Antarctic ozone hole is 13th largest on record and expected to persist into November

October 28 2021

Lt. Timothy Holland, NOAA Corps, emerges from a balloon assembly station with an ozonesonde attached to a weather balloon before releasing it over the South Pole. Credit: Josiah Horneman, Station Physician's Assistant, Antarctic Support Contract

The 2021 Antarctic ozone hole reached its maximum area on October 7 and ranks 13th largest since 1979, scientists from NOAA and NASA reported today. This year's ozone hole developed similarly to last year's:

A colder than usual Southern Hemisphere winter lead to a deep and larger-than-average hole that will likely persist into November or early December.

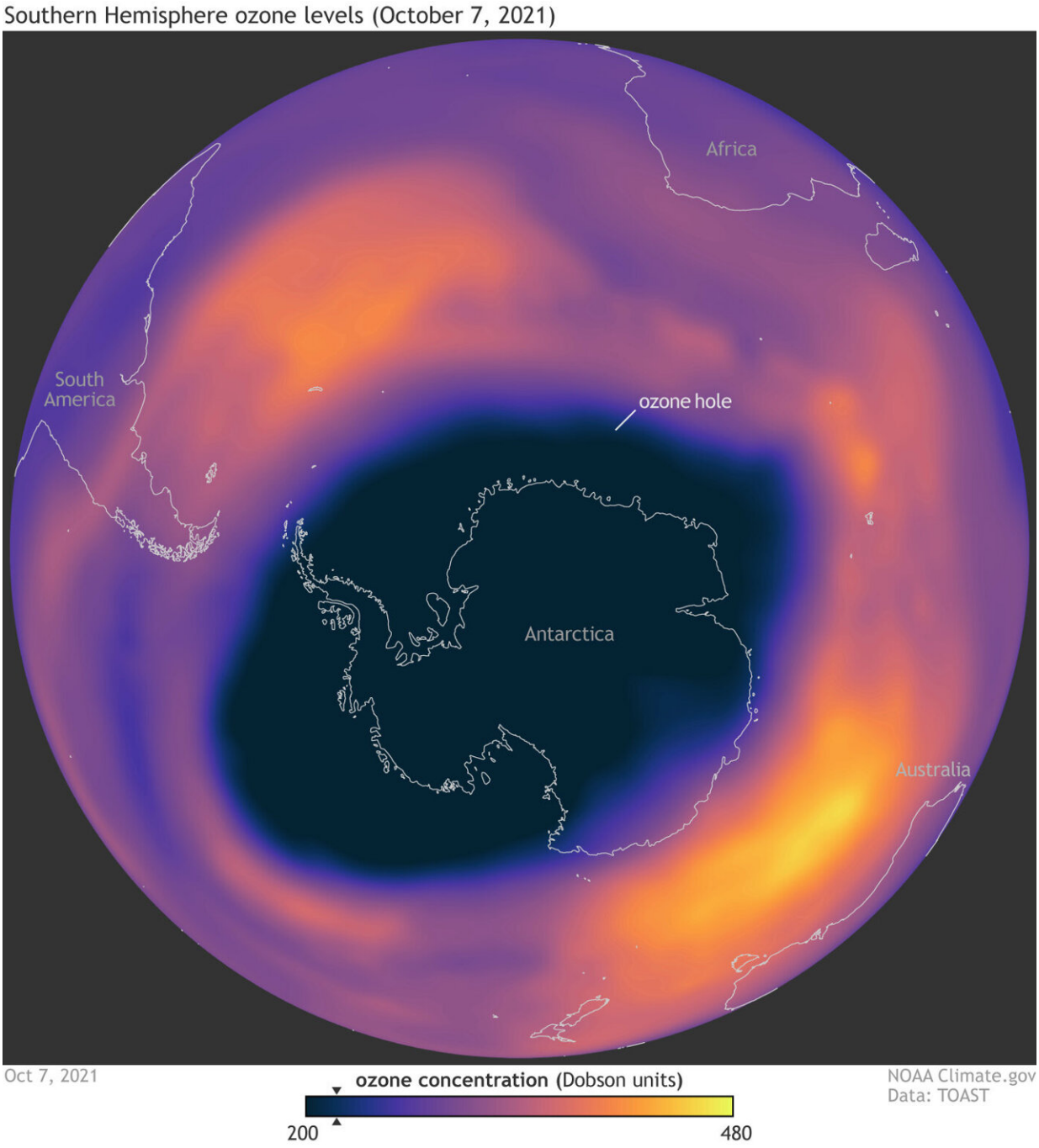
"This is a large ozone hole because of the colder than average 2021 stratospheric conditions, and without a Montreal Protocoloffsite link, it would have been much larger," said Paul Newman, chief scientist for Earth Sciences at NASA's Goddard Space Flight Center.

What we call the ozone hole is a thinning of the protective ozone layer in the stratosphere (the upper layer of Earth's atmosphere) above Antarctica that begins every September. Chlorine and bromine derived from human-produced compounds are released from reactions on high-altitude polar clouds. The chemical reactions then begin to destroy the ozone layer as the sun rises in the Antarctic at the end of winter.

Size matters. But how do you measure a hole in the atmosphere?

NOAA and NASA researchers detect and measure the growth and break up of the ozone hole with satellite instruments aboard Aura, Suomi-NPP and NOAA-20 satellites.

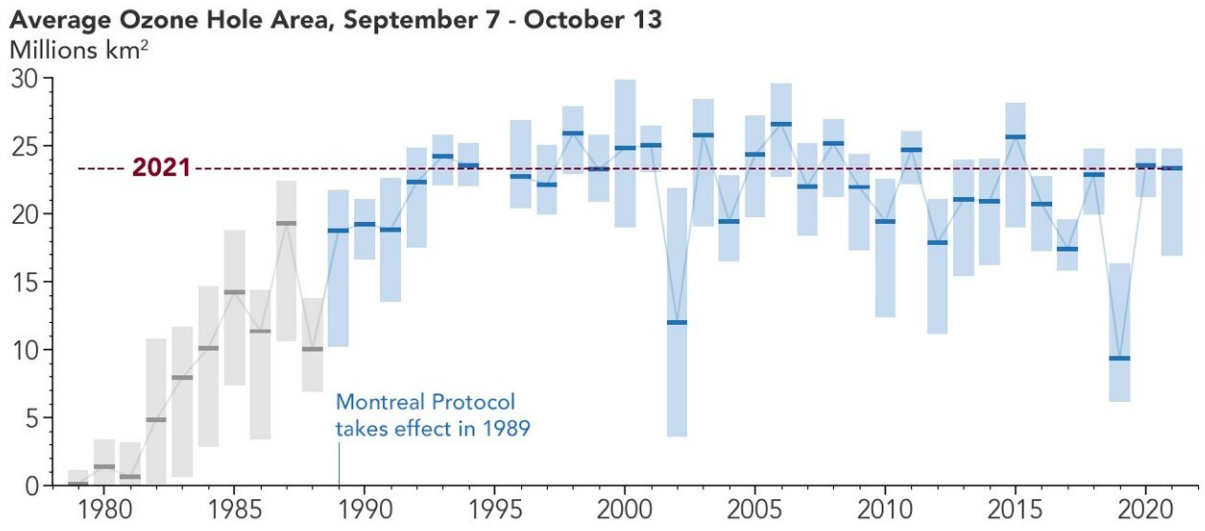
This year, NASA satellite observations determined the ozone hole reached a maximum of 9.6 million square miles (24.8 million square kilometers)—roughly the size of North America—before beginning to shrink in mid-October. Colder-than-average temperatures and strong winds in the stratosphere circling Antarctica contributed to the hole's size.



This visualization depicts the ozone hole over Antarctica at its maximum extent on October 7. 2021. Scientists define the "ozone hole" as the area in which ozone levels are depleted below 220 Dobson Units (dark blue, marked with black triangle on color bar). Credit: Climate.gov

NOAA scientists at the South Pole Station record the ozone layer's thickness by releasing weather balloons carrying ozone-measuring instruments called ozonesondes that measure the varying ozone concentrations as the balloon rises into the stratosphere.

When the polar sun rises, NOAA scientists also make measurements with a Dobson Spectropherometer, an optical instrument that records the total amount of ozone between the surface and the edge of space known as the total column ozone value. This year, scientists recorded the lowest total-column ozone value of 102 Dobson Units on October 7, the 8th lowest since 1986. At altitudes between 8 and 13 miles (14 to 21 kilometers) ozone was nearly completely absent during the ozone hole's maximum size.



This chart depicts the average extent of the Antarctic ozone hole during peak ozone depletion season from 1979 to present. Scientists said the 2021 ozone hole would have been 1.5 million square miles larger if atmospheric chlorine levels today were as high today as they were in the early 2000s. Credit: NASA

The good news

Though the 2021 Antarctic ozone hole is larger than average, it's substantially smaller than ozone holes measured during the late 1990s and early 2000s.

The ozone hole is recovering due to the Montreal Protocol and subsequent amendments banning the release of harmful ozone-depleting chemicals called chlorofluorocarbons or CFCs. If atmospheric chlorine levels from CFCs were as high today as they were in the early 2000s, this year's ozone hole would likely have been larger by about 1.5 million square miles (about four million square kilometers) under the same weather conditions.

Provided by NOAA Headquarters

Citation: Antarctic ozone hole is 13th largest on record and expected to persist into November (2021, October 28) retrieved 23 June 2024 from https://phys.org/news/2021-10-antarctic-ozone-hole-13th-largest.html