

The Ozone Shield

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The ozone layer is the layer of the atmosphere in which ozone absorbs ultraviolet solar radiation.

Ozone is a molecule made of three oxygen atoms.

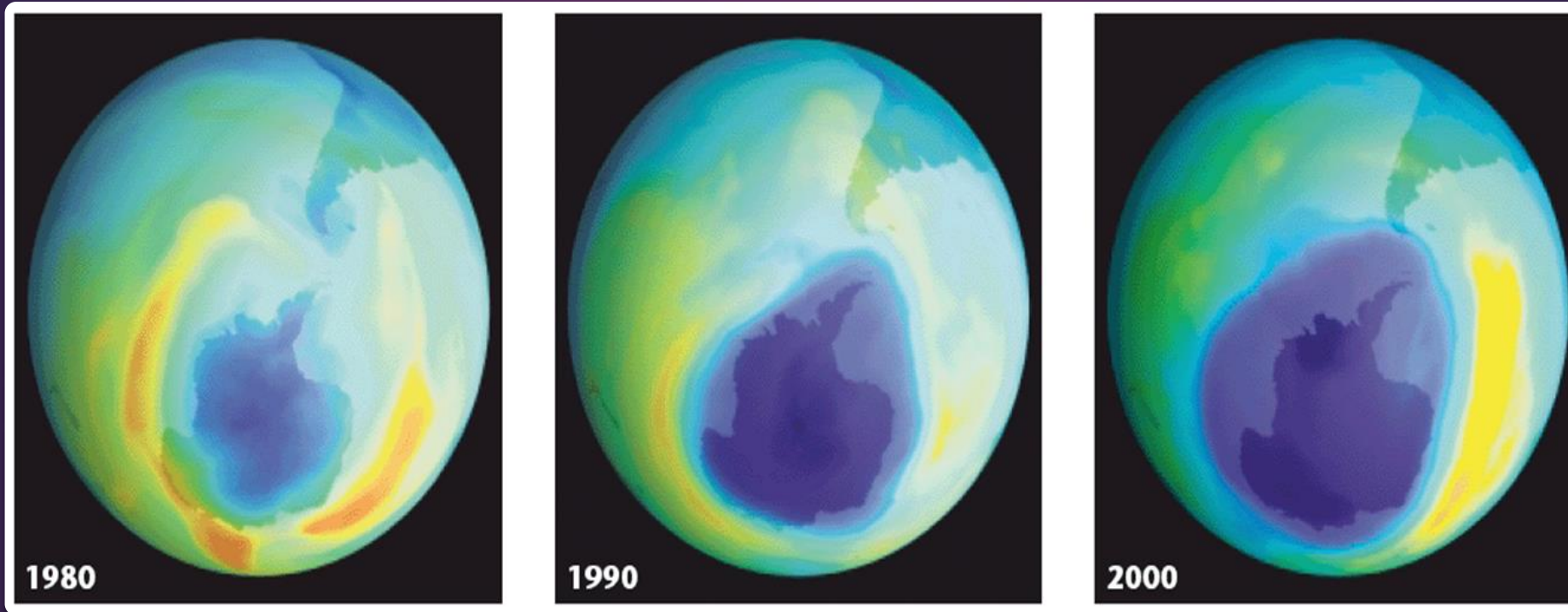
UV light is harmful to organisms because it can damage the genetic material in living cells.

By shielding the Earth's surface from most of the sun's UV light, the ozone in the stratosphere acts like a sunscreen for the Earth's inhabitants.

The Ozone Hole

In 1985, scientists in Antarctica released data showing that the ozone layer above the South Pole had thinned by 50 to 98%

After the data was released, NASA scientists reviewed data collected by the Nimbus 7 weather satellite ranging back to 1978 when the satellite was first launched. They were able to see the first signs of ozone thinning over Antarctica from data collected in 1979.



The Ozone Hole

Chlorofluorocarbons (CFCs) were found to be the cause of this ozone depletion.



For many years, CFC's were thought to be miracle chemicals



Used in:

coolants for refrigerators and air conditioners

cleaning solvents.

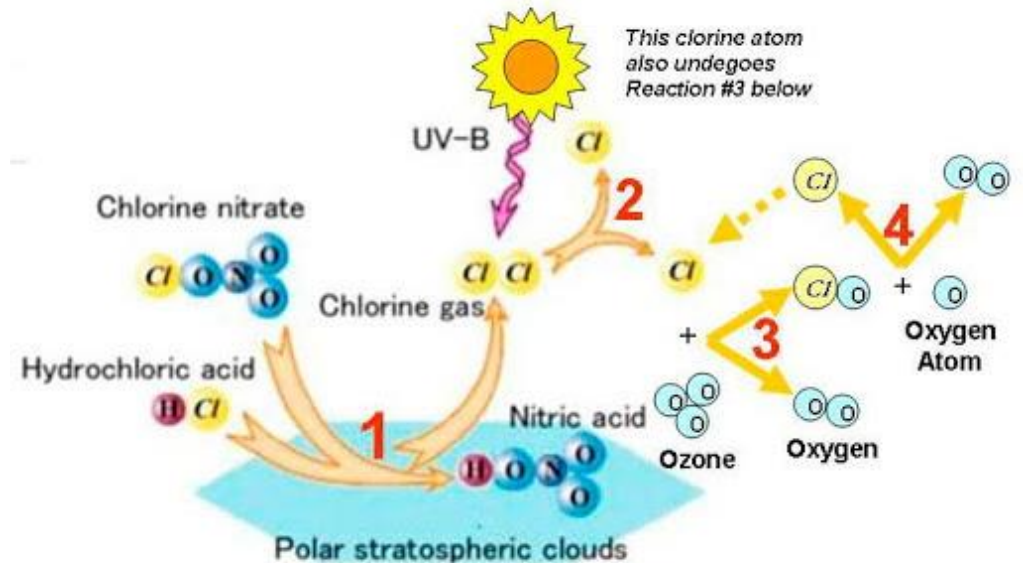
propellant in spray cans of everyday products

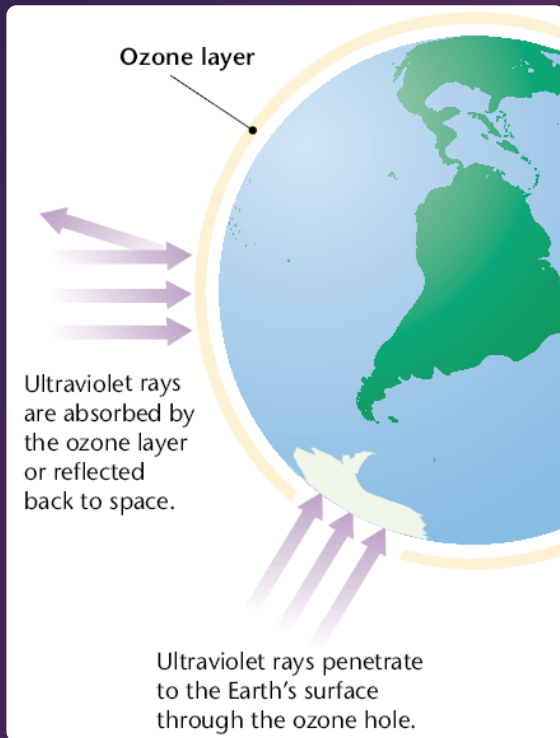
deodorants, insecticides, and paint.

Chemicals That Cause Ozone Depletion

How Does the Ozone Hole Form

- ▶ During the dark polar winter, strong circulating winds over Antarctica (polar vortex) isolate cold air from surrounding warmer air. The air within the vortex grows extremely cold, forming polar stratospheric clouds.
- ▶ On the surfaces of polar stratospheric clouds, the products of CFC's are converted to Cl_2 . When sunlight returns to the South Pole in the spring, Cl_2 is split into 2 Cl by UV radiation. The Cl atoms rapidly break down ozone, which causes a thin spot that lasts for several months.





Damaging Effects of UV Light	
Humans	<ul style="list-style-type: none"> • increased incidence of skin cancer • premature aging of the skin • increased incidence of cataracts • weakened immune response
Amphibians	<ul style="list-style-type: none"> • death of eggs • genetic mutations among survivors • reduction of populations
Marine Life	<ul style="list-style-type: none"> • death of phytoplankton in surface water • disruption of food chain • reduction in the number of photosynthesizers
Land Plants	<ul style="list-style-type: none"> • interference with photosynthesis • reduced crop yields

Effects of Ozone Thinning

Protecting the Ozone Layer



- ▶ In 1987, a group of nations met in Canada and agreed to take action against ozone depletion.
- ▶ Under an agreement called the Montreal Protocol, these nations agreed to phase out all ozone depleting substances like CFC's
- ▶ Today, the Montreal Protocol has been ratified by the majority of the world's countries.
- ▶ New data from 2018 suggests that the ozone hole is now beginning to close due to a decrease of CFC's found in the atmosphere.