figure comes from climate models: it describes the ten-year averaging as of the flow, when it was of the heat flux [2 ¶4][1 p. 9]. Its body does note that peer review is under way [2 ¶11]. See section 6.

OVERSTATED
Some of the strongest evidence
New Scientist's headline: "Satellites show some of the strongest evidence the AMOC is weakening" [2 headline]

The headline follows the preprint's own abstract, which calls the heat fluxes "satellite-based" [1 p. 4]. But satellites supply one input, the radiation at the top of the atmosphere; the rest of the heat-flux estimate comes from reanalyses, and the AMOC figure from climate models [1 p. 14]. "Strongest" is the view of one outside researcher in the article [2 ¶5]; another there says the strongest evidence is "the combination of several different lines of evidence", which together, he says, indicate a slowdown [2 ¶16]. And the study has not yet passed review [3]. See section 6.

1 · THE STUDY

A heat budget from satellites and reanalyses, turned into an AMOC trend with climate models

Michael Bell of the Met Office and eleven colleagues at the Met Office, the universities of Reading, Oxford and Vienna and Guangdong Ocean University posted the preprint on Research Square on October 7, 2026, under CC BY 4.0 [1 p. 2][1 p. 3]. It has not been peer reviewed: Research Square lists it as under review at *Nature Climate Change* [3].

STEP 1
Heat lost to the air
The heat the ocean gives up at its surface, from the DEEP-C method: the radiation balance at the top of the atmosphere measured by satellites (ERBE, then CERES), minus the energy the atmosphere carries away and stores, from three reanalyses, ERA5, JRA55 and MERRA2; version 5.1, 1985–2023 [1 p. 14].

STEP 2
A falling trend
Over the Atlantic between 26.5°N and 70°N, the three versions agree that the heat loss fell: from 0.986 PW by 0.047 ± 0.026 PW a decade, 18.5% over the 39 years, ±10.3% [1 p. 7]. One PW is 10^{15} watts.

STEP 3
A relation from climate models
In simulations of climate change by 14 CMIP6 models (Table A1 lists 15; CMCC was left out [1 p. 17]), trends in the overturning at 26.5°N follow trends in the heat lost north of it over the ten years before, at about 19 Sv per PW [1 p. 9][1 Fig. 3]. One Sv is a million cubic metres a second.

STEP 4
The AMOC estimate
Applied to the 30-year trend of the ten-year means, the relation gives −1.02 Sv a decade, ±1.00 once the models' scatter is added; as a share, 14.2 ± 13.9% [1 p. 10][1 p. 11].

Review, data and funding

Research Square's record of the preprint, as served on October 29, 2026, lists four review events between October 11 and 27, whose content is not public, and an editorial decision recorded as "revise" on October 28, two days after New Scientist's article [3][2]. The manuscript is dated August 28 [1 p. 4]. Its "Data availability" and "Code availability" headings are empty [1 p. 19], and the heat-flux version it uses, 5.1, is not in the University of Reading's public archive, which holds version 5.0, ending in 2017 [6]. The Met Office authors are funded by the Hadley Centre Climate Programme, two authors by the National Science Foundation of China and one by the European Space Agency [1 p. 19]. The declaration on Research Square's cover page reads "There is NO Competing Interest." [1 p. 2][3]

In the authors' words

NUSHF is the preprint's net upward surface heat flux: the heat the ocean loses to the air.

> *"Taken together, the above results suggest that the northern Atlantic heat fluxes have reduced in response to increasing greenhouse gases and that the AMOC has already begun a slow weakening trend."*
> Bell et al. (2026) [1 p. 13]

> *"Clearly conclusions based on NUSHF obtained directly from the reanalyses need to be treated with great caution."*
> Bell et al. (2026) [1 p. 8]

> *"The correlation of interannual fluctuations in the AMOC and this NUSHF is very weak, so only the slopes of these timeseries are worthy of comparison."*
> Bell et al. (2026), comparing with RAPID [1 p. 11]

The fall in heat loss reproduces in the public data, but it rests on one method

All three versions of the estimate show the fall, and so does the public, earlier version of the same data, which we re-ran. The surface fluxes the same reanalyses compute themselves do not [1 Fig. 1][6].

Trends with their 95% ranges, 1985–2023: from the numbers in Fig. 1 of [1], panels (c) and (g). CC BY 4.0, and for the mean from its text [1 Fig. 1][1 p. 7]. The open dot is our re-run of the public DEEP-C v5.0, which ends in 2017, over our reading of the preprint's region [6]. A negative trend means less heat lost.

Our analysis of DEEP-C v5.0 (Liu and Allan, University of Reading, CC BY 4.0), built with ERA5: the net surface flux over our reading of the preprint's region, ocean cells only, as calendar-year means [6]. Trend −0.038 ± 0.021 PW a decade (95%, the preprint's recipe); 1985–2004 alone −0.024 ± 0.041; 2005–2016 +0.013 ± 0.120.

OUR ANALYSIS
Our re-run of the public data
The preprint's version of the data, 5.1, is not public, so we used version 5.0, the one the University of Reading archives: the same method with ERA5 only, ending in November 2017 [6 README]. We took the region from the preprint's map, a box that follows the coasts from 26.5°N to 70°N [1 Fig. 1], kept ocean cells and summed. Our region covers 22.3 million km², near the 21.9 million the preprint's numbers imply [1 p. 7], and our yearly values track its ERA5 curve in Fig. 1(c), by eye: 1.00 PW in 1985, 1.05 in 1989, 0.73 in 2012. The trend for 1985–2016 is −0.038 ± 0.021 PW a decade, −1.7 W m⁻² a decade, a fall of 12% along the fitted line. So the fall is not an artefact of version 5.1 or of the years after 2016; it is not a test of the method against an independent one.

OUR ANALYSIS
One method, three related estimates
The three versions share the satellite record and the method; they differ in the reanalysis that supplies the atmosphere's energy transport [1 p. 14]. The ±10% treats them as independent and comes from their spread [1 p. 7], so it leaves out errors they share. The authors estimate one, for gaps in the satellite record, and find it small, and they note that their +0.026 is reasonably consistent with the individual fits' own 95% ranges, which span −0.019 to −0.080 PW a decade [1 p. 7]. The reanalyses' own surface fluxes show no fall at all [1 Fig. 1]. The authors give reasons, with references, to distrust those for trends [1 p. 8], and a 2023 study of ERA5's found its basin-wide trends "partially artificial" [8 Abstract]. An earlier version of the DEEP-C method matched RAPID's mean heat transport at 26°N, 1.23 PW against 1.22 [13 Abstract].

OUR ANALYSIS
The fall came before about 2005
In our re-run the decade means fell from 0.955 PW in 1985–1994 to 0.919 in 1995–2004 and 0.863 in 2005–2016 [6]: about 40% of the fall between the first two decades and the rest at a step around 2004–2005. The 1985–2004 trend alone, −0.024 ± 0.041 PW a decade, is not significant; since 2005 there is no trend, +0.013 ± 0.120, though the range is wide [6]. The preprint's own comparison with RAPID shows almost no trend in the year-by-year heat loss over 2005–2023 either [1 Fig. A1]. So its 30-year AMOC figure rests on how 1985–2004 compares with the years since, mostly before the direct record began.

3 · TO THE AMOC

The AMOC figure comes from climate models, and its range runs from almost nothing to 28%

The preprint did not measure the overturning. It turned the heat-loss trend into an AMOC trend with a relation found in climate models, and its uncertainty more than doubles at that step [1 p. 10][1 p. 11].

Trends with 95% ranges, from the numbers in the text [1 p. 10][1 p. 11] and in Fig. A1 of [1]. CC BY 4.0 [1 Fig. A1]. The inferred trends are 19 Sv per PW times a heat-loss trend; RAPID's covers only 2005–2023.

Two different numbers
The 18% is the 39-year trend in each year's heat loss, 1985–2023 [1 p. 7]. The 14.2% is the change over the last 30 years in the heat loss averaged over the ten years before each year, the form the models' relation uses [1 p. 9][1 p. 11]. At 19 Sv per PW, that 30-year trend is −1.02 ± 0.46 Sv a decade; adding the models' scatter around their relation, 0.456 Sv a decade or ±0.89 at 95%, gives ±1.00 [1 p. 10][1 p. 11]. The paper then states the heat loss's own percentage change as the AMOC's, with a range of 13.9%, which matches 14.2 × 1.00/1.02, the same relative uncertainty (our arithmetic).

OUR ANALYSIS
A range that starts near zero
14.2 ± 13.9% runs from 0.3% to 28.1%. Equating the AMOC's percentage with the heat loss's assumes the overturning is proportional to the heat loss, as the preprint's Fig. A1 does [1 Fig. A1]. The paper does not say whether its 14.2% comes from the fitted trend or from the first and last ten-year means [1 p. 11]. From the fitted trend instead, −1.02 Sv a decade over the 29 years between the first and last ten-year means is about 3.0 Sv, 17.5% of RAPID's 2005–2023 average in release v2024.1a, 16.9 Sv [4]. Either way, the range is wide.

The climate models behind the step

The key region is the models' weak spot
The fall in heat loss is largest off the Canadian east coast, a region "particularly poorly simulated by most of the CMIP6 models", and the models' patterns of reduced heat loss "differ from those of the DEEP-C products in nearly all cases", the authors write [1 p. 12].

The models may vary too little
The fall is rare in the models' runs without added greenhouse gases: only 1 of their 324 forty-year trends is steeper than the ERA5 version's [1 p. 9]. But the spread of those runs "is probably somewhat smaller than it should be", the authors note [1 p. 10]; a 2018 study found that most models of the two previous generations underestimate the overturning's slow swings [14 Abstract]. The 324 trends overlap by half, and one model, CMCC, was left out for its large swings and drift, a choice the authors say affects that spread [1 p. 15][1 p. 17].

A relation from forced runs
The relation comes from periods when greenhouse gases drive the overturning: "Weaker correlations might be obtained in periods when greenhouse gas forcing has equilibrated" [1 p. 17]. For 30-year trends it explains 72% of the variance [1 p. 9]. Read by eye from Fig. 3(c), the largest trends, which anchor the line, come from runs in which CO_2 is quadrupled at once; near the observed heat-loss trend, about −0.05 PW a decade, the models' AMOC trends spread from about −1.5 to −0.2 Sv a decade. The scatter, 0.456 Sv a decade, is about half the trend inferred [1 Fig. 3][1 p. 10].

The mechanism has support
That less heat loss weakens the overturning under warming is the preprint's premise [1 p. 5], and model experiments back it: in a 2023 study the weakening was "mainly caused by and linearly related to the North Atlantic heat flux perturbation" [12 Abstract].

4 · THE DIRECT RECORD

At 26.5°N, RAPID measured a similar decline since 2004, but it can't test 30 years

The RAPID array has measured the overturning at 26.5°N since April 2004 [4]. We re-ran the preprint's comparison with the release it used, v2024.1a, and got its numbers; the newest release, published on October 13, 2026, runs to November 2024 [5].

Our analysis. Calendar-year means of RAPID's overturning: the line from release v2024.1a, averaged from its 12-hourly values [4]; the open circles from v2024-2, whose 2024 covers January to November [5]. Contains public sector information licensed under the Open Government Licence v3.0. "Data from the RAPID AMOC observing project is funded by the Natural Environment Research Council, U.S. National Science Foundation (NSF) with support from NOAA. They are freely available from https://rapid.ac.uk/."

2005–2023 · OUR ANALYSIS
−0.889
Sv a decade over the preprint's years, ±1.54 with its own recipe: its −0.89 ± 1.5 reproduced, a range that includes zero [4][1 Fig. A1]

APRIL 2004 TO 2023 · OUR ANALYSIS
−9.9%
along the fitted line to December 2023, −1.77 Sv: New Scientist's figure of about 10% since 2004 holds [4][2 ¶7]

TO NOVEMBER 2024 · OUR ANALYSIS
−0.67
Sv a decade in the newest release, ±1.04 with AR(1) noise: 2024 averaged 17.7 Sv, above that release's 2005–2023 average of 17.0 [5]

Trends over 2005–2023 with 95% ranges, from the numbers in Fig. A1 of [1]. CC BY 4.0: RAPID's year means, and the overturning the preprint infers from DEEP-C. 19 Sv per PW times the heat loss of the same year or of the ten years before [1 Fig. A1].

OUR ANALYSIS
A match that settles little
The preprint concludes that its heat-loss results "are as consistent with the RAPID data as can reasonably be expected" [1 p. 12]. They are, but the test can't tell much apart: RAPID's ±1.5 covers every version, including the three from same-year heat loss, which show no trend. The authors call RAPID's decline "slightly larger" than theirs [1 p. 11]; against those three it is several times larger. RAPID's own heat transport across 26.5°N, the heat that supplies the losses farther north, shows no significant change over 2004–2024: −0.01 ± 0.09 PW a decade [5].

OUR ANALYSIS
What the site found before
Our page on the overturning's western side found the whole overturning at 26.5°N declining by 0.09 ± 0.08 Sv a year over 2004–2023, about a third as fast as the western boundary's contribution [16 p. 2]. That figure uses the Florida Current record after its correction for the slow drift of Earth's magnetic field, which cut RAPID's trend by about 40%; the correction's authors read the record as "interdecadal variability rather than a long-term decline" [17 implications]. Whether RAPID's decline is significant depends on the noise model: McCarthy and colleagues give 1.0 [0.4–1.6] Sv a decade for 2004–2023, a 90% range by the preprint's account [9 Abstract][1 p. 6], while with AR(1) noise our 95% ranges include zero (table below).

5 · OTHER EVIDENCE

Other ways of extending the record disagree about a decline

Before 2004 the overturning has to be inferred: from sea temperatures, heat fluxes and other properties of the ocean, which the preprint lists [1 p. 5], or from ship-based measurements and ocean reanalyses [10 Abstract][15 Abstract]. The methods disagree [1 p. 5].

Estimates of the overturning's change, by method

STUDY	METHOD	YEARS	FINDING
This preprint [1 p. 4]	**DEEP-C heat loss, through a relation from climate models**	**the last 30 years, to 2023**	**14.2 ± 13.9% weaker**
Caesar et al., 2018 [11 Abstract]	A pattern of sea-surface temperatures, calibrated with climate models	since the mid-20th century	about 3 ± 1 Sv, around 1.5%, weaker
Mayer et al., 2023 [8 Abstract]	ERA5's air–sea heat fluxes with ocean heat content	1950–2019	a decline, its size uncertain
Worthington et al., 2021 [10 Abstract]	Ship-based measurements in a model built on RAPID	1981–2016	no overall decline
Terhaar et al., 2025 [7 Abstract]	The reanalyses' own heat fluxes, through a relation from climate models	1963–2017	no decline in the decadal average
Winkelbauer et al., 2026, preprint [15 Abstract]	17 ocean reanalyses	1993–2023	heat transport at 26.5°N down 0.058 ± 0.039 PW a decade
McCarthy et al., 2025 [9 Abstract]	RAPID's moorings across 26.5°N	2004–2023	1.0 [0.4–1.6] Sv a decade weaker (90%, the preprint says [1 p. 6])

All but the preprint read in abstract only. Winkelbauer et al. report heat transport, not the overturning's volume.

OUR ANALYSIS
Why the claim of greater robustness is overstated
The preprint argues that because heat loss drives the weakening, a heat-loss proxy should be cleaner than proxies with other influences, such as sea temperatures, and than direct records too short to show a trend [1 p. 12]. That has support: model experiments tie the weakening to heat loss [12 Abstract], and in 24 climate models Terhaar and colleagues found that subpolar sea temperatures cannot robustly reconstruct the overturning, while heat-flux anomalies are tightly linked to it on decadal and centennial timescales [7 Abstract]. But robustness is not shown. A heat-flux proxy depends on its fluxes: Terhaar and colleagues applied the same kind of relation to the reanalyses' own fluxes and found no decline since the 1960s, while with DEEP-C the preprint finds one [7 Abstract][1 p. 4]. Heat loss also answers to the weather. On annual timescales, Terhaar and colleagues write, heat-flux anomalies "are mostly altered by atmospheric variability and less by AMOC anomalies" [7 Abstract], which matters less for the preprint's ten-year means; but the 2023 ERA5 study ties trends in the Irminger and Labrador Seas, near the region of the largest fall, to the North Atlantic Oscillation [8 Abstract][1 p. 12]. The conversion depends on climate models that handle that region poorly [1 p. 12]. And the paper, which discusses other proxies [1 p. 5], does not test its estimate against any other proxy's over the same years.

6 · NEW SCIENTIST

New Scientist got the numbers right and the certainty wrong

Alec Luhn's article of October 26, 2026, reports the preprint's numbers accurately and gives other scientists' views, but its headline and standfirst state the result more firmly than the study does [2].

What the article gets right
- The fall of about 18% in the heat lost over about 40 years, 1985–2023 [2 ¶3][1 p. 4].
- That the study is still in peer review, and that its fluxes came in part from satellites [2 ¶11].
- RAPID's decline of about 10% since 2004, and that it can't show a long-term trend [2 ¶7]; our re-run gives −9.9% to December 2023 [4].
- The 2018 sea-temperature estimate of about 15% since the 1950s [2 ¶8][11 Abstract], and the 2025 heat-flux study that found no decline over 1963–2017 [2 ¶10][7 Abstract].
- Outside voices on both sides, including Stefan Rahmstorf's doubt that heat flux is a better indicator than sea-surface temperature [2 ¶14].

What it drops or changes
- **The range.** The standfirst says the system "has slowed 14 per cent in 30 years" [2 standfirst]: the ±13.9% never appears, nor that the figure comes from climate models.
- **The method.** It says the scientists "used the first decade of data to estimate an average flow" [2 ¶4]. What was averaged, over the ten years before each year, was the heat flux; the flow was never measured [1 p. 9][1 p. 11].
- **Satellites.** The headline credits them, as the preprint's own abstract does in calling its fluxes "satellite-based" [1 p. 4]; but satellites supply one input, the radiation at the top of the atmosphere; the rest of the heat-flux estimate comes from reanalyses and climate models [1 p. 14].
- **Europe.** It says the AMOC has carried less heat towards Europe [2 ¶1]. The preprint does tie the AMOC's heat to Europe's mild climate [1 p. 4], but it infers less heat lost to the air over the whole region, most off Canada [1 p. 12]; it doesn't measure the heat reaching Europe, and RAPID's heat transport at 26.5°N shows no significant change since 2004 [5].
- **Credit.** It names Richard Allan of Reading and colleagues [2 ¶3]; Allan is the second author, and the lead and corresponding author is Michael Bell of the Met Office [1 p. 3].

Who calls it the strongest evidence
The headline's judgment is Neil Fraser's, of the Scottish Association for Marine Science, who was not involved: he calls it among the strongest evidence yet that the AMOC has weakened in the past 40 years [2 ¶1], though the preprint's AMOC estimate covers 30 [1 p. 4]. David Thornalley of University College London says heat flux is closer than sea temperature to what drives the AMOC [2 ¶9]; Stefan Rahmstorf of the University of Potsdam doubts that heat flux is the better indicator, though he says it and sea temperatures together add to the concern [2 ¶14]; for him the strongest evidence is "the combination of several different lines of evidence", which together point to a slowing AMOC [2 ¶16]. Team member Michael Mayer calls the heat fluxes better than other estimates [2 ¶12].

What the article adds
The article says climate models expect Greenland's meltwater to weaken the circulation, and that some studies put a possible collapse as early as 2060 [2 ¶6]. The preprint never mentions a collapse: it describes "a slow weakening trend" [1 p. 13] and suggests that "the AMOC may not reduce so fast over the next 10 years" [1 p. 13]. Its mechanism is heat loss, not meltwater; in the model experiments it relies on, few models showed a significant change from fresh water [12 Abstract]. RAPID's trend, McCarthy and colleagues find, is "not consistent with a collapse in the mid-21st century" [9 Abstract]. We could not identify the study of ocean reanalyses the article credits with a 15% weakening in 30 years [2 ¶15]; the nearest, a preprint by Winkelbauer and colleagues, with Mayer among them, reports heat transport, not the overturning's flow [15 Abstract].

7 · SO NEWS

The episode's title promises pole-shift data; neither source mentions the poles

No transcript of the episode was available, so its own words could not be checked. We checked its title and the label on its link to the article [18].

What the episode says
Its title: "Impenetrable Barrier Breached - Next-Level Pole Shift Data". Its label on the link to New Scientist: "AMOC Article" [18]. The label is accurate: the link goes to a news article about the AMOC [2].

OUR ANALYSIS
Nothing about the poles
Neither the preprint nor the article mentions Earth's magnetic field, the magnetic poles, a pole shift or an excursion; we searched both texts [1][2]. The preprint's authors conclude that their results suggest the heat fluxes "have reduced in response to increasing greenhouse gases" [1 p. 13], and its abstract finds the fall rare in the models' unforced runs, "suggesting the change is a consequence of forced climate change" [1 p. 4]. The title sets "Next-Level Pole Shift Data" beside the barrier story, and we rate the phrase, as Unsupported, on our page on that paper. Without a transcript we can't tell which link it refers to; if it is this one, nothing in either source supports it. What the field's weakening does and doesn't change is in our guide to the field's decline.

8 · LIMITS

What this page can and can't settle

A partial re-run, not a reproduction
The preprint's heat-flux version, 5.1, with its three reanalyses and its years to 2023, is not public. We re-ran the public version 5.0, with ERA5 only and years to 2016, over our own reading of the region and with our own ocean mask; the masks we tried change the trend by less than 0.002 PW a decade [6].

The model step, taken as given
We did not re-run the CMIP6 analysis behind Figs. 2–4: that would take hundreds of gigabytes of output from 14 models (Table A1 lists 15; CMCC was left out) [1 Table A1][1 p. 17]. Our remarks on Fig. 3 are by eye.

How the 14.2% was computed
The paper names the quantity, the percentage change of the ten-year mean heat loss, but not the calculation: a fitted trend, or the first and last ten-year means [1 p. 11].

Review status, from Research Square's record
The status and the editorial decision come from the record embedded in the preprint's page, not from its rendered timeline; the reviews themselves are not public [3].

Studies read in abstract
The studies by Terhaar [7], Mayer [8], McCarthy [9], Worthington [10], Caesar [11], Couldrey [12], Liu [13], Yan [14] and Winkelbauer [15] and their colleagues were read in abstract only; those by Xing [16] and Volkov [17] and their colleagues as read for our earlier page.

The episode's words
No transcript was available. If one appears, every statement the episode makes about this study will need checking [18].

What would change these verdicts
01 The reviewed paper. The journal asked for revisions on October 28 [3]; if the 14.2 ± 13.9% and the claim of greater robustness come through review, or change, claims 2 and 3 would be rated again.

02 DEEP-C v5.1 made public, so that the 1985–2023 trends, the ten-year means and the 14.2% can be recomputed, ideally beside an independent estimate of the North Atlantic's heat loss.

03 A longer RAPID record. McCarthy and colleagues find the trend unlikely to reach a signal-to-noise ratio above 2 before the 2040s [9 Abstract].

9 · FILES

Repeat our analysis

Three short scripts produce the numbers of ours on this page, apart from arithmetic shown where it is used, with two small results files. They read RAPID's and DEEP-C's public files as data; the DEEP-C script downloads its 207 MB file itself and checks its checksum.

PY **rapid_trends.py**
RAPID at 26.5°N: the 2005–2023 trend with the preprint's recipe, the trends of the monthly means, the 2024 mean and the heat transport, from releases v2024.1a and v2024-2 · 7 KB [4][5]

PY **deepc_region.py**
The heat lost between 26.5°N and 70°N in DEEP-C v5.0, its trend and sub-periods, with three ocean masks · 7 KB [6]

PY **trendstats.py**
The straight-line fits and their 95% ranges: white noise, AR(1) and the preprint's recipe · 4 KB [1 p. 15]

JSON **rapid-numbers.json**
What rapid_trends.py prints, with the year means drawn in section 4 and the checksums of its inputs · 4 KB

JSON **deepc-numbers.json**
What deepc_region.py prints, with the year values drawn in section 2 · 5 KB

Run it
Put the three scripts in one folder. For RAPID, download releases v2024.1a and v2024-2 from the British Oceanographic Data Centre's pages for their DOIs [4][5], take `moc_transports_200404_2024327.nc` and `RAPID_transports_v2024-2.nc` out of the two zips (1.1 GB and 286 MB), and run `python3 -I rapid_trends.py moc_transports_200404_2024327.nc RAPID_transports_v2024-2.nc rapid-numbers.json`. For DEEP-C, run `python3 -I deepc_region.py FOLDER deepc-numbers.json`; it downloads the file into FOLDER unless it is already there [6]. They need Python 3 with NumPy and SciPy, and h5py for RAPID's files, installed in the interpreter's own site-packages: `python3 -I` ignores packages installed with `pip install --user`. With the files in place each takes under a minute.

Sources

Bracketed numbers refer to this list. For the preprint [1], p. gives a page of Research Square's 37-page PDF, counting its two cover pages (the manuscript's one page 1 is p. 3), Fig. a Figure and Table a table. For the New Scientist article [2], ¶ counts the paragraphs of its text after the standfirst and the photo caption, skipping the "Read more" link inside the text, the "Advertisement" and "Free newsletter" labels and the closing reference line, 16 paragraphs in all; headline and standfirst name those parts. For the RAPID release [5], notes are its release notes; for DEEP-C [6], README is its readme. For the other sources, p. gives a page, § a section and Abstract the abstract; where only an abstract was read, the entry says so. Links checked October 29, 2026.

1 Bell, M. J., Allan, R. P., Baker, J. A., Hewitt, H. T., Jackson, L. C., Johnson, H. L., Kay, W., Liu, C., Mayer, M., Sutton, R. T., Wood, R. A., and Yang, X. (2026). Evidence the ocean is losing less heat in the northern Atlantic and the AMOC has started to slowly weaken. Research Square preprint, version 1, posted October 7, 2026 (manuscript dated August 28, 2026); not peer reviewed, under review at *Nature Climate Change*. CC BY 4.0. We read the full text, Research Square's 37-page PDF.

2 Luhn, A. (2026). Satellites show some of the strongest evidence the AMOC is weakening. *New Scientist*. October 26, 2026. Read in full. © New Scientist, quoted briefly. ¶ counts the 16 paragraphs of its text after the standfirst and the photo caption, as the note above explains.

3 Research Square (2026). The preprint's page, as served on October 29, 2026. The record embedded in it gives the status "under review" at *Nature Climate Change*, four review events numbered 1 to 4 between October 11 and 27, an editorial decision recorded as "revise" at 09:24 UTC on October 28, 2026, and the declaration "There is NO Competing Interest."

4 Moat, B. I., Smeed, D. A., Rayner, D., Johns, W. E., Smith, R. H., Volkov, D. L., Elipot, S., Petit, T., Kajtar, J. B., Baringer, M. O., and Collins, J. (2026). Atlantic meridional overturning circulation observed by the RAPID-MOCHA-WBTS array at 26N from 2004 to 2024 (v2024.1a). British Oceanographic Data Centre; the release the preprint uses (its ref. 60). UK Open Government Licence v3.0. We read its 12-hourly overturning series, April 2, 2004 to March 27, 2024.

5 Liu, C., and Allan, R. P. (2022). Reconstructions of the radiation fluxes at the top of atmosphere and net surface energy flux: DEEP-C Version 5.0. University of Reading Research Data Archive. CC BY 4.0. We read its net surface energy flux file (January 1985 to November 2017, built with ERA5) and its README. The preprint's version 5.1 is not in the archive.

6 Mayer, J., Haimberger, L., and Mayer, M. (2023). A quantitative assessment of air–sea heat flux trends from ERA5 since 1950 in the North Atlantic Ocean. *Earth System Dynamics* 14(5), 1085–1105. CC BY 4.0. Abstract only.

7 McCarthy, G. D., Hug, G., Smeed, D. A., Morris, K. J., and Moat, B. (2025). Signal and noise in the Atlantic Meridional Overturning Circulation at 26°N. *Geophysical Research Letters* 52(7), e2025GL115055. CC BY-NC 4.0. Abstract only.

8 Caesar, L., Rahmstorf, S., Robinson, A., Feulner, G., and Saba, V. (2018). Observed fingerprint of a weakening Atlantic Ocean overturning circulation. *Nature* 556(7700), 191–196. Abstract only.

9 Liu, C., Allan, R. P., Mayer, M., Hyder, P., Desbruyères, D., Cheng, L., Xu, J., Xu, F., and Zhang, Y. (2020). Variability in the global energy budget and transports 1985–2017. *Climate Dynamics* 55(11–12), 3381–3396. CC BY 4.0. Abstract only; the preprint's ref. 53.

10 Winkelbauer, S., Forget, G., Mayer, M., Bourdalle-Badie, R., Cipollone, A., Haimberger, L., Haines, K., Osafune, S., Song, Y., Storto, A., Yang, C., and Zu, H. (2026). Atlantic Meridional Heat Transports from Ocean Reanalyses, Monitored Sections and Heat Budget Constraints. EGUsphere preprint, posted September 14, 2026; not peer reviewed. CC BY 4.0. Abstract only.

11 Volkov, D. L., Smith, R. H., Garcia, R. F., Smeed, D. A., Moat, B. I., Johns, W. E., and Baringer, M. O. (2024). Florida Current transport observations reveal four decades of steady state. *Nature Communications* 15, 7780. CC BY 4.0. As read for our page on the overturning's western side; it gives a section.

12 Couldrey, M. P., Gregory, J. M., Dong, X., et al. (2023). Greenhouse-gas forced changes in the Atlantic meridional overturning circulation and related worldwide sea-level change. *Climate Dynamics* 60(7–8), 2003–2039. CC BY 4.0. Abstract only; the preprint's ref. 16.

13 Yan, X., Zhang, R., and Knutson, T. R. (2018). Underestimated AMOC variability and implications for AMV and predictability in CMIP models. *Geophysical Research Letters* 45(9), 4319–4328. Abstract only; the preprint's ref. 59.

14 Xing, Q., Elipot, S., Johns, W. E., Smeed, D. A., Moat, B. I., and Loder, J. W. (2026). Meridionally consistent decline in the observed western boundary contribution to