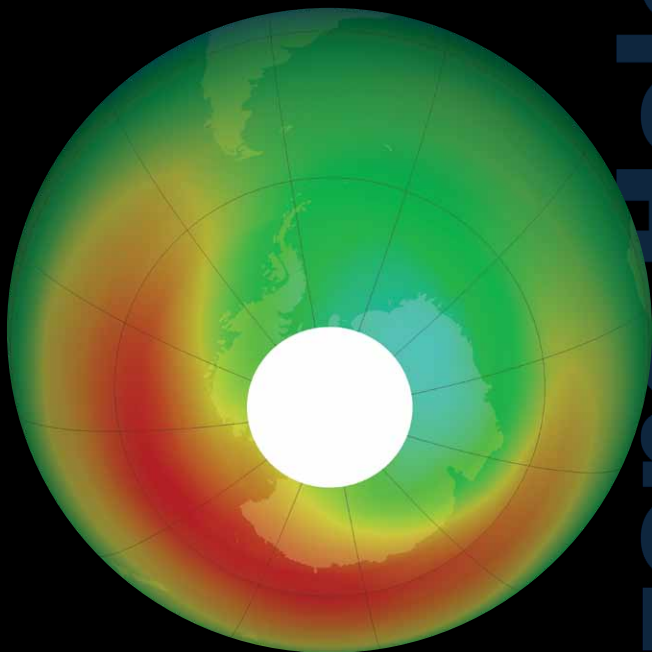
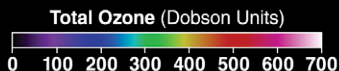




Ozone Hole Through the Years 1970 - 2011



October 1970

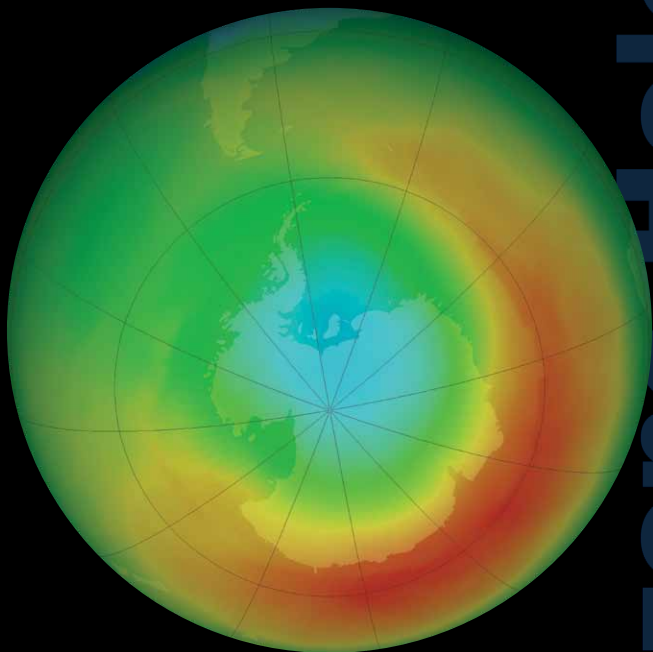


Ozone Hole

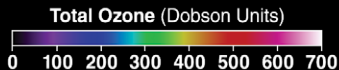


Ozone Hole

Through the Years 1970 - 2011



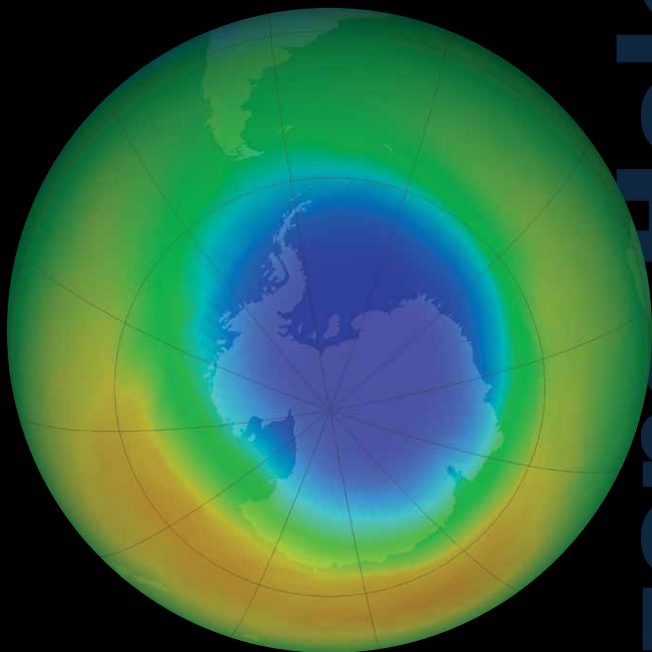
October 1979



Ozone Hole



Ozone Hole Through the Years 1970 - 2011



October

1984

Total Ozone (Dobson Units)

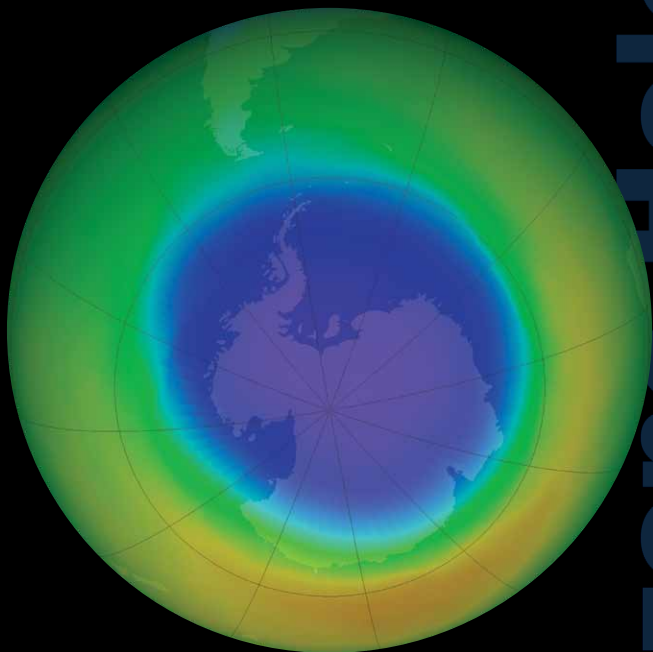


Ozone Hole



Ozone Hole

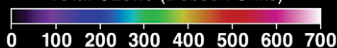
Through the Years 1970 - 2011



October

1989

Total Ozone (Dobson Units)

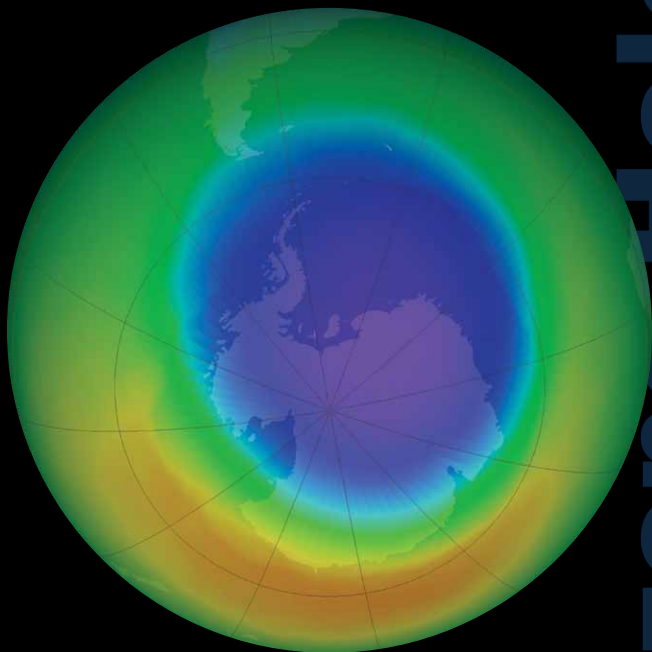


Ozone Hole



Ozone Hole

Through the Years 1970 - 2011



October

2000

Total Ozone (Dobson Units)

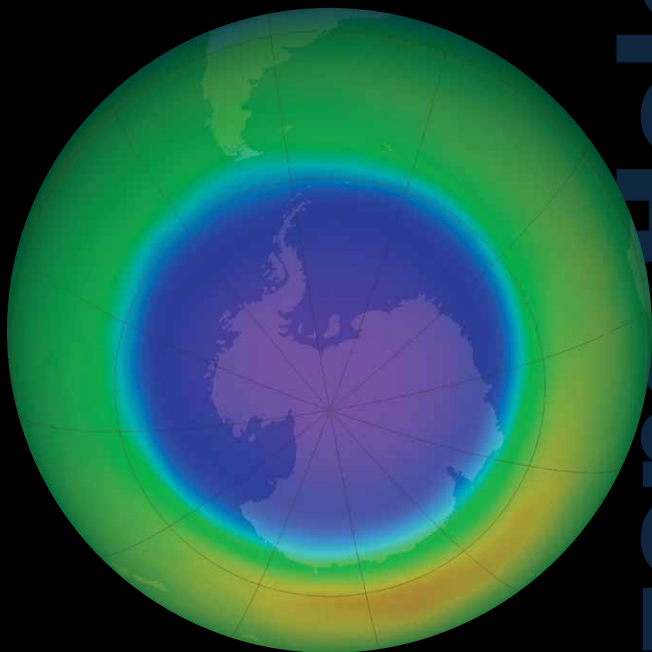


Ozone Hole



Ozone Hole

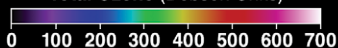
Through the Years 1970 - 2011



October

2011

Total Ozone (Dobson Units)



Ozone Hole

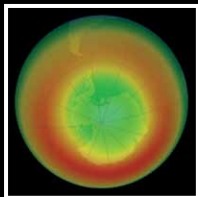
The Hole Story About Earth's Ozone

What Would Have Happened To The Ozone Layer if Chlorofluorocarbons (CFCs) Had Not Been Regulated?

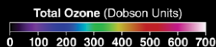
The images below present two cases of simulated 2063 ozone concentrations: the *World Avoided* case (top), where CFC emissions into the atmosphere steadily increased up to 2063; and the *Projected* case (bottom), which assumes CFC emissions stopped because of the Montreal Protocol.



World Avoided
ozone levels nearly depleted



Projected
ozone levels similar to
current levels



Ozone is Earth's natural sunscreen, shielding life from dangerous solar ultraviolet radiation. Unfortunately, human-produced chemicals in our atmosphere—such as chlorofluorocarbons (CFCs), used for many years as refrigerants and in aerosol spray cans—have depleted the Earth's ozone layer. Scientists first recognized the potential for harmful effects of CFCs on ozone in the early 1970s. As CFCs continued being used through the 1980s, scientists observed decreases in global ozone levels.

By 1985, ozone levels around the globe had continued to drop and scientists discovered something peculiar over Antarctica—a significant thinning of the ozone layer, later coined as the *Antarctic ozone hole*. In the 1980s, governments around the world woke up to the destruction of the ozone layer and in 1987 negotiated the Montreal Protocol—an international treaty designed to protect the ozone layer by banning CFCs and similar ozone-depleting chemicals. Since the mid-1990s, global ozone levels have become relatively stable. In fact, in 2010, the science advisors to the Montreal Protocol found that global ozone is no longer decreasing, but also is not yet increasing. Although the Montreal Protocol has stopped the production and consumption of CFCs, these gases have very long atmospheric lifetimes—in some cases, more than 100 years.

The images on the front show the monthly-averaged total ozone over Antarctica in October of 1970, 1979, 1984, 1989, 2000, and 2011. Ozone typically reaches its maximum depletion over Antarctica in October due to special meteorological phenomena that exist nowhere else on the planet. The Antarctic ozone hole increased in severity from 1970 to 1995 as CFC levels increased. Fortunately, the size of the hole has now stabilized because of the Montreal Protocol, and it should return to its pre-1980 levels by about 2065.

About the Data

The October 1970 observations were measured by the Backscatter Ultraviolet (BUV) instrument aboard the Nimbus-4 satellite. The circle of white centered over the South Pole is an area of no data, where the BUV could not measure during that time. The data from 1979, 1984, and 1989 are from NASA's Total Ozone Mapping Spectrometer (TOMS) instruments aboard the NASA Nimbus-7 satellite. Data from 2000 are from the NASA Earth Probe TOMS satellite. Data from 2011 are from the Ozone Monitoring Instrument (OMI) aboard the Aura satellite—a NASA/KNMI mission.