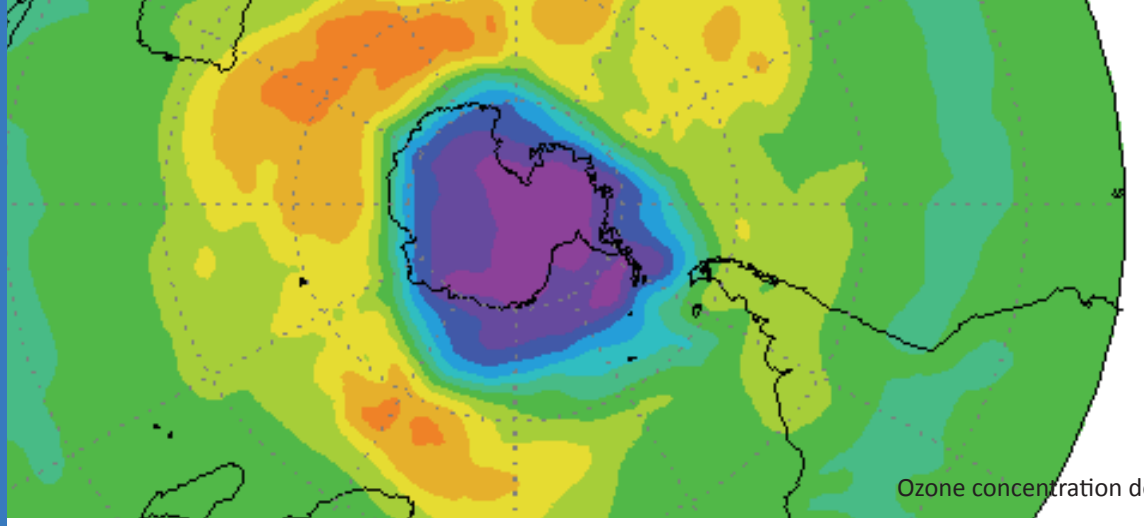


Ozone concentration derived from satellite data.

Ozone

Ozone, as well as Oxygen, plays key roles in our world. Oxygen gas (O_2 – two oxygen atoms bonded together) is the second most common gas in our atmosphere. This gas is necessary for sustaining most life on our planet. People and animals need to breathe Oxygen to live. Ozone (O_3 – a less stable molecule where three oxygen atoms are bonded together) is a chemical cousin of Oxygen. Ozone is far less abundant in the atmosphere but is also critical for sustaining life on Earth.

Good Ozone

Most of the good ozone exists in an upper part of the atmosphere, called the stratosphere, in a layer from about 8 to 30 miles above the surface of the Earth. Ozone in the stratosphere absorbs the majority of the harmful Ultraviolet (UV) radiation from the Sun before it reaches the Earth's surface. This is very helpful as some UV radiation is extremely damaging to living cells. Without ozone, life on land would not be possible.

The amount of ozone in the atmosphere is called the ozone layer, or total column ozone. The amount of ozone over any portion of the globe can differ greatly due to varying climate and chemical interactions. Starting in the mid-1980s, a very unusual change was noticed in the ozone layer over the South Pole—nearly all the ozone at certain levels in the stratosphere was destroyed each spring. This phenomenon, which became known as the Ozone Hole, was eventually traced to pollutants called chlorofluorocarbons (CFCs) that drifted to the upper atmosphere.

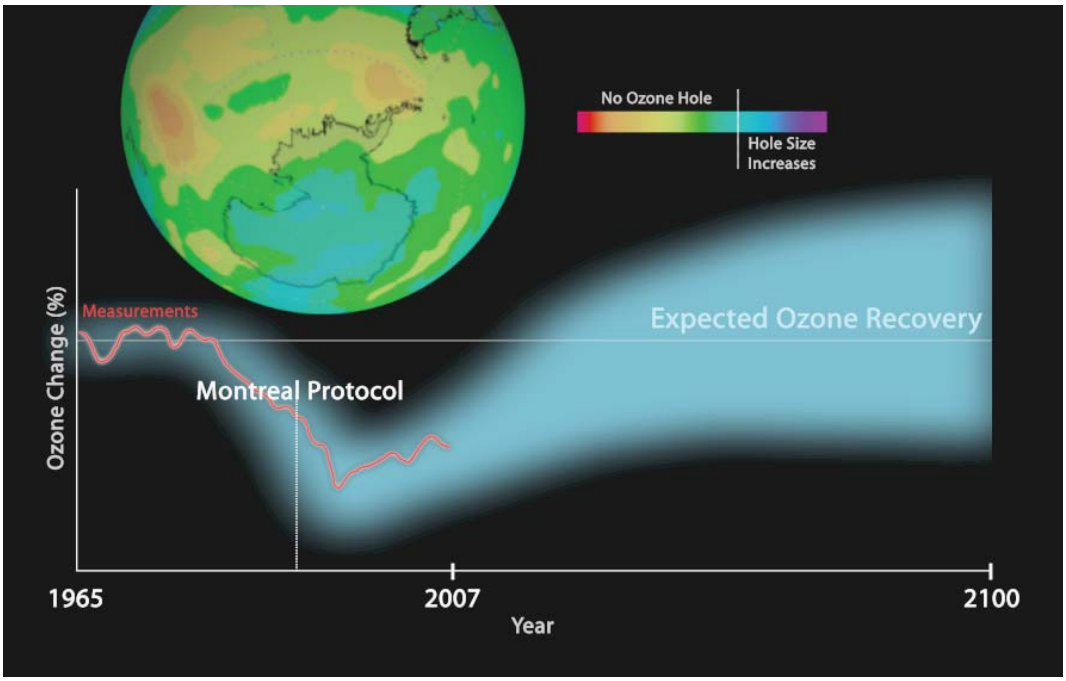
Winter and Spring at the South Pole are a very special time of the year. Very strong winds, called the polar vortex, encircle the continent of Antarctica, causing the air to be isolated and very cold. Polar stratospheric clouds form at these very cold temperatures. Special reactions on the surface of these frozen clouds cause the rapid release of chemicals that change Ozone into Oxygen. It took a team of scientists with a variety of backgrounds in chemistry and meteorology to unravel this mystery.
In 1987, an agreement called the Montreal Protocol was signed by many nations to limit the production and use of CFCs, the chemicals responsible for most of the ozone loss. The United States has stopped producing the harmful chemicals, and there is evidence that things are getting better. However, stockpiles of these and related chemicals are still being used, and the lifetime of these compounds is very long once they are released into the atmosphere. It will be the middle of the century before the Ozone Hole stops forming.

The North Pole also has ozone loss, but due to the way the continents disrupt the wind flow, a strong polar vortex rarely forms, and polar stratospheric clouds are less common. The atmosphere is less isolated so ozone-rich air mixes in with depleted air.

Bad Ozone

We usually hear about the bad ozone on a hot summer day. Air Pollution from automobile exhausts, industrial emissions, gasoline vapors, and chemical solvents react rapidly to sunlight, producing ozone in the lowest layer of the atmosphere, called the troposphere. Ozone is not healthy for people and animals to breathe and it can damage plants.

Ozone is extremely important, but it is best kept at a distance.

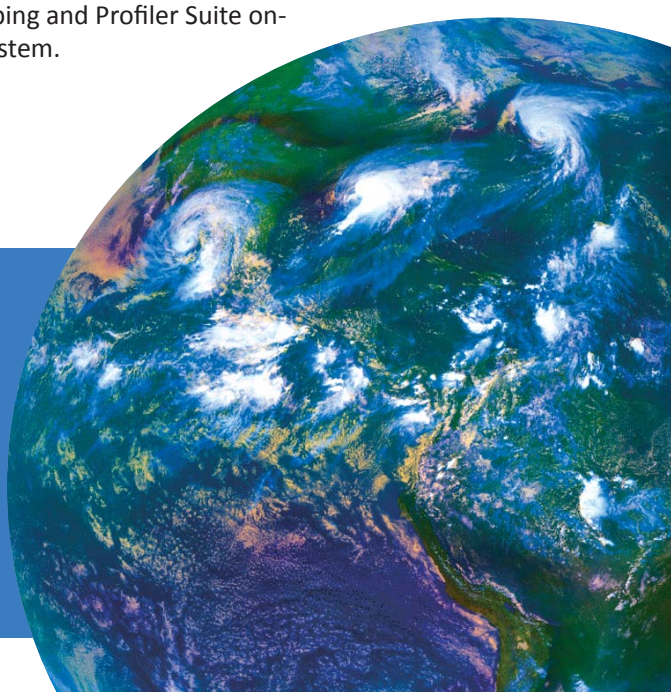


Ozone is Measured by Satellites

Satellites are best at measuring ozone in the upper atmosphere (the good ozone). The Environmental Protection Agency measures ground level ozone (the bad ozone) using ground-based detectors.

NOAA monitors ozone with the Solar Backscattered Ultraviolet Version 2 (SBUV/2) and High Resolution Infrared Radiation Sounder (HIRS) sensors aboard its polar-orbiting satellites. The SBUV/2 measures the amount of UV light energy that is reflected back into space by the atmosphere and the Earth's surface. Scientists calculate the total column of ozone and ozone concentrations at different levels in the atmosphere by making measurements at different wavelengths of UV light and comparing how ozone affects each of those wavelengths. HIRS can also measure total column ozone using infrared (IR) energy passing through the atmosphere. This technique is useful because the poles do not receive UV light from the Sun in the winter, but the Earth is constantly radiating IR energy.

In the future, ozone will be measured by the more accurate Ozone Mapping and Profiler Suite on-board the National Polar-orbiting Operational Environmental Satellite System.



Links

Frequently asked questions: www.ozonelayer.noaa.gov/faq/faq.htm
UV Index forecast map: www.epa.gov/sunwise/uvindex.html
Global ozone levels: www.osdpd.noaa.gov/ml/air/ozone.html
NASA speaks on ozone: www.nasa.gov/missions/earth/f-ozone.html
EPA talks about ozone: www.epa.gov/ozone
AirNow (air quality measurement): http://airnow.gov
Ozone maps and data: http://toms.gsfc.nasa.gov
More about NOAA satellites and products: www.nesdis.noaa.gov