NOAA Global Monitoring Laboratory

The Planetary Pulse

FALL 2025

Feature Story

NOAA, NASA: 2025 ozone hole is 5th smallest since 1992

Scientists with NOAA and NASA have ranked this year's ozone hole over the Antarctic as the fifth smallest since 1992—the year that the Montreal Protocol, a landmark international agreement to phase out ozone-depleting chemicals, began to take effect.

During the height of this year's ozone depletion season from September 7 through October 13, the average extent of the 2025 ozone hole was about 7.23 million square miles. The ozone hole is already breaking up nearly three weeks earlier than average over the past decade.

The hole reached its greatest one-day extent for the year on September 9 at 8.83 million square miles. That's about 30% smaller than the largest hole ever observed in 2006, which had an average area of 10.27 million square miles. >>>

In September at the Amundsen-Scott South Pole Station, scientists launched a NOAA ozonesonde on a balloon to help monitor the Antarctic ozone hole. Credit: Simeon Bash/University of Chicago

Research News

GML completes first in-situ air sampling aboard NOAA King Air aircraft

During early-August test flights for the National Observations of Greenhouse gases using Aircraft Profiles (NOGAP) campaign, GML successfully conducted the first in-situ air sampling aboard the NOAA King Air aircraft platform. The flights in Florida tested GML's atmospheric sampling instruments up to 30,000 feet, demonstrating the ability of the King Air platform to provide invaluable data for GML's research initiatives and significantly advance NOAA's atmospheric sampling capabilities. >>>

Casey O'Toole, Nick Underwood, NOAA Commissioned Corps Officers Wally Wibowo and Jacob Alvey, Jeff Peischl, Anna McAuliffe, and Steve Borenstein stand in front of N67RF, the NOAA King Air outfitted with NOAA GML's NOGAP payload. Credit: Steve Borenstein/NOAA

GML's surface radiation measurements improve NOAA's operational weather forecast models

In a Monthly Weather Review study, GML's Surface radiation measurements were key to helping researchers identify the source of a surface temperature bias in NOAA's operational weather forecast models. Researchers, from GML, CIRES, and GSL, recommended two ways to improve future forecasts: better use of observations to start the weather models to avoid initial dryness and assuming that cloud droplets are slightly smaller than previously prescribed to brighten model cloud forecasts. These changes can improve NOAA forecasts for aviation, energy, and severe weather in sucessors to the current HHHR weather model. >>>

The State College, Pennsylvania, SURFRAD station is located on the grounds of Penn State University's (PSU) agricultural research farm and is hosted by PSU's Meteorology Department.

In Our Community

The sun finally reemerges at the South Pole

In September, the staff at NOAA's South Pole Observatory got their first clear view of the sun after six months of darkness. The return of the sun signals the start of spring in the Southern Hemisphere.

Credit: LTJG Sky Jordan

Awards and Recognitions

2024 Bronze Medal awarded to GML team for groundbreaking atmospheric observing platform

September 30, 2025—A team of scientists and engineers from GML has been awarded the Department of Commerce 2024 Bronze Medal for Scientific and Engineering Achievement for creating the High-altitude Operational Returning Uncrewed System (HORUS). The team is recognized "for developing a novel, low-cost, balloon-glider platform for deploying lightweight meteorological and atmospheric composition sampling and measurement systems to 90,000 feet and returning them to their original launch location."

The HORUS team is composed of members from GML, NOAA's Office of Marine and Aviation Operations, FedWriters, CIRES, and CU Boulder's Integrated Remote and In Situ Sensing (IRISS) initiative. GML team members include Bianca Baier, Colm Sweeney, and Jack Higgs. They are recognized with CIRES/GML scientists and engineers Tim Newberger, Sonja Wolter and Steve Borenstein. IRISS engineers Brian Argrow and Michael Rhodes

Bronze Medal awarded to research team for SABRE

September 29, 2025—A team from CSL, GML, and the NOAA Climate Program Office received a 2024 DOC Bronze Medal for scientific/engineering achievement "for establishing a new paradigm for NOAA-directed stratospheric science with the successful execution of the Stratospheric Aerosol processes, Budget and Radiative Effects (SABRE) 2023 airborne science mission." GML federal employees Bradley Hall and Patrick Cullis are members of the winning team. GML's CIRES affiliates Elizabeth (Lizzy) Asher, Geoff Dutton, Eric Hintsa, Fred Moore, and David Nance were recognized as part of the team. >>>

Aurora activity from Eielson Air Force Base in Fairbanks, Alaska during the SABRE 2023 Arctic deployment. Credit: Maximilian Dollner, University of Vienna

Above, left to right: GML Director Vanda Grubišić presented certificates to Sandy McClellan, Jack Higgs, and Lori Bruhwiler for Federal Years of Service at an August All-Hands Meeting.

Federal Years of Service recognition for GML staff

10 years
Dottie Cowan
Julie Hyziewicz

15 years
Samantha Middel
Brian Vasel
Aidan Colton
James Salzman
Christine Smith
Sandy McClellan
Jack Higgs

20 years
Paul Fukumura-Sawada
David Marshall

30 years
Stephen Montzka
Lori Bruhwiler

40 years
Debra Hansen
Darryl Kuniyuki

45 years
John Augustine

Thanks to the GML Awards Committee for spearheading the initiative to reinstate in GML the recognition for Years of Service, and especially to David Marshall for his significant efforts in pulling it all together.

GML scientist receives Clarivate Highly Cited Researcher Award

The Clarivate Highly Cited Researcher Awards recognizes researchers whose work is ranked in the top one percent by citations for field and year in the Web of Science™ citation index. John Miller was recognized as a Clarivate Highly Cited Researcher in 2025.

GML Publications

Friedlingstein, P., Le Quéré, C., O'Sullivan, M., et al.: Emerging climate impact on carbon sinks in a consolidated carbon budget, *Nature*, https://doi.org/10.1038/s41586-025-09802-5, 2025.

Ort, L., Pozzer, A., Hoor, P., Obersteiner, F., Zahn, A., Ryerson, T. B., Thompson, C. R., **Peischl, J.**, Commane, R., Daube, B., Bourgeois, I., Lelieveld, J., and Fischer, H.: Enhancement of O3–CO ratios at tropospheric subtropical latitudes: Photochemistry and stratospheric influence, *Atmos. Chem. Phys.*, 25, 14987–15007, https://doi.org/10.5194/acp-25-14987-2025, 2025.

Lyu, C., Harkins, C., Li, M., Mueller, K., Prothero, J., Verreyken, B., et al.: Development of the United States GReenhouse gas and Air Pollutants Emissions System (GRA2PES), *Journal of Geophysical Research: Atmospheres*, 130, e2025JD043597, https://doi.org/10.1029/2025JD043597, 2025.

Verret, M., Naeher, S., Lacelle, D., Ginnane, C., Dickinson, W., Norton, K., **Turnbull, J.**, and Levy, R.: Preservation and degradation of ancient organic matter in mid-Miocene Antarctic permafrost, Biogeosciences, 22, 5771–5786, https://doi.org/10.5194/bg-22-5771-2025, 2025.

Howar, L. V., Salawitch, R. J., Wilmouth, D. M., **Hintsa, E. J.**, Hare, J. S., Hanisco, T. F., et al.: Conditions necessary for chlorine activation in the mid-latitude summer lower stratosphere, *Journal of Geophysical Research: Atmospheres*, 130, e2025JD043786, https://doi.org/10.1029/2025JD043786, 2025.

Lawler, M. J., Schill, G. P., Murphy, D. M., Abou-Ghanem, M., Brock, C. A., Lyu, M., et al.: The composition and stratospheric fate of aerosol particles originating in the polar vortex, *Journal of Geophysical Research: Atmospheres*, 130, e2025JD043530, https://doi.org/10.1029/2025JD043530, 2025.

Kanaya, Y., Sommariva, R., Saiz-Lopez, A., Mazzeo, A., Koenig, T. K., Kawana, K., et al.: Observational ozone datasets over the global oceans and polar regions (version 2024), *Earth Syst. Sci. Data*, 17, 4901–4932, https://doi.org/10.5194/essd-17-4901-2025, 2025.

Van Malderen, R., Zang, Z., Chang, K.-L., Björklund, R., Cooper, O. R., Liu, J., et al.: Ground-based tropospheric ozone measurements: regional tropospheric ozone column trends from the TOAR-II/HEGIFTOM homogenized datasets, *Atmos. Chem. Phys.*, 25, 9905–9935, https://doi.org/10.5194/acp-25-9905-2025, 2025.

Authors in GML are listed in **bold**.

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