Fact-Checked Science

PAPER CHECK · OZONE LAYER

NOAA and NASA's 2026 ozone report holds up: a big hole, not a deep one, recovery on track

On November 4, 2026, NOAA and NASA reported that the Antarctic ozone hole had become the seventh largest in 48 years of monitoring but "was not as deep as other large holes on record", and that long-term recovery is still on track [1 p. 1][2 ¶1]. Their numbers reproduce from the agencies' own files: the largest hole since 2015 by area, of middling depth [4]. One large year can't show that recovery has stalled, and the 2026 WMO/UNEP Assessment says it continues [13 p. 41]. S0 News of November 13 got the rank right, but called the year a "massive explosion in ozone loss" [3 00:01:01] and said the recovery "hasn't" continued [3 00:03:00].

By Fact-Checked Science · Published November 13, 2026

OUR ANALYSIS marks our own reasoning and calculations: the ranks, the trend tests and their rules, written before we ran them, the record days, the unit conversions and our reading of the agencies' weather diagnostics. The verdicts are our assessment. Everything else comes from the numbered sources. Total ozone is measured in Dobson units (DU): 100 DU is a layer of pure ozone 1 mm thick at standard temperature and pressure; the mass deficit is the ozone, in millions of tonnes, that would bring the hole up to 220 DU.

The agencies' numbers hold: a big hole of middling depth, and recovery on track

OUR ASSESSMENT

7th of 47

Our analysis: 2026's rank by NASA's mean area for September 7–October 13 and by its largest single day; on both, the largest since 2015 [4][5].

23rd of 47

Our analysis: its rank by the ozone it lacked, NASA's mean mass deficit for September 21–October 13. Each of the nine other largest holes lacked more [4].

28%

How far the chlorine and bromine over Antarctica had fallen back toward their 1980 level by the start of 2024, by NOAA's index [11].

THE CLAIMS

TRUE

Big, but not as deep

"The ozone hole ranked seventh largest by area in 48 years of monitoring, but was not as deep as other large holes on record." NASA's copy of the release [2 ¶1]

Both halves reproduce. NASA's seasonal file puts 2026 at 24.92 million km^2 from September 7 to October 13, seventh of the 47 years with data since 1979 (there are none for 1995), and its largest day, 27.06 million km^2 on September 18, is also seventh [4][5]. Each of the nine other largest holes was deeper on NASA's three measures of the hole and at the South Pole with a satellite top-up. By the release's own South Pole method, the one behind its 105 Dobson units, 2003, 2005, 2008 and 2015 read higher than 2026, which ranks 14th of 41 years there (our analysis) [9]. See sections 2 and 3.

TRUE

Weather, not a stalled recovery

"While weather caused a greater loss of ozone this year, long-term recovery still on track" NOAA's copy, its subtitle [1 p. 1]

The WMO/UNEP Assessment published in October says Antarctic ozone "continues to recover, notwithstanding substantial interannual variability … primarily driven by dynamical forcings" [13 p. 4], and the halogens that destroy it keep falling [11]. The loss was greater than in 2024 and 2025, though middling for the record [4]. NASA's weather diagnostics bear out the direction of the explanation, weaker-than-average planetary waves and a larger-than-average vortex, but not the "especially weak" waves or the "unusually" large or powerful vortex the scientists describe (our analysis) [7]. See sections 4 and 5.

OVERSTATED

Massive explosion in ozone loss

"we have been showing the massive explosion in ozone loss this year" [3 00:00:59–00:01:03] … "In many ways, the records have cracked" [3 00:01:19–00:01:22]

The hole was large, seventh by area [4]. But the ozone it lacked, the mass deficit, ranks 23rd of 47, below the 1990–2010 average and below every year from 2020 to 2023; it was two-thirds more than in 2025, one of the smallest holes since 1992 [4][25]. In the season, records for the date fell only for area, on 8 days in CAMS's analysis and 1 in NASA's file, with none for depth and none for all time (our analysis) [21][5]. See section 6.

TRUE

Largest hole in over a decade

"overall it was the seventh largest ozone hole on record, largest in over a decade." [3 00:01:24–00:01:27]

Seventh of 47 by NASA's season mean and by its largest day, and on both the largest since 2015, eleven seasons ago [4][5]. CAMS's analysis ranks it fourth and third, also the largest since 2015 [21]. By depth it isn't: holes as recent as 2022–2024 were deeper (our analysis). See section 2.

FALSE

Ozone recovery hasn't continued

"The ozone recovery would not continue, and it hasn't." [3 00:02:58–00:03:00]

The release the episode linked says the opposite [1 p. 1], and so does the 2026 Assessment: "Recovery of Antarctic ozone continues despite occasional large ozone holes in recent years" [13 p. 41]. The halogens that destroy the ozone keep falling [11]. 2026 sits inside the year-to-year swings around the post-2000 line, which by itself can't show a stall, not its depth was average, after small holes in 2024 and 2025 (our analysis) [4]. See section 5.

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1 · WHAT NOAA AND NASA REPORTED

One release in two copies, with the same numbers

NOAA and NASA published their summary of the 2026 season on November 4, each on its own site [1 p. 1][2]. S0 News linked NOAA's copy [3 00:01:18–00:01:19]. All but one of its numbers check against the agencies' files: the South Pole record doesn't match NOAA's current table, and one pair of figures isn't a conversion (section 7).

The release's numbers, and what the agencies' files give

THE RELEASE	THE FILES (OUR ANALYSIS)	HOLDS?
Seventh largest "in 48 years of monitoring", by "the seasonal mean area" [1 p. 2 ¶2]	24.92 million km^2, seventh of the 47 years with data, 1979–2026 [4]	Yes
About 9.6 million square miles (25 million km^2), September 7–October 13 [1 p. 2 ¶3][2 ¶2]	24.92 million km^2, which is 9.62 million square miles	Yes
"more than twice the area of the United States" [1 p. 2 ¶3]	2.5 times the 50 states and DC, 9.83 million km^2 [24]	Yes
Largest day: 10.5 million square miles (27.1 million km^2) on September 18 [1 p. 2 ¶5][2 ¶4]	27.06 million km^2 on September 18 [5]	Yes
"about 90% as large as the largest ozone hole ever observed, which occurred on September 9, 2000" [1 p. 2 ¶5]	27.06 against 29.86 million km^2 on September 9, 2000: 90.6% [5]	Yes
"not as deep as other large holes on record" [2 ¶1]	Each of the nine other largest holes was deeper on NASA's measures (section 3)	Yes
105 Dobson units over the South Pole on October 17 [1 p. 3 ¶3][2 ¶8]	105 by one of NOAA's two ways of finishing a balloon sounding; 117 by the other [9]	Yes (section 7)
"The lowest value ever recorded over the South Pole was 92 Dobson units in October 2006" [1 p. 3 ¶4]	93 on October 9, 2006, by the method of the 105; 92 on September 29, 1999 [9]	Not as stated (section 7)
Chlorine down "about a third relative to levels reached in the 1980s" [1 p. 4 ¶3]	28% of the way back to the 1980 level at the start of 2024 [11]	Roughly
Recovery "by the 2070s" [1 p. 4 ¶4][2 ¶11]	The 2026 Assessment: back to 1980 values "during the 2060s" [13 p. 4]	Yes
Forming "later in the season in recent years" [2 ¶3]	Not shown at 95% by our pre-registered test with data to 2025; significant to 2021 as published [15 §4] (section 5)	Not shown to 2025
Could have been "1 to 2 million square miles (3.5 million square kilometers) larger" at 2000's levels of ozone-depleting substances [2 ¶5]	An estimate whose method isn't given; 3.5 million km^2 is 1.35 million square miles	Not checkable (section 7)

NOAA's copy was read from a printed copy, by page and paragraph; NASA's, by paragraph [1][2]. Conversions use the international mile, 1 square mile = 2.589988 km^2, and the US area is the Census Bureau's total for the 50 states and DC.

Where the two copies differ

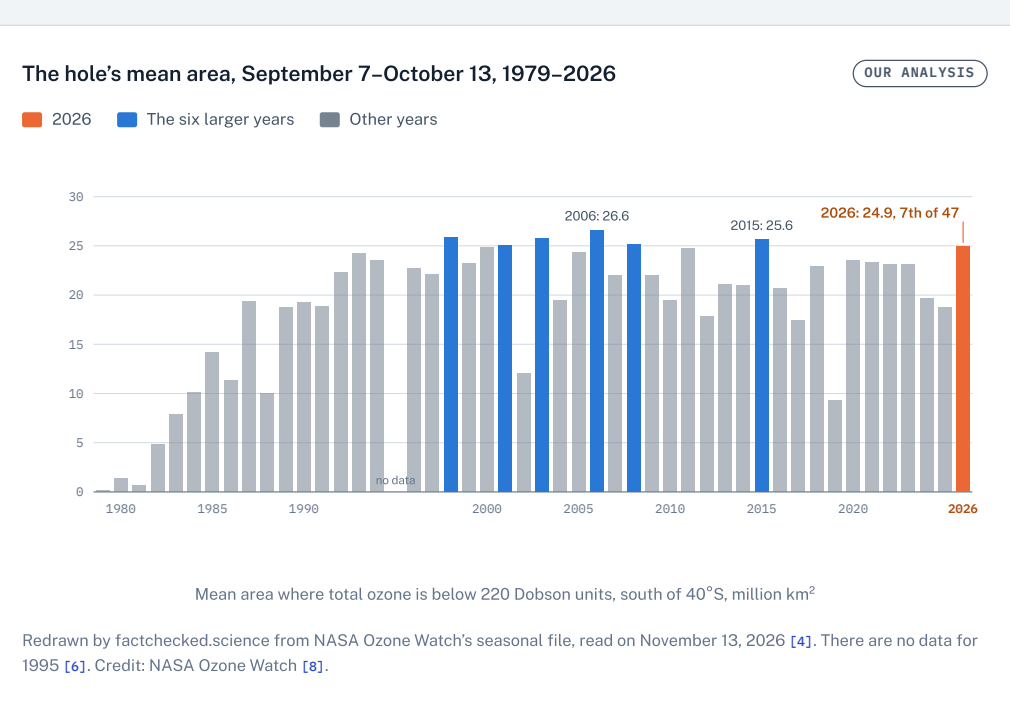
NOAA's copy leads with the weather: "Atypical weather conditions caused the Antarctic ozone hole to grow to an unusually large size" [1 p. 2 ¶1]. NASA's leads with the recovery, which "remains on track … despite atmospheric conditions that contributed to a larger Antarctic ozone hole" [2 ¶1]. NOAA's names the measure of the ranking, "the seasonal mean area" [1 p. 2 ¶2], and adds the comparison with the United States, the 90% and its date, the Dobson spectrophotometer and the 1 mm gloss on the Dobson unit; NASA's adds "but was not as deep as other large holes on record" [2 ¶1]. The scientists' quotations differ in wording: in NOAA's copy Paul Newman says "at their year 2000 peak" [1 p. 2 ¶6] and Amy Butler "well up from the lower atmosphere … further from the South Pole" [1 p. 3 ¶2]; in NASA's, "at their peak in 2000" [2 ¶5] and "propagate up from the lower atmosphere … further from the pole" [2 ¶7]. Unless we say otherwise, we quote NASA's copy.

2 · HOW BIG

Seventh of 47 years by area, and the largest since 2015

NASA Ozone Watch ranks holes by their mean area from September 7 to October 13, the weeks when they are largest, counting the region south of 40°S where total ozone is below 220 Dobson units [6]. 2026 is seventh by that measure and by its single largest day [4][5].

The hole's mean area, September 7–October 13, 1979–2026 OUR ANALYSIS



Redrawn by factchecked.science from NASA Ozone Watch's seasonal file, read on November 13, 2026 [4]. There are no data for 1995 [6]. Credit: NASA Ozone Watch [8].

MEAN AREA OUR ANALYSIS

24.92

million km^2, September 7–October 13: seventh of 47. 2015's, the most recent larger, was 25.64; 2006 holds the record, 26.60 [4].

LARGEST DAY OUR ANALYSIS

27.06

million km^2 on September 18: seventh of the 47 years' largest days. 2015's was 28.21, and the record is 29.86, on September 9, 2000 [5].

CAMS'S ANALYSIS OUR ANALYSIS

4th, 3rd

of 48 on the same two measures in CAMS's analysis, which counts south of 60°S: 24.24 and, as a daily mean, 27.30 million km^2 (27.44 at its six-hourly peak), also the largest since 2015 [21][22].

OUR ANALYSIS

"Proportions we haven't seen in a decade"

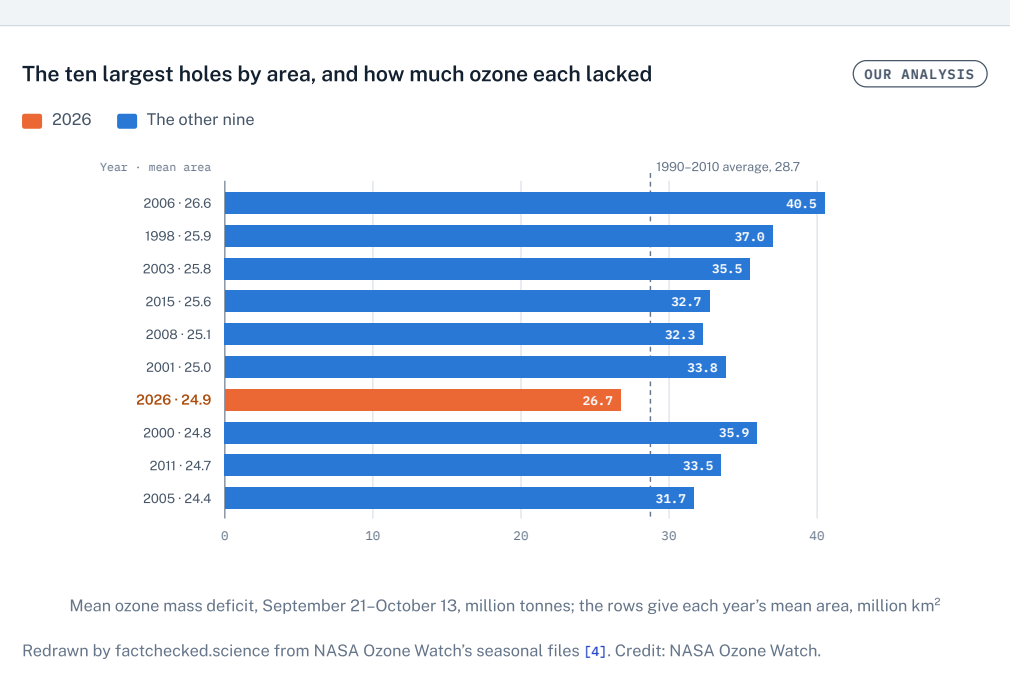
On both of NASA's area measures the most recent larger hole was 2015's, so 2026 is the largest of the eleven seasons from 2016 to 2026. That is what Newman's "allowing the hole to grow to proportions we haven't seen in a decade" says [2 ¶3], and the episode's "largest in over a decade" [3 00:01:24–00:01:27]. The same season to October 18 is reviewed in more detail, with CAMS's daily percentiles, in our review of the 2026 hole.

3 · HOW DEEP

Middling in depth: on NASA's measures, every other large hole lacked more ozone

Area says how far the thinned ozone spreads; depth, how thin it gets. NASA measures depth as the lowest total ozone in the hole and as the mass deficit, the ozone that would have to be added to bring the hole up to 220 Dobson units [6]. NOAA measures it overhead at the South Pole with balloons, weekly since 1986 and two or three times a week in spring [10].

The ten largest holes by area, and how much ozone each lacked OUR ANALYSIS



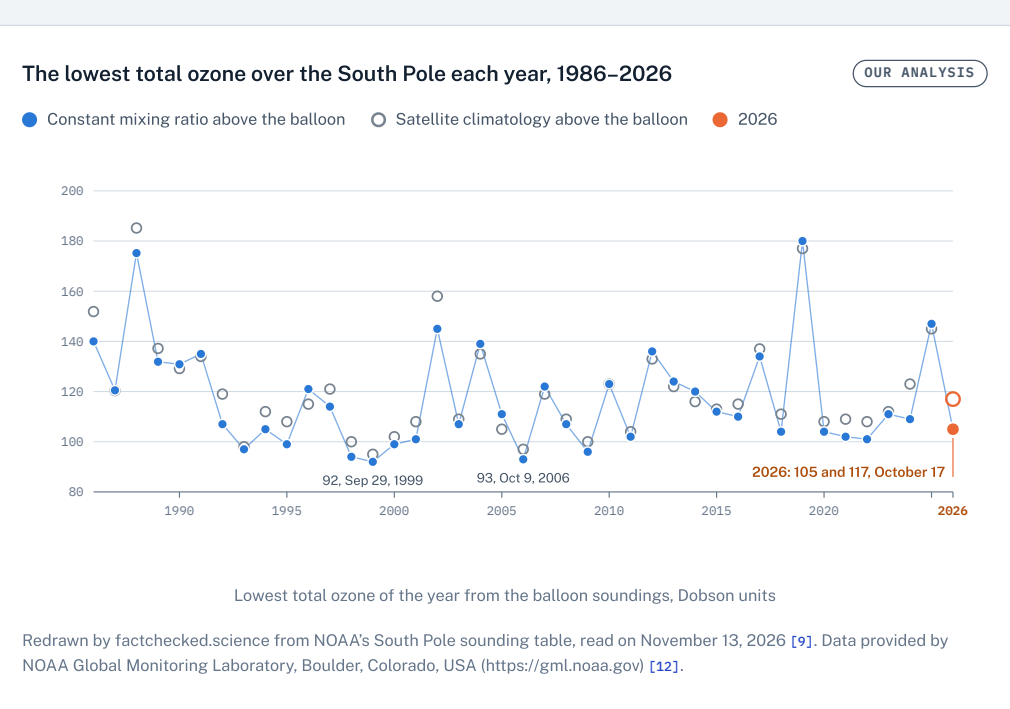
Redrawn by factchecked.science from NASA Ozone Watch's seasonal files [4]. Credit: NASA Ozone Watch.

2026's depth, ranked from the deepest

MEASURE	2026	RANK	LAST DEEP YEAR
Mean minimum ozone, September 21–October 16	123.15 DU	26th of 47, tied with 2016 (27th with the tie broken, as in our October review)	202
Lowest single day	114 DU, October 4	30th of 47, tied with 2014	202
Mean mass deficit, September 21–October 13	26.74 million tonnes	23rd of 47	202
South Pole, lowest sounding, with a satellite climatology above the balloon	117 DU, October 17	23rd of 41	202
South Pole, lowest sounding, with a constant mixing ratio above (the release's 105)	105 DU, October 17	14th of 41, tied with 1994	202
South Pole, 12–20 km layer	17.5 DU, October 17	30th of 41	202

Our analysis, by rules written before this check's computations, which record what we already knew from October: 2026's area, its rank and two of these depth ranks. NASA's seasonal and daily files for 1979–2026 [4][5]; NOAA's South Pole table for 1986–2026, each year's lowest sounding from August to December [9]. One hundred Dobson units is a layer of pure ozone 1 mm thick at standard temperature and pressure [1 p. 3 ¶4].

The lowest total ozone over the South Pole each year, 1986–2026 OUR ANALYSIS



Redrawn by factchecked.science from NOAA's South Pole sounding table, read on November 13, 2026 [9]. Data provided by NOAA Global Monitoring Laboratory, Boulder, Colorado, USA (https://gml.noaa.gov) [12].

OUR ANALYSIS

Large but not deep

Of the ten largest holes by area, all nine others were deeper than 2026 on NASA's three measures, the mean and the lowest minimum ozone and the mass deficit, and at the South Pole with a satellite climatology above the balloon [4][9]. By the release's own South Pole method, four read higher than 2026's 105: 2003 and 2008 at 107, 2005 at 111 and 2015 at 112, a comparison we added after a fresh review. The release's "not as deep" is about the hole as a whole, and NASA's measures of the whole hole bear it out. A large hole of middling depth is what a large vortex spreading ordinary losses over a wider area would make, which is the release's explanation and the subject of the next section.

4 · WHY IT WAS BIG

Weaker waves and a larger vortex, as the release says, though by less than its words suggest

The release puts 2026's size down to the weather: a polar vortex that was "unusually large this year in part because" the planetary-scale waves that usually break it up "were especially weak in August and September" [2 ¶7]. NASA's and CAMS's data bear out the direction, not the superlatives.

In the scientists' and the agencies' words

Paul Newman leads NASA's ozone research team; Amy Butler is a research scientist at NOAA's Chemical Sciences Laboratory [2 ¶3][2 ¶7].

> *"The polar vortex was unusually large this year in part because planetary-scale weather systems that typically propagate up from the lower atmosphere and break up the vortex were especially weak in August and September. … That weak wave action kept the strongest polar vortex winds further from the pole by several degrees of latitude, creating a larger area for conditions ideal for ozone depletion to occur."*
>
> Amy Butler, NASA's copy [2 ¶7]

> *"But an unusually powerful polar vortex has extended ozone depletion in the Antarctic this season, allowing the hole to grow to proportions we haven't seen in a decade."*
>
> Paul Newman, NASA's copy [2 ¶3]

> *"Interannual variability in the magnitude of springtime Antarctic ozone reduction is mainly driven by year-to-year variations in planetary wave activity."*
>
> WMO/UNEP Assessment, 2026 [13 p. 40]

WAVE FORCING OUR ANALYSIS

14th of 48

by weakness, the planetary waves of August–September 2026, measured by NASA's eddy heat flux at 100 hPa, 45–75°S: below the median, not among the five weakest. Waves 1–3 alone: 8th [7].

VORTEX AREA OUR ANALYSIS

9 of 43

days from September 1 to October 13 when the vortex at 460 K, about 18 km up, was larger than in nine years out of ten for the date. It was larger than average on 28; in August, smaller [7].

WIND AT 60°S, 50 HPA OUR ANALYSIS

37th of 48

by strength in September, the month our rules set for "unusually powerful", which needed a place in the top five. August: 47th; October, when the hole lingered: 10th [7].

OUR ANALYSIS

A larger cold region, not a colder one

CAMS's lowest 50 hPa temperature south of 60°S was average in 2026: 28th coldest of 48 years for September 1–October 13, 29th in August [21]. Fitted over 2000–2025, the trend and that temperature explain 88% of the variation in NASA's season-mean area from year to year, and they predict 21.4 million km^2 for 2026, with a 95% range of 18.1–24.8. The hole was 24.9, just above the range, by a test whose rules we wrote before running it [4]. The margin is small: with the temperature averaged over other weeks, or the fit started in 1990, 2026 falls just inside its range; but in every variant it is 3.0–4.5 million km^2 larger than the cold predicts, a check we added after a fresh review. So the cold explains only part of 2026's size, which fits the release's explanation: strong winds further from the pole, spreading the cold over a larger area.

What the diagnostics can't show

NASA's 2026 weather values come from its GEOS FP analysis from August 1, against a 1979–2025 baseline from MERRA-2 [7]; our review of the season to October 18 found its minimum temperature 1–2 °C colder than CAMS's. NASA's file also shows the area of air cold enough for polar stratospheric clouds at a record for August, but CAMS's August minimum was average, so we don't rely on that record. The wind at 60°S is one fixed latitude: if the strongest winds sat further from the pole, as Butler says, it would read weak while the vortex was large. Where the winds sat needs gridded data, which we didn't use.

The direction of the release's explanation holds; "especially weak" and "unusually powerful" are stronger than NASA's standard indices show.

5 · IS RECOVERY ON TRACK?

Our tests can't tell recovery from a stall; the halogen record and the Assessments can

Recovery means the hole shrinking as the chlorine and bromine that destroy the ozone decline. They are declining [11], and the 2026 Assessment finds that the hole "has generally diminished in area and depth since the year 2000" [13 p. 22]. We tested what 2026 says about that trend, by rules written before we computed any trend, though knowing 2026's mean area from October. The answer: on NASA's files, with data to 2025, our tests can't tell whether the recovery has continued or stalled, so the verdicts rest on the halogen record and the Assessments.

In the assessments' words

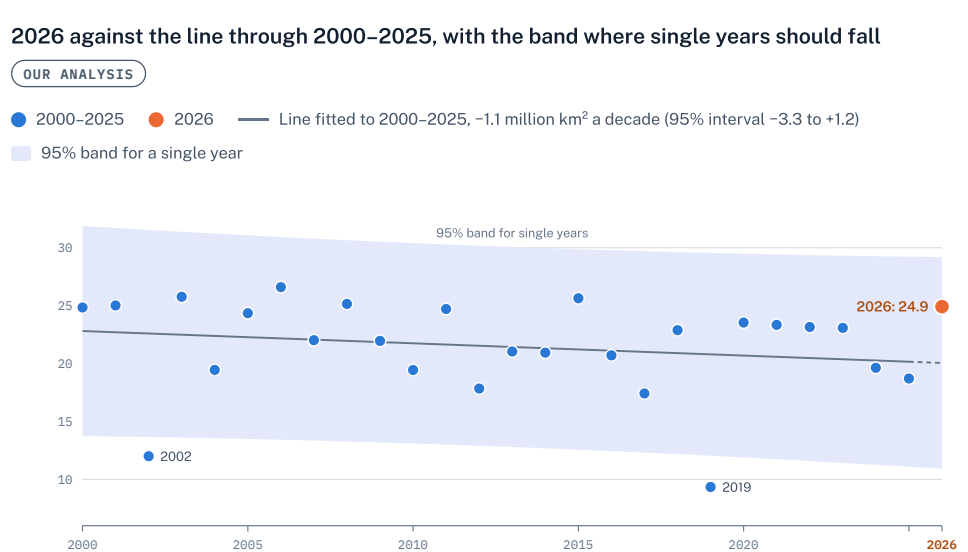
The WMO/UNEP Scientific Assessment of Ozone Depletion is written every four years for the parties to the Montreal Protocol; the 2026 edition's Executive Summary came out in October [13].

> *"Total column ozone (TCO) in the Antarctic continues to recover, notwithstanding substantial interannual variability in the area, depth, and longevity of the ozone hole, primarily driven by dynamical forcings. In a middle-of-the-road greenhouse-gas scenario, Antarctic TCO is projected to return to 1980 values during the 2060s."*
>
> 2026 Assessment [13 p. 4]

> *"Recovery of Antarctic ozone continues despite occasional large ozone holes in recent years. New lines of evidence and analyses since the last Assessment have strengthened this conclusion. Deviations from long-term recovery trends during recent years were primarily driven by dynamical forcings and radiative feedbacks."*
>
> 2026 Assessment [13 p. 41]

> *"September is the period when stratospheric ozone over Antarctica shows the largest sensitivity to decreasing ODSs, and when Antarctic ozone recovery rates are the strongest and the most statistically significant."*
>
> 2022 Assessment [14]

2026 against the line through 2000–2025, with the band where single years should fall OUR ANALYSIS



Our pre-registered test, on NASA Ozone Watch's seasonal file [4]. The band is the 95% prediction interval of the straight line fitted by least squares to 2000–2025; 2026 was not used in the fit. The line's slope isn't distinguishable from zero, and the band's top is above the largest season ever measured. Credit: NASA Ozone Watch.

OUR ANALYSIS

The test, fixed in advance

We fitted a straight line to NASA's season-mean area for 2000–2025, the years since the halogens peaked, and asked whether 2026 falls inside the 95% band where a single year should fall. It does: the band for 2026 runs from 10.9 to 29.2 million km^2, and 2026 is 24.9 [4]. It is 4.9 above the line, more than any year since 2000. But the band's top is 2.6 million km^2 above the largest season ever measured, 26.6 in 2006, so even a record season would have fallen inside it: the test shows only that one year can't demonstrate a stall, not that recovery is on track. In depth, 2026 is unremarkable: the mass deficit and the minimum ozone sit close to their own lines.

OUR ANALYSIS

Why the area alone can't settle it

The line falls by 1.1 million km^2 a decade, but its 95% confidence interval runs from −3.3 to +1.2, and with 2026 added from −2.8 to +1.4: the line isn't distinguishable from flat, before 2026 or after. That is what swings of this size produce. In 2004 Newman and colleagues wrote that the slow decline from falling chlorine "will be obscured by large dynamically forced year-to-year variations of 4 million km^2 (1σ)" [17 Abstract]; the scatter around our line is 4.1. In 2006 the same team projected that "Detection of a statistically significant decrease of area will not occur until about 2024" [18 Abstract]; with data to 2025, our simple test finds no such decrease yet. The 2026 Assessment puts the recent departures from the long-term trend down to "dynamical forcings and radiative feedbacks" [13 p. 41].

The September and onset measures, published and rerun on NASA's files

MEASURE	PERIOD	CHANGE A DECADE	SOURCE
Start date: first day above 8 million km^2, held for 3 days	2000–2021	8.1 ± 3.6 days later, as published	Stone et al. [15 §4]
Mean area in September	From 2000	−2.8 ± 2.8 million km^2, as published	Stone et al. [15 §4]
Start date, Stone's definition	2000–2021	5.5 days later (95% interval 0.6 to 10.4)	NASA's files, our run
Start date, Stone's definition	2000–2025	3.5 days later (−0.3 to 7.3)	NASA's files, our run
Mean area in September	2000–2021	−2.5 million km^2 (−5.2 to 0.3)	NASA's files, our run
Mean area in September	2000–2025	−1.7 million km^2 (−3.8 to 0.3)	NASA's files, our run
First day at 10 million km^2 (pre-registered)	**2000–2025**	**3.1 days later (−0.8 to 6.9)**	**NASA's files, our run**
First day at 10 million km^2, 2016–2025 against 2000–2009 (pre-registered)	**Two decades**	**5.5 days later (−1.1 to 12.1)**	**NASA's files, our run**

Our runs of the published definitions on NASA's daily files [5] were added after the pre-registered tests and are labelled exploratory in our log. By our own rule, a 95% interval that excludes zero and a Kendall test below 0.05, none of our runs shows a trend with data to 2025; Stone's start date to 2021 passes the interval but not the Kendall test (p = 0.06), and for the September area the Kendall test alone passes (p = 0.018 and 0.025). Stone and colleagues set their thresholds "based on behavior at the peak of EESC loading around the year 2000", of 12, 10 and 8 million km^2 "with 8 million km^2 producing the strongest trends" [15 §3], and caution that "the trend values and significance should not be taken as an optimal estimate" [15 §5].

Forming later: published to 2021, not shown to 2025

Newman's "The annual ozone hole has been forming later in the season in recent years, which tells us the ozone layer is healing" [2 ¶3] rests on published work: Stone and colleagues found the start date later by 8.1 ± 3.6 days a decade from 2000 to 2021 and called later starts "a robust sign of ozone recovery" [15 §5], and Solomon and colleagues found that healing "has now begun to occur during the month of September" [16 Abstract]. On NASA's files, with 2022–2025 added, our pre-registered test doesn't show it at 95%: the start comes about five days later on average in 2016–2025 than in 2000–2009, but the interval runs from −1.1 to +12.1 days, and 2023 and 2025 started early, on August 16–17. 2026 opened on August 25 by our measure, within the range of recent years [5].

Other influences, and a study of October

In model simulations, smoke from Australia's wildfires of January 2020 enlarged the 2020 hole by about 2.5 million km^2, and the 2022 Hunga eruption "had only a small impact on Antarctic ozone chemistry in the years immediately following the event" [13 p. 41]. "Following indications of early-spring recovery", Kessenich and colleagues found October ozone in the middle stratosphere of the hole's core down 26% since 2004, which they link to changes in the air descending from the mesosphere inside the vortex [19 Abstract]; the 2026 Assessment, which reviews the work published since 2022, concludes that recovery continues [13 p. 41]. Newman and colleagues projected full recovery to 1980 levels around 2068 [18 Abstract].

OUR ANALYSIS

The release's "3.5 million square kilometers"

The release's estimate that 2026 "could have been 1 to 2 million square miles (3.5 million square kilometers) larger" at 2000's levels of ozone-depleting substances [2 ¶5] comes without its method, and the record can't check it: over the 26 years to 2026, the change along our line has a 95% range from a fall of 8.5 to a rise of 3.0 million km^2, and an observed trend isn't the same as the hole at 2000's levels [4].

6 · WHAT S0 NEWS SAID

Right on the rank; overstated on the loss, and wrong on the recovery

S0 News of November 13 turned first to the release: "We've got the official report from NASA and Noah linked below" [3 00:01:18–00:01:19]. "Noah" is NOAA, and the link was NOAA's copy. The episode's words are quoted from tactiq.io's automatic transcript, supplied by the site's owner; its graphics weren't seen.

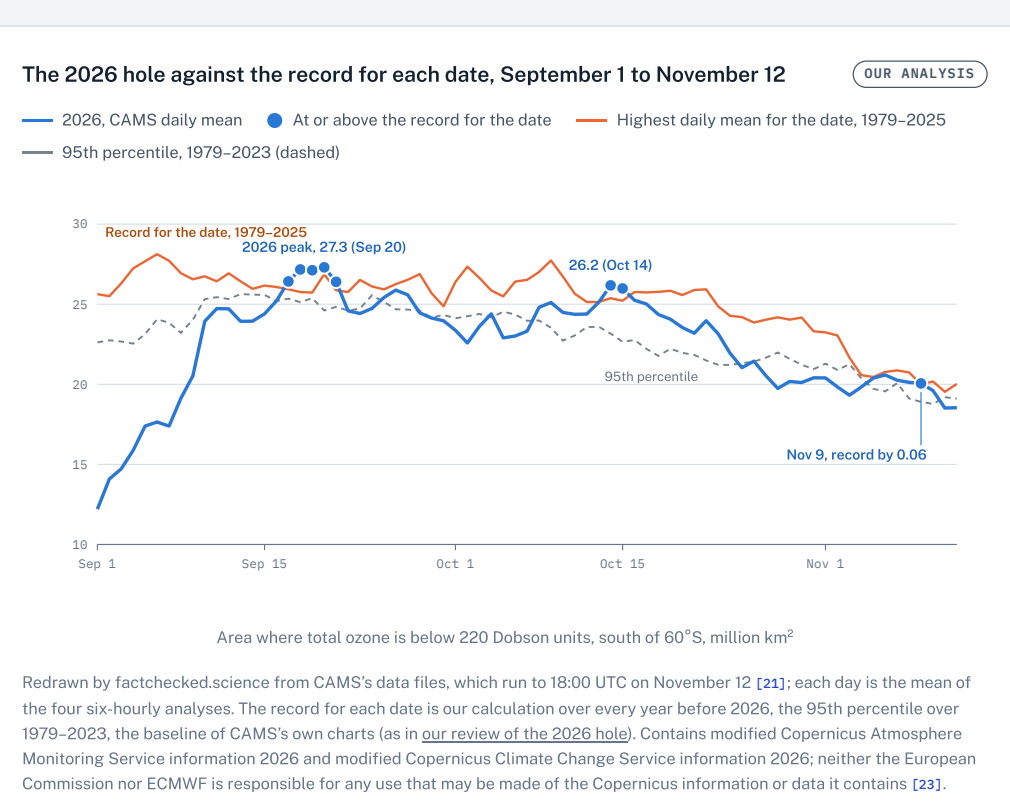
In the episode's words "Shells" is probably "shifts".

> *"Now folks, we are diving right into the details because we have been showing the massive explosion in ozone loss this year."*
>
> S0 News of November 13 [3 00:00:57–00:01:03]

> *"In many ways, the records have cracked and overall it was the seventh largest ozone hole on record, largest in over a decade."*
>
> S0 News of November 13 [3 00:01:19–00:01:27]

> *"If the pole shift was real, and we needed to worry, super auroras were supposed to surge, and they have. The ozone recovery would not continue, and it hasn't."*
>
> S0 News of November 13 [3 00:02:51–00:03:00]

The 2026 hole against the record for each date, September 1 to November 12 OUR ANALYSIS



Redrawn by factchecked.science from CAMS's data files, which run to 18:00 UTC on November 12 [21]; each day is the mean of the four six-hourly analyses. The record for each date is our calculation over every year before 2026, the 95th percentile over 1979–2023, the baseline of CAMS's own charts (as in our review of the 2026 hole). Contains modified Copernicus Atmosphere Monitoring Service information 2026 and modified Copernicus Climate Change Service information 2026; neither the European Commission nor ECMWF is responsible for any use that may be made of the Copernicus information or data it contains [23].

"Massive explosion in ozone loss": Overstated

The area grew by a third from 2025 to 2026 and the ozone the hole lacked by two-thirds, because 2025's hole was one of the smallest since 1992 [25]. Against the record, 2026's mass deficit, 26.7 million tonnes, ranks 23rd of 47: below the 1990–2010 average of 28.7, and below 2018 and each year from 2020 to 2023 [4]. The minimum ozone ranks 26th; the South Pole's 105 Dobson units is the 14th lowest of 41 years by its method (23rd with the satellite top-up), against record lows of 92–93 (section 3).

"The records have cracked": area records for the date, nothing more

In CAMS's analysis the daily mean beat the record for the date on 8 days: September 17–21, October 14–15 and, since our review of October 24 counted seven, November 9, by 0.06 million km^2 [21]. NASA's file has one in the season, October 15, and a few in May and June, before the hole forms [5]. Neither has a record for depth in the season, and the season's largest day and mean were seventh, not first. That review rated the episode's "We've beat or tied daily records over a dozen times this season" Overstated.

"Seventh largest … largest in over a decade": True

As the release says, and on both NASA area measures the largest since 2015 (section 2) [4]. The sentence is about area; by depth, deeper holes came as recently as 2022–2024.

"The ozone recovery would not continue, and it hasn't": False

The release the episode linked and the 2026 Assessment both say recovery continues [1 p. 1][13 p. 41], and the halogens that drive it keep falling [11]; one large, weather-driven year can't show a stall (section 5). Whether the channel predicted this a decade ago can't be checked here; our review of the episode takes up its list of predictions, and our review of October 24 found that the hole's size follows the stratosphere's cold, not geomagnetic activity.

Quoted, not rated

"It has been kind of brutal from this seat watching the ozone recovery shells yap the last 6 months about past year's data and now we've got the story on 2026 and they're not so loud anymore." [3 00:01:03–00:01:13] The "past year's data" is presumably the 2025 hole, the fifth smallest since 1992 [25]; the 2026 report the episode linked repeats that recovery is on track [1 p. 2 ¶1].

7 · READ WITH CARE

A record, an attribution, a method and a conversion, stated exactly

None of these changes what the release says about 2026. Each is stated here exactly, with what the agencies' own data give.

The South Pole's record low

"The lowest value ever recorded over the South Pole was 92 Dobson units in October 2006" [1 p. 3 ¶4], as NOAA's release for 2025 also said [25]. NOAA's current South Pole table gives 93 on October 9, 2006, by the same method as the release's 105, and 92 on September 29, 1999; the Dobson instrument read 91 on October 9, 2006 [9]. So October 2006 holds the lowest October reading, and 92 is 1999's. NOAA's South Pole pages still give 89 in October 1993, on October 6 on one page and October 12 on another [10]; the table, which reflects NOAA's 2018 reprocessing of its balloon records [20 Abstract], now gives 97–99 for those soundings.

How the 105 was finished

The balloons reach about 30 km and miss the 10% or less of the ozone above, which has to be estimated [10]. NOAA's table gives two totals for each sounding: one holding the ozone above at the mixing ratio last measured (its "CMR" column, as we read the name), one taking it from a satellite climatology. For October 17 they are 105 and 117, and NOAA's own plot shows 117 [9][10]. The release uses the first, as NOAA's release for 2025 did for its 147 [25]; by the second, 2026 ranks 23rd of 41 instead of 14th.

The Dobson spectrophotometer

NOAA's copy says the 105 was found with balloon-borne instruments "and using an optical instrument called the Dobson Ozone Spectrophotometer" [1 p. 3 ¶3]; NASA's names only the balloons [2 ¶8]. NOAA's table has no 2026 Dobson values yet, and on our reading of NOAA's plot the 2026 Dobson readings it shows are no lower than about 116 Dobson units [9][10].

"1 to 2 million square miles (3.5 million square kilometers)"

3.5 million km^2 is 1.35 million square miles, inside the range, but the range itself is 2.6–5.2 million km^2, so the two figures are not conversions of each other [2 ¶5]. For 2025 the agencies gave the same kind of estimate as "more than one million square miles" [25].

48 years, 47 ranked

1979–2026 is 48 years, but NASA has no data for 1995, between its TOMS instruments on Meteor-3 and Earth Probe [6], so the ranking is of 47. NOAA's release for 2025 counted the same record as "46 years of observations" [25].

Smaller points

NOAA's "record-breaking holes that occurred 10 or 20 years ago" [1 p. 3 ¶3] fits 2006; "10 years ago" fits 2015 only loosely, a record for late-season size, not depth [15 §4]. NASA's "in previous decades" [2 ¶8] fits. Of the four satellites the release credits [2 ¶9], NASA Ozone Watch's pages name Aura's instrument and those on Suomi NPP and NOAA-20, not NOAA-21 [6]; that doesn't show NOAA-21 went unused, since NOAA's copy credits them to "the annual monitoring", NOAA's as well as NASA's [1 p. 4 ¶1]. And the two copies quote the scientists in slightly different words (section 1).

8 · REPEAT OUR NUMBERS

One script fetches the agencies' files, checks them against ours and reruns every step

The rules came first, with their hashes; what came after them is labelled in the log. Rerun from the files we used, every script gave our numbers again.

- PY **ozone_pipeline.py** Downloads the 122 input files from NASA Ozone Watch, NOAA and CAMS, checks each against the SHA-256 of our copy in ozone-inputs.json, runs every step and compares the numbers with ours; standard library only · 5 KB and 39 KB
- PY **rankings.py, trend_test.py and release_checks.py** The pre-registered ranks, trend tests and checks of the release's numbers · 10 KB, 15 KB and 8 KB
- TXT **RULES_rankings.txt, RULES_trend.txt and RULES_release_checks.txt** The rules, written before this check's data were downloaded, with what we already knew, a dated amendment, and the exploratory and post-review additions marked as such · 7 KB, 8 KB and 5 KB
- TXT **analysis-log.txt** The SHA-256 of the rules, the data, every script and every output, in the order they were made · 6 KB
- PY **exploratory_checks.py, cams_t50_months.py and cams_crosscheck.py** Added after the pre-registered tests: other weather diagnostics, the published September and onset measures, CAMS's August and September temperatures and CAMS's ranks; and, after a fresh review, the depth comparison on all six measures and the temperature fit's variants · 14 KB, 1 KB and 2 KB
- PY **ozone_records.py and charts.py** The record-day count of our review of October 24, unchanged, and this page's five charts · 7 KB and 23 KB
- JSON **rankings.json, trend_test.json, release_checks.json and exploratory_checks.json** Our outputs, with the SHA-256 of every file each script read · 29 KB, 21 KB, 5 KB and 24 KB
- TXT **record-days.txt, chart-numbers.json and cams-numbers.txt** The record days in NASA's and CAMS's files, the charts' numbers, and CAMS's ranks and temperatures · 7 KB, 6 KB and 1 KB
- PY **crosscheck_scipy.py and measure_gml_plot.py** A separate recomputation of the trend tests with numpy and scipy, which matched, with its output, crosscheck-scipy.txt; and our reading of NOAA's South Pole plot, with its output, gml-plot-markers.txt · 2 KB, 1 KB, 2 KB and 1 KB

Run it

`python3 -I ozone_pipeline.py <empty folder>`, with the other files beside it, downloads about 7 MB into that folder, writes every output to its `out` folder and compares the numbers with ours. NASA's 2026 files and CAMS's files grow every day, so a later run adds days; the seasonal ranks and the trend tests should not change. `crosscheck_scipy.py` needs numpy and scipy; `measure_gml_plot.py` needs Pillow and NOAA's plot.

The data and their terms

NASA Ozone Watch: US government data; "Please credit all material to 'NASA Ozone Watch'" [8]. **NOAA:** public domain, credited as NOAA asks [12]. **CAMS:** our outputs contain modified Copernicus Atmosphere Monitoring Service information 2026, under its licence [23]. We host only our own scripts and outputs; the script fetches the agencies' files. The release's photograph and NASA's map are not reproduced.

9 · LIMITS

What we couldn't check

The counterfactual

How the release's "3.5 million square kilometers" was estimated isn't said [2 ¶5], and the record can't check it; we couldn't.

Where the winds sat

Butler's "further from the pole by several degrees of latitude" needs gridded winds; NASA's published diagnostics give the wind at 60°S only [7].

Analyses that changed

NASA's 2026 weather values come from a different analysis than its baseline [7], and its ozone files can be revised: between our reads of October 19 and November 13, eight June values of the 2020 hole's area changed, and with them the June climatology in the 2026 files, which touches none of our numbers [5].

2026's Dobson readings

NOAA's table doesn't hold them yet; we read them off its plot [10].

Abstracts only

Five of the studies were read only as abstracts, as the source list marks; Stone and colleagues' paper was read in full [15].

What would change these verdicts

01 A revision of NASA's seasonal file that moves 2026 out of seventh place, or a deeper reading of its depth.

02 A run of large, deep holes that the next Assessment can't put down to the weather, or halogens that stop falling.

03 An analysis of gridded winds that shows the vortex was not unusually large or displaced, which would weaken the release's explanation.

Related checks

OVERSTATED Ozone loss as the "extinction" mechanism The Disaster Cycle, Fact-Checked

Sources

Bracketed numbers refer to this list. For NOAA's copy of the release [1], read from a printed copy, p. gives a page and ¶ a paragraph on that page, captions not counted; for NASA's copy [2], ¶ gives a paragraph of the article, captions not counted. For the episode [3], times are positions in the video (hours:minutes:seconds), from the first to the last line of its automatic transcript that holds the words quoted. For the 2026 Assessment [13], p. gives a page of its PDF; for the papers, Abstract names the part we used and § a section. The agencies' files were read on November 13, 2026, between 16:07 and 16:37 UTC. Ranks, trends, percentiles and record counts are our own calculations from those files. Links checked November 13, 2026.

1 National Oceanic and Atmospheric Administration (2026). NOAA, NASA release measurements of 2026 ozone hole. News release, November 4, 2026 ("Last updated November 4, 2026"); the episode's link. Read in full from a copy the site's owner printed on November 13, 2026, at 09:53 CST, because noaa.gov refused our client; p. gives a page of that five-page print and ¶ a paragraph on the page, captions not counted. Its photograph, credited "Tommy Jensen/Amentum. With permission.", is not reproduced.

2 NASA (2026). NASA, NOAA Track 2026 Antarctic Ozone Hole. By Sally Younger, NASA's Earth Science News Team, November 4, 2026. Read in full on November 13, 2026; ¶ gives a paragraph of the article, captions not counted. The same numbers as NOAA's copy; section 1 lists where the two differ. Its map (NASA Earth Observatory) and photograph are not reproduced.

3 SpaceWeatherNews (S0) (November 13, 2026). Earth Oxygen Begins to Leak | S0 News Nov.13.2026. YouTube video, https://www.youtube.com/watch?v=9Lau3x7wQPc, published 12:13 UTC; its description links NOAA's copy of the release as "Ozone Report". Quoted from tactiq.io's automatic transcript, supplied by the site's owner; times are positions in the video. The video's graphics weren't seen.

4 NASA Ozone Watch. Seasonal records, 1979–2026, with no data for 1995: mean ozone-hole area, September 7–October 13; mean ozone mass deficit, September 21–October 13; mean minimum ozone, September 21–October 16. Read November 13, 2026, unchanged since our read of October 19. Ranks, trends and comparisons are our own calculations. Credit: NASA Ozone Watch.

5 NASA Ozone Watch. Daily ozone-hole area and minimum ozone, one file for each year 1979–2026 (for example the 2026 area, with its 1979–2025 climatology; data to November 10), and the 2026 daily mass deficit. Read November 13, 2026. Credit: NASA Ozone Watch.

6 NASA Ozone Watch. 2026 Antarctic OMPS and MERRA-2 Ozone: definitions and data sources, last updated November 13, 2026, 15:46 UTC; and its home page, which lists the instruments it uses. Read November 13, 2026.

7 NASA Ozone Watch. Meteorology: eddy heat flux at 100 hPa, 45–75°S, all waves and waves 1–3 (August and September of each year, and 2026 daily); zonal-mean wind at 60°S (50 hPa, August–October of each year; 10 hPa, August and September); polar vortex area at 460, 600 and 850 K and the area of polar-stratospheric-cloud temperatures (NAT) at 460 K (2026 daily, with the 1979–2025 climatology). MERRA-2, with "Data starting 2026-08-01 … from GEOS FP". Read November 13, 2026. Ranks are our own calculations.

8 NASA Ozone Watch. Disclaimers: "Please credit all material to 'NASA Ozone Watch' unless otherwise noted", and "All of the data available within this site are subject to being updated at any point." Read November 13, 2026.

9 NOAA Global Monitoring Laboratory. South Pole ozonesonde summary table, spo5_2026_11_03.csv: for each balloon sounding from 1967 to November 3, 2026, the total ozone with two estimates of the ozone above the balloon (columns SondeTotalCMR and SondeTotalSBUV), the Dobson total ozone and the 12–20 km column. Read November 13, 2026. Ranks are our own calculations. Data provided by NOAA Global Monitoring Laboratory, Boulder, Colorado, USA (https://gml.noaa.gov).

10 NOAA Global Monitoring Laboratory. South Pole Ozone Hole, with its pages Total Column Ozone, including its plot of 2026, and Historical Minimum Profiles. Read November 13, 2026.

11 NOAA Global Monitoring Laboratory (2024). The NOAA Ozone Depleting Gas Index: Guiding Recovery of the Ozone Layer, 2024 update: the Antarctic index was 71.6 at the start of 2024. Read November 13, 2026.

12 NOAA Global Monitoring Laboratory. Disclaimer, "Data and Products": public domain, with the acknowledgement used under our charts. Read November 13, 2026.

13 World Meteorological Organization (2026). Executive Summary. *Scientific Assessment of Ozone Depletion: 2026*, GAW Report No. 327, WMO, Geneva; published October 2026. Read November 13, 2026, on the web and in its PDF; p. gives a page of the PDF.

14 World Meteorological Organization (2022). Executive Summary. *Scientific Assessment of Ozone Depletion: 2022*, GAW Report No. 278, WMO, Geneva. Read November 13, 2026.

15 Stone, K. A., Solomon, S., Kinnison, D. E., and Mills, M. J. (2021). On Recent Large Antarctic Ozone Holes and Ozone Recovery Metrics. *Geophysical Research Letters* 48(22), e2021GL095232. CC BY-NC 4.0. Read in full in Europe PMC; § gives a section.

16 Solomon, S., Ivy, D. J., Kinnison, D., Mills, M. J., Neely, R. R., and Schmidt, A. (2016). Emergence of healing in the Antarctic ozone layer. *Science* 353(6296), 269–274. Abstract only, from Europe PMC.

17 Newman, P. A., Kawa, S. R., and Nash, E. R. (2004). On the size of the Antarctic ozone hole. *Geophysical Research Letters* 31(21). Abstract only, from Crossref.

18 Newman, P. A., Nash, E. R., Kawa, S. R., Montzka, S. A., and Schauffler, S. M. (2006). When will the Antarctic ozone hole recover? *Geophysical Research Letters* 33(12). Abstract only, from Crossref.

19 Kessenich, H. E., Seppälä, A., and Rodger, C. J. (2023). Potential drivers of the recent large Antarctic ozone holes. *Nature Communications* 14, 7259. CC BY 4.0. Abstract only, from Crossref.

20 Sterling, C. W., Johnson, B. J., Oltmans, S. J., Smit, H. G. J., Jordan, A. F., Cullis, P. D., Hall, E. G., Thompson, A. M., and Witte, J. C. (2018). Homogenizing and estimating the uncertainty in NOAA's long-term vertical ozone profile records measured with the electrochemical concentration cell ozonesonde. *Atmospheric Measurement Techniques* 11(6), 3661–3687. CC BY 4.0. Abstract only, from Crossref.

21 Copernicus Atmosphere Monitoring Service. Ozone monitoring data: Southern Hemisphere ozone-hole area and minimum 50 hPa temperature south of 60°S, every six hours from January 1, 1979, to November 12, 2026, 18:00 UTC (data CAMS/C3S). Read November 13, 2026. Records, ranks and percentiles are our own calculations.

22 Copernicus Atmosphere Monitoring Service. Monitoring of the ozone layer: its ozone-hole area is counted below 220 DU south of 60°S. As read for our review of the 2026 hole.

23 ECMWF. Licence to use Copernicus Atmosphere Monitoring Service products, as read for our review of the 2026 hole.

24 US Census Bureau. State Area Measurements and Internal Point Coordinates (2010; page revised December 16, 2021): the 50 states and DC cover 3,796,742 square miles, 9,833,517 km^2, of land and water. Read November 13, 2026.

25 National Oceanic and Atmospheric Administration (2025). NOAA, NASA: 2025 ozone hole is 5th smallest since 1992. News release, November 24, 2025. Read in full from the copy saved for our review of the 2026 hole.

METHOD

How this was checked

On November 13, 2026, we checked every number and statement in the release against its two copies, NOAA's, which the site's owner printed for us because noaa.gov refused our client, and NASA's, which we compared sentence by sentence; then against the agencies' own data: NASA Ozone Watch's seasonal records, its daily files for every year from 1979 to 2026 and its weather diagnostics, NOAA's South Pole sounding table and its index of ozone-depleting gases, and CAMS's analyses. We set them beside the 2026 and 2022 WMO/UNEP Assessments and the published studies of the hole's recovery, 25 sources in all. The episode's words are quoted from its automatic transcript; its graphics weren't seen [3].

The verdicts and the items tagged "Our analysis" are our own assessment, built on the cited sources: the ranks; the trend test and what one year can and can't show; our reading of NASA's weather diagnostics; the record days; and the unit conversions.

We wrote the rules of our tests before downloading this check's data, though not blind: they record what we already knew from our October reviews, 2026's mean area, its rank and two depth ranks. One amendment, naming the South Pole column and the vortex measures, followed once the files' headers had been read and before anything was computed; the checks added afterwards are labelled exploratory, as are those added after the review below. We logged the SHA-256 of the rules, the data and every output. Every rank, trend and record count was computed from the agencies' files, and the trend tests again with a separate numpy and scipy script, which matched. We could not check the release's estimate of how much larger the hole would have been at 2000's levels of ozone-depleting substances, since its method isn't given; where the vortex's strongest winds sat, which needs gridded winds; or 2026's Dobson values at the South Pole, which NOAA's table doesn't yet hold.

After the page was built, a fresh reviewer who hadn't seen the drafting recomputed about 80 numbers with separate code, reran our scripts (1,483 outputs, no difference) and checked all 83 quotations, every locator and source, and found every verdict right. The changes that followed: the depth comparison now names its measures, and says plainly that by the release's own South Pole method four of the nine other largest holes read higher than 2026; section 5 now says plainly that our tests on NASA's files can't tell, with data to 2025, whether recovery has continued or stalled, and reports the September and onset measures as they came out; the pre-registration statements say what we already knew; the temperature fit is reported with its narrow margin; the check of the release's 3.5 million square kilometers was dropped; and about thirty smaller fixes, including the wind test's pre-registered month, Butler's "in part", Stone and colleagues' stated basis and caveat, Kessenich and colleagues' "early-spring recovery", CAMS's daily-mean peak, a change in NASA's 2020 file, and the tables' layout on phones.

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

FALSE	The evidence contradicts the claim.
OVERSTATED	Has some basis but claims much more than the evidence supports.
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

Nov 13, 2026	Published on factchecked.science after a full check against the sources. Built from NOAA's and NASA's copies of the release, the agencies' data files, the 2026 and 2022 Assessments and our pre-registered tests; the five charts are redrawn from NASA's, NOAA's and CAMS's data. The release's own claim to the seventh place is checked within the first claim, not rated separately. Section 7 sets out four details of the release beside the agencies' data: a record that doesn't match NOAA's current table, an attribution the data don't show, a number that matches by one of two methods, and two figures that aren't conversions of each other. A fresh review the same day changed no verdict: it led us to name the depth measures behind "not as deep", to say that our trend tests can't tell recovery from a stall, to report the reruns and the temperature fit as they came out, to say what our rules knew in advance, and to make about thirty smaller fixes.

Fact-Checked Science is independent. It isn't affiliated with the channels, presenters or authors whose claims it checks.

Last updated Nov 13, 2026