PAPER CHECK · OCEAN CIRCULATION

The Atlantic overturning is weakening on its western side

Four mooring arrays from the Lesser Antilles to Nova Scotia show the western boundary's contribution to the Atlantic's deep overturning declining [1 Abstract]. It is one side of the basin: the eastern side partly offsets it, the whole overturning at 26.5°N is declining about a third as fast, and only two of the four records span about two decades.

By Fact-Checked Science · Published October 14, 2026

OUR ANALYSIS marks our own reasoning and calculations, and the verdicts are our assessment. Everything else comes from the numbered sources.

A real decline on the western side, oversold as a slowdown of the whole current

OUR ASSESSMENT

4 of 4

arrays show the western contribution declining, one of them not significantly [1 p. 2]

3 of 4

trends are statistically significant at 2σ [1 p. 7]

2 of 4

records span about two decades; the other two end in 2014 [2]

THE CLAIMS ABOUT THE OVERTURNING

TRUE

The western boundary's contribution declined at all four arrays, significantly at three

Xing et al. 2026 [1 p. 2][1 p. 7]

Straight-line fits to the authors' published daily series reproduce all four trends, from 0.10 to 0.67 Sv a year, and our approximate re-run of their uncertainty method gives similar 2σ ranges. Only the shortest record, six years off Nova Scotia, can't be told from zero. See section 1.

PARTLY TRUE

"a meridionally consistent decline in deep western overturning transport across these latitudes over the past two decades"

Xing et al. 2026, abstract [1 Abstract]

The direction is consistent, but only two records span about two decades; the northern two cover 2004–2014 and 2008–2014. In the years all four share, October 2008 to May 2014, only 16.5°N shows a significant decline [3 p. 10]. See section 2.

OVERSTATED

"A critical Atlantic Ocean current shows two-decade slowdown"

University of Miami news release, April 28, 2026 [4]

What declined is the western boundary's contribution, which the release's own text calls "a key part of the AMOC along its western boundary", not the whole current system its headline and opening describe: at 26.5°N the whole overturning declined about a third as fast [4][1 p. 2]. See section 3.

MISLEADING

"nearly nine times faster than the simulations"

S.-K. Lee, *Ocean to Climate*, April 9, 2026 [5]

It divides the western trend at 16.5°N for 2000–2022 by climate models' trend for the whole overturning at 35°N for 1985–2014: different quantities, places and years [1 p. 2]. At 26.5°N the paper finds the western signal overstates the whole overturning's trend about threefold. See section 4.

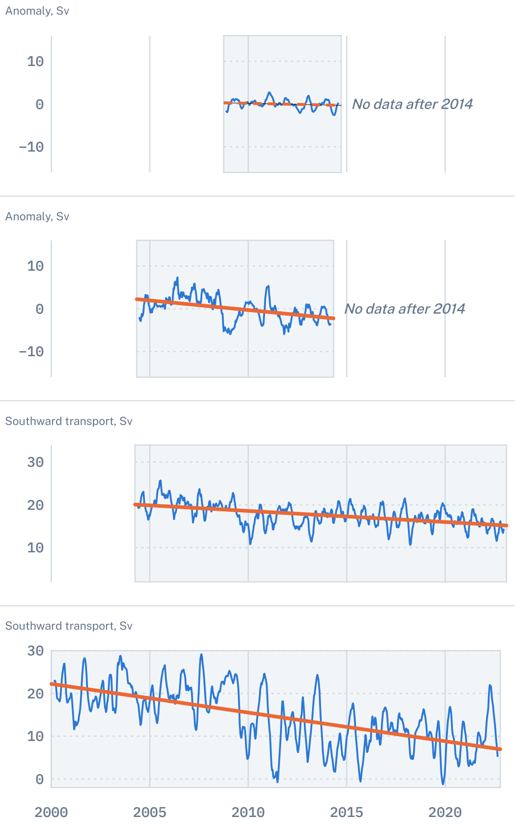
1 · FOUR ARRAYS

The western contribution declined at all four latitudes, significantly at three

Moorings on the western continental slope give daily estimates of the deep western overturning transport: the western boundary's contribution to the deep southward flow across the whole basin, below about 1,000 metres [1 Abstract][1 p. 8].

Deep western overturning transport at four latitudes, north at top

— 3-month running mean of the daily series — The paper's trend - - - Trend not significant



42.5°N

RAPID-Scotian line, off Nova Scotia

2008 to 2014, 6.0 years

0.10 ± 0.17 Sv per year

not statistically significant

39.5°N

Line W, off New England

2004 to 2014, 10.0 years

Weakening 0.45 ± 0.17 Sv per year

about 4.5 Sv weaker over the record

26.5°N

RAPID-MOCHA, east of the Bahamas

2004 to 2023, 18.9 years

Weakening 0.26 ± 0.07 Sv per year

about 5 Sv weaker over the record

16.5°N

MOVE, off the Lesser Antilles

2000 to 2022, 22.8 years

Weakening 0.67 ± 0.13 Sv per year

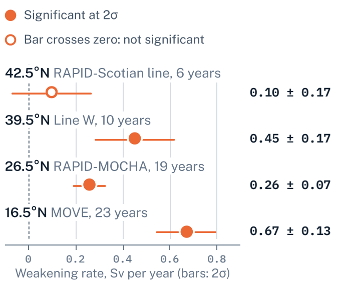
about 15 Sv weaker over the record

All four panels share one time axis and one vertical scale, so slopes compare directly. Values are southward positive, so lines fall when the southward flow weakens; the published series use the opposite sign. The two northern series are anomalies about their own record means [1 p. 8][1 p. 9] (the published file's means are −7.9 and −2.4 Sv, which we subtract). Trends are the paper's, with 2σ ranges [1 p. 2]; 1 Sv is a million cubic metres per second [6 §Introduction]. Redrawn by factchecked.science from the authors' published series [2]; as that record lists CC BY-SA 4.0 among its licences, these charts are shared under it.

2 · CONFIDENCE

Same direction, different confidence

Every array points toward weakening, which is what "meridionally consistent" means. But the records cover different years, and the shortest can't tell its trend from zero [1 p. 2].



The paper's trends for each full record, with 2σ ranges [1 p. 2].

OUR ANALYSIS

Rates that differ more than sixfold

The trends run from 0.10 to 0.67 Sv a year, but the records cover different years and each trend depends strongly on the years chosen. Matching the years doesn't remove the spread: where the records overlap, the paper's own table shows the decline generally larger farther south, and over the years all four share, October 2008 to May 2014, the trends run from −0.11 Sv a year at 39.5°N to 1.93 at 16.5°N, with only 16.5°N significant [3 p. 10]. The paper describes its sub-period trends as "consistently found to be positive and significant and increasing in magnitude from high to low latitudes (except in one instance; table S1)" [1 p. 2]; in the table, every departure from that pattern falls in the one period all four records share.

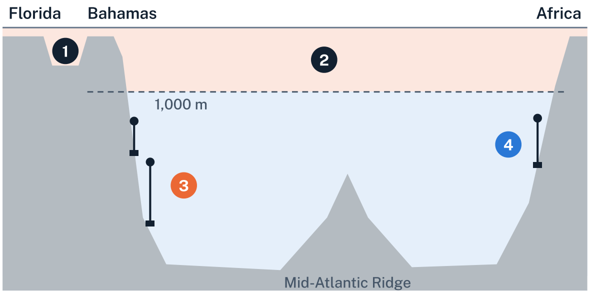
What was measured

Moorings on the western slope record density and currents. From them the authors compute the cross-slope pressure gradient, or its equivalent, and integrate it into a transport below 1,000 metres, relative to 1,000 (1,100 at 42.5°N), holding the eastern side at its long-term mean [1 Abstract][1 p. 8][1 p. 9]. They call it the deep western overturning transport and stress that it is "clearly distinct from the transport of the Deep Western Boundary Current" [1 p. 1]. Bottom-pressure recorders sat on some moorings, but their data weren't used [1 p. 9][3 p. 8].

3 · THE WHOLE AMOC

Why the western side is not the whole overturning

At 26.5°N, the RAPID array measures the whole Atlantic Meridional Overturning Circulation, so the western signal can be compared with the full one [1 p. 7].



1 Florida Current

Measured by submarine cable since 1982. Corrected for the slow drift of Earth's magnetic field, it has been "remarkably stable" for four decades [6 Abstract].

2 Upper ocean

Above roughly 1,000 metres, the Florida Current and the wind-driven surface layer carry warm water north, and part of it returns south across the open ocean; the net northward flow, about 17 Sv, is the upper limb of the overturning [6 §Implications].

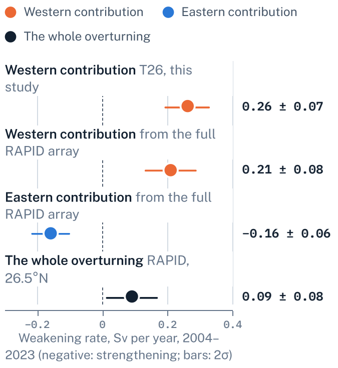
3 Western boundary

Moorings on the western slope track density and currents below 1,000 metres. From them the study estimates the western boundary's contribution to the deep southward flow across the whole basin, and that contribution is declining [1 p. 2][1 p. 8].

4 Eastern boundary

Its contribution strengthened at 26.5°N over the same years, by 0.16 ± 0.06 Sv a year, offsetting part of the western decline [1 p. 2].

Schematic east–west section near 26.5°N, not to scale. The upright markers on the slopes show moorings.



Trends at 26.5°N from April 2004 to February 2023, as the paper gives them [1 p. 2][1 p. 4]. The parts don't simply add up to the whole, the authors note.

OUR ANALYSIS

Put together

The Florida Current has held steady once its cable record is corrected, the deep western contribution is declining, and the eastern side partly compensates [6 Abstract][1 p. 2]. At 26.5°N the whole overturning is declining by 0.09 ± 0.08 Sv a year, only just significant and about a third of the western signal: the western series "captures the sign of the AMOC trend but overestimates the size" [1 p. 2]. That figure already uses the corrected Florida Current record [7]; the correction cut RAPID's overturning trend by about 40%, and Volkov and colleagues, who made it, read the 26.5°N record as "interdecadal variability rather than a long-term decline" [6 §Implications].

4 · READ WITH CARE

A solid western signal, and the limits of what it shows

This section is our assessment, checked against the paper, its supplement, the authors' data and the coverage.

OUR ANALYSIS

Two decades, at two sites

Only 16.5°N and 26.5°N run for about twenty years. Line W covers 2004 to 2014 and the Scotian line 2008 to 2014, so north of 26.5°N these series say nothing about the past decade [2].

OUR ANALYSIS

One boundary, not the whole AMOC

The series are designed to capture the western boundary's contribution only [1 p. 1]. The University of Miami's headline, "A critical Atlantic Ocean current shows two-decade slowdown", drops that qualifier, though its text keeps it, and its line that the trend "suggests a basin-wide shift rather than a short-term fluctuation" goes beyond the paper [4].

OUR ANALYSIS

An analysis choice matters, as the authors show

At 16.5°N the array's standard estimate of the deep southward flow between the Antilles and the Mid-Atlantic Ridge, referenced to 4,950 metres, shows no significant trend (−0.06 ± 0.16 Sv a year) [1 p. 2][1 p. 4]. Moving the reference up to 1,200 metres alone gives a decline that isn't significant (0.27 ± 0.34); counting only the western boundary as well gives 0.52 ± 0.30. The authors attribute the difference to both choices [1 p. 4][1 p. 5].

OUR ANALYSIS

Not "nearly nine times faster" than models

A blog summary of the paper, generated with NotebookLM, divided the 16.5°N western trend by the climate models' mean trend for the whole overturning at 35°N [5][1 p. 2]. The paper sets the two side by side only to say the models' decline is weaker; they measure different things [1 p. 2].

OUR ANALYSIS

Twenty years is short

Direct observations of the overturning are "relatively short", the paper says, "making it difficult to discern" decadal swings from a trend [1 p. 1]. Its own table shows how much the period matters: at 16.5°N the trend is 1.93, 1.22 or 0.70 Sv a year depending on the years chosen [3 p. 10].

OUR ANALYSIS

How the numbers were checked

Straight-line fits to the authors' daily data reproduce all four trends to two decimals, and an approximate re-run of their uncertainty method, maximum likelihood with correlated noise, gives similar 2σ ranges [2][1 p. 10].

`OUR ANALYSIS`

Bottom line: a careful, reproducible result about one side of the Atlantic's overturning.

The western boundary's contribution declined in all four records, significantly in three. But it is not the whole circulation: at 26.5°N the full overturning declined about a third as fast, and only two records are long enough to speak for two decades [1 p. 2].

Sources

Bracketed numbers refer to this list; p. gives a page (for the paper, the page of its 11-page PDF; for the supplement, of its PDF), § a section, and Abstract the part of a work we used. Links checked October 14, 2026.

1 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 the Atlantic Meridional Overturning Circulation. *Science Advances* 12(15), eadz7738. Published April 8, 2026. CC BY 4.0. We read the publisher's PDF in PubMed Central; p. gives its page (of 11).

2 Xing, Q. (2025). Time series of deep western overturning transport across the Atlantic. Zenodo, version 1, published March 21, 2025; daily series T16, T26, T39 and T42. The record lists two licences, CC BY 4.0 and CC BY-SA 4.0.

3 Xing, Q., et al. (2026). Supplementary Materials for "Meridionally consistent decline in the observed western boundary contribution to the Atlantic Meridional Overturning Circulation": figs. S1 to S6 and table S1. p. gives the page of the supplement's PDF.

4 Reisewitz, A. (2026). A critical Atlantic Ocean current shows two-decade slowdown, study finds. University of Miami Rosenstiel School news, April 28, 2026.

5 Lee, S.-K. (2026). The North Atlantic Deep Western Boundary Current is Faltering. *Ocean to Climate* (blog), April 9, 2026. The post says it was created with NotebookLM.

6 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 (after a 2025 author correction to the licence). § gives a section of the article.

7 Moat, B., Smeed, D., Rayner, D., et al. (2026). RAPID-MOC time series April 2004 to March 2024 (v2024.1a). README for the RAPID-MOCHA-WBTS data, January 29, 2026. Its change log for September 2024 records the Florida Current correction.

METHOD

How this was checked

On October 14, 2026, we checked every statement, number and source on the original infographic, 64 items, against the paper, its supplementary materials, the authors' published daily series, the Florida Current study, the RAPID data notes, the University of Miami release and the blog summary it names. We re-fitted the four trends from the authors' daily data, re-ran an approximation of their uncertainty method and measured the original charts against their axes. The check corrected several statements; the change log lists them.

After the page was built, a second reviewer who hadn't seen the drafting re-fitted the four records and our approximation of the uncertainty method from the authors' data, which matched to the second decimal, and checked every quotation and reference. The changes that followed: the spread of rates is set beside the paper's table of shared periods, which doesn't remove it; the paper's description of that table is quoted in full, with every departure from it falling in the one period all four records share; note 2 says the upper ocean's net flow is northward, while part of it returns south across the open ocean; the release is quoted on "a key part of the AMOC along its western boundary"; Volkov and colleagues' reading of the 26.5°N record as interdecadal variability is added; the re-run is called an approximation; and several locators were corrected.

The verdicts and the items tagged "Our analysis" are our own assessment, built on the cited sources: the trend re-fits, the record counts and our reading of the paper's comparisons. The paper is open access under CC BY 4.0 [1]; the time-series charts are redrawn from the authors' data, and the other charts and the schematic are our own.

This page was researched and written with Claude, an AI assistant made by Anthropic, and then re-checked against its sources in a separate verification pass.

The verdicts on this page

`MISLEADING`	Contains something true but leaves a false impression, usually by leaving out key context.
`OVERSTATED`	Has some basis but claims much more than the evidence supports.
`PARTLY TRUE`	Part of the claim holds up and part doesn't.
`TRUE`	The evidence supports the claim.

All ten verdicts, and how we check

CORRECTIONS

Corrections and changes

If we get something wrong, we fix it and record the change below with the date. If a correction changes a verdict, the log says what the old verdict was.

Change log

`Oct 14, 2026` Published on factchecked.science after a full check against the sources and a re-fit of the four trends from the authors' data. Changes from the infographic: added our verdicts on four claims. The title no longer speaks of a "deep return flow … along its western edge": the series measure the western boundary's contribution to the whole basin's overturning, which the paper says is "clearly distinct from" the Deep Western Boundary Current, so the chart, note 3 and the schematic were reworded and redrawn without a current hugging the slope. The arrays run from the Lesser Antilles, not the Caribbean, and capture one boundary's contribution to the deep limb, not the whole limb. The 39.5°N record weakened by about 4.5 Sv, not 4. The more than sixfold spread of rates is now set beside the paper's table of shared periods, which shows the decline generally larger farther south. Note 2 now says the upper ocean's net flow is northward, carried by the Florida Current and the surface layer, while part of it returns south across the open ocean. "What was measured" now says the transports come from moored density and current data, with bottom-pressure records unused, and that the 42.5°N series is referenced to 1,100 m. The eastern-boundary trend and the 4,950 m result are credited to the paper rather than to a blog summary. "The upper branch looks steady" became "the Florida Current has held steady": the whole overturning at 26.5°N is declining by 0.09 ± 0.08 Sv a year, and that figure already uses the corrected Florida Current record. At 16.5°N, re-referencing alone gives a decline that isn't significant; the authors attribute the difference to two choices. The blog's claim is quoted exactly, "nearly nine times faster". We added the comparison at 26.5°N, our re-fit and the data's licences; the published northern series aren't zero-mean, so we subtract their means.

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Last updated Oct 14, 2026