

Major Issues of Air Pollution:

1. Ozone Layer Depletion
2. Climate Change-Global Warming

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1. Ozone Layer Depletion

1-1 Ozone

The ozone layer sits in the **stratosphere** between 15 km and 30 km above the Earth. This layer protects the Earth's surface from excessive **ultraviolet (UV) radiation** from the Sun.

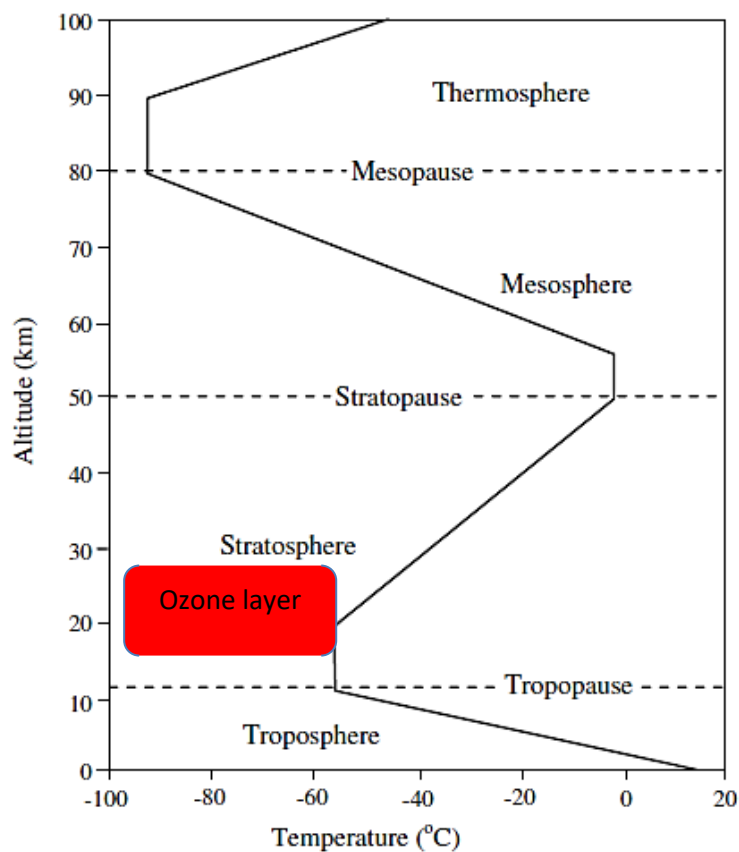


Figure 1. Position of the Ozone layer in the atmosphere.

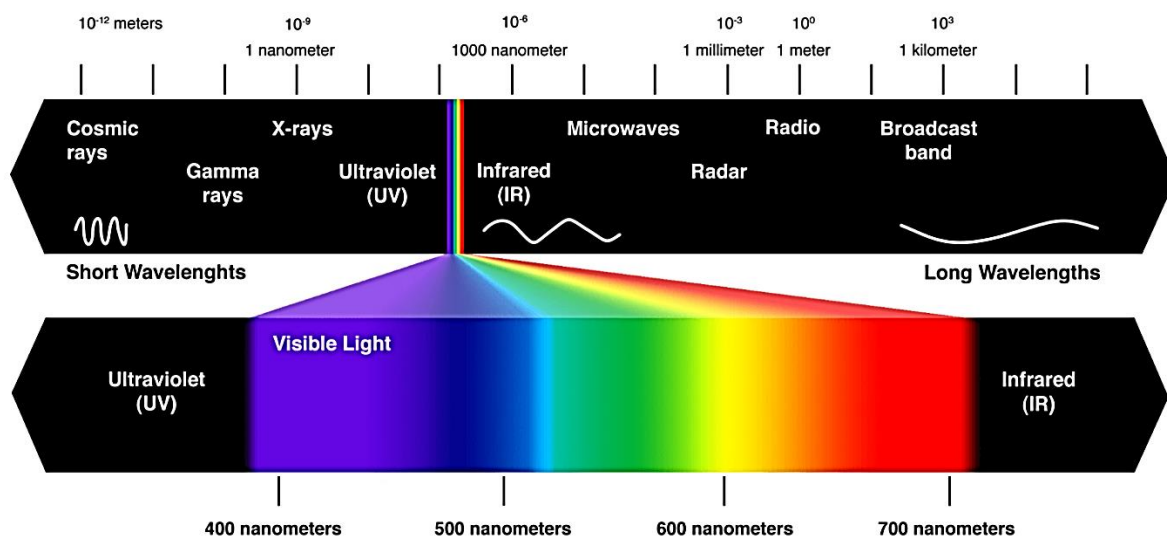
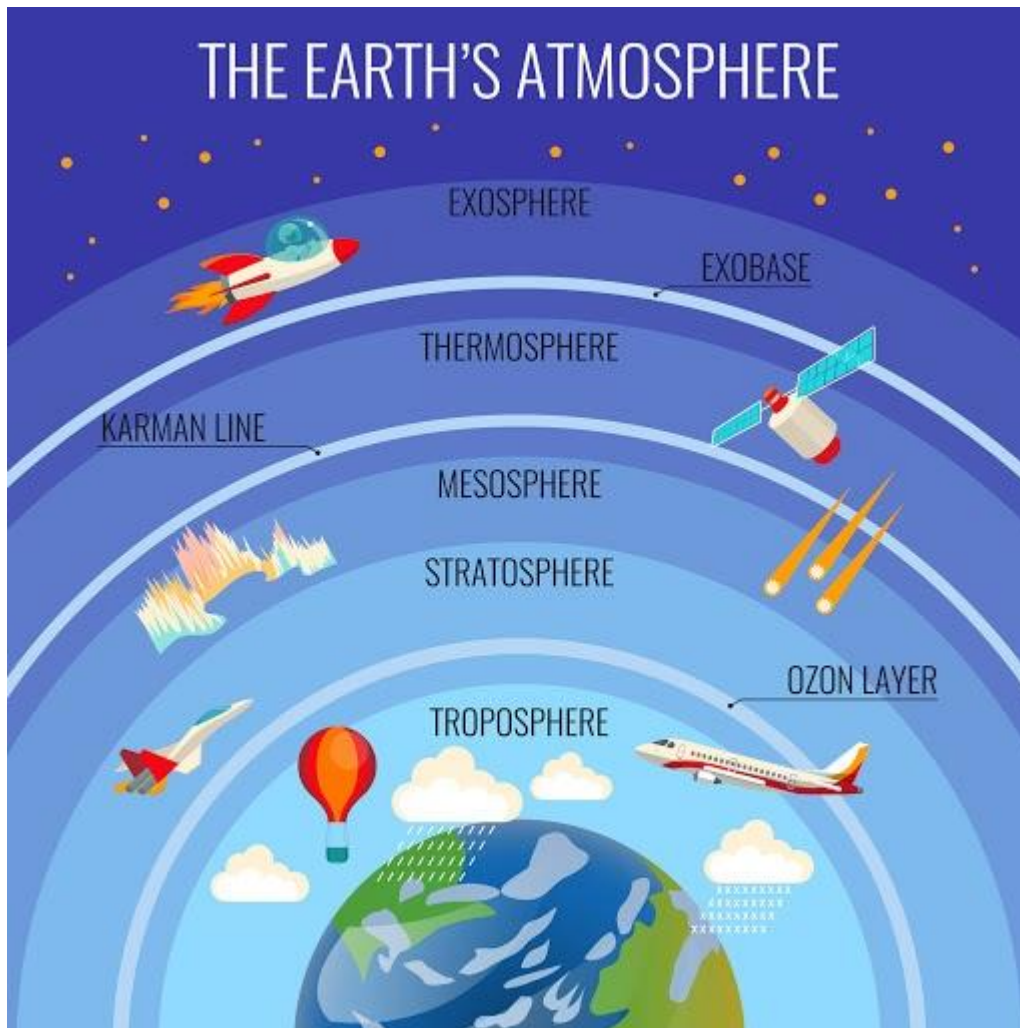


Figure 2. The spectrum of the Sun's solar radiation.

The UV 100-400 nm is divided into three bands:

1. UVA (315-400 nm)
2. UVB (280-315 nm)
3. UVC (100-280 nm)

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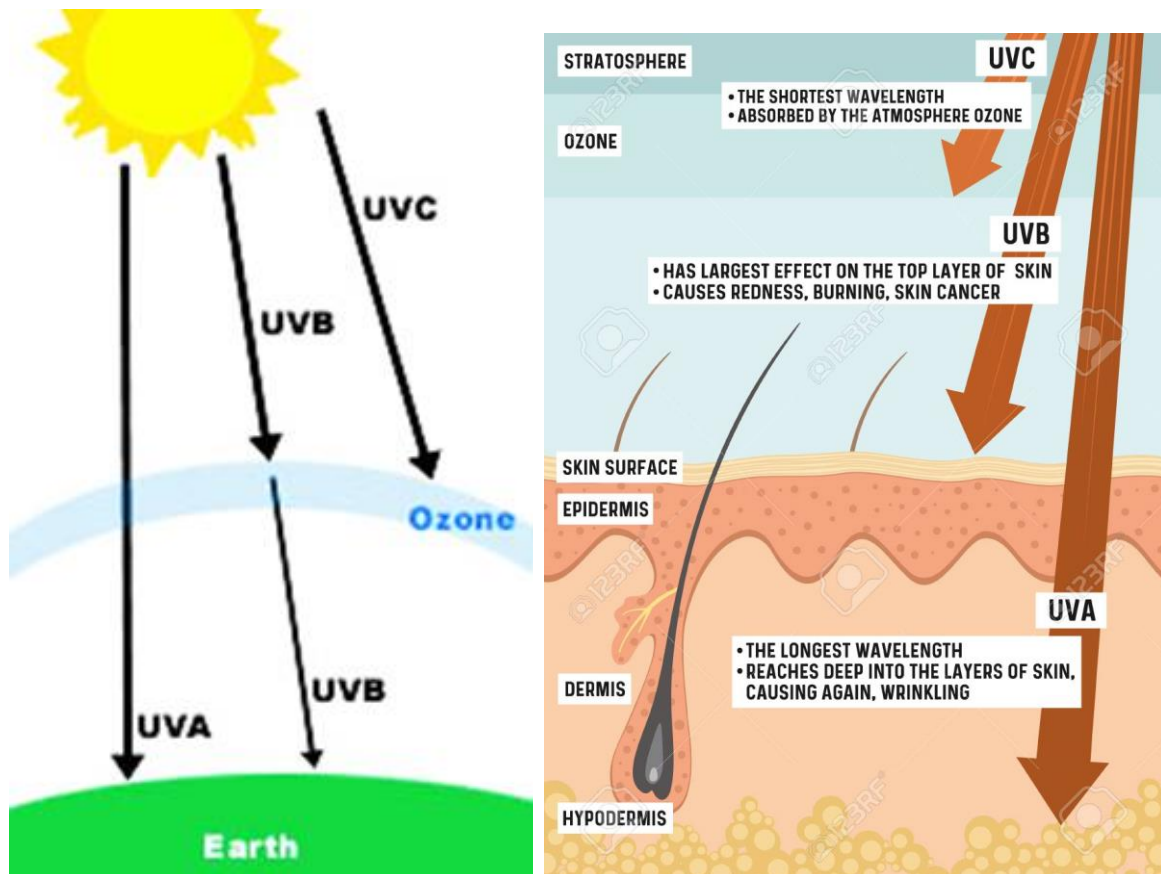


Figure 3. (A) UVC absorbed by the **stratosphere (Ozone)**. (B) The dermis absorbs UVA and UVB.

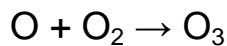
- UVA (longest wavelength): can penetrate the **middle** layer of the skin (**dermis**).
- UVB (shorter wavelength): can penetrate the outer layer of the skin (**epidermis**).
- UVC (shortest wavelength): blocked by the **stratospheric ozone layer**.

1-2 Ozone cycle

Creation of O₃: When UV-C light reaches the stratosphere, it is completely absorbed by oxygen molecules and never reaches the Earth's surface. UV-C splits oxygen molecules into oxygen atoms:



These single atoms (O) then react with other oxygen molecules (O₂) to produce ozone molecule (O₃):



Splitting of O₃: Gas such as chlorine or O, or O₃ react with O₃ cause Ozone loss.

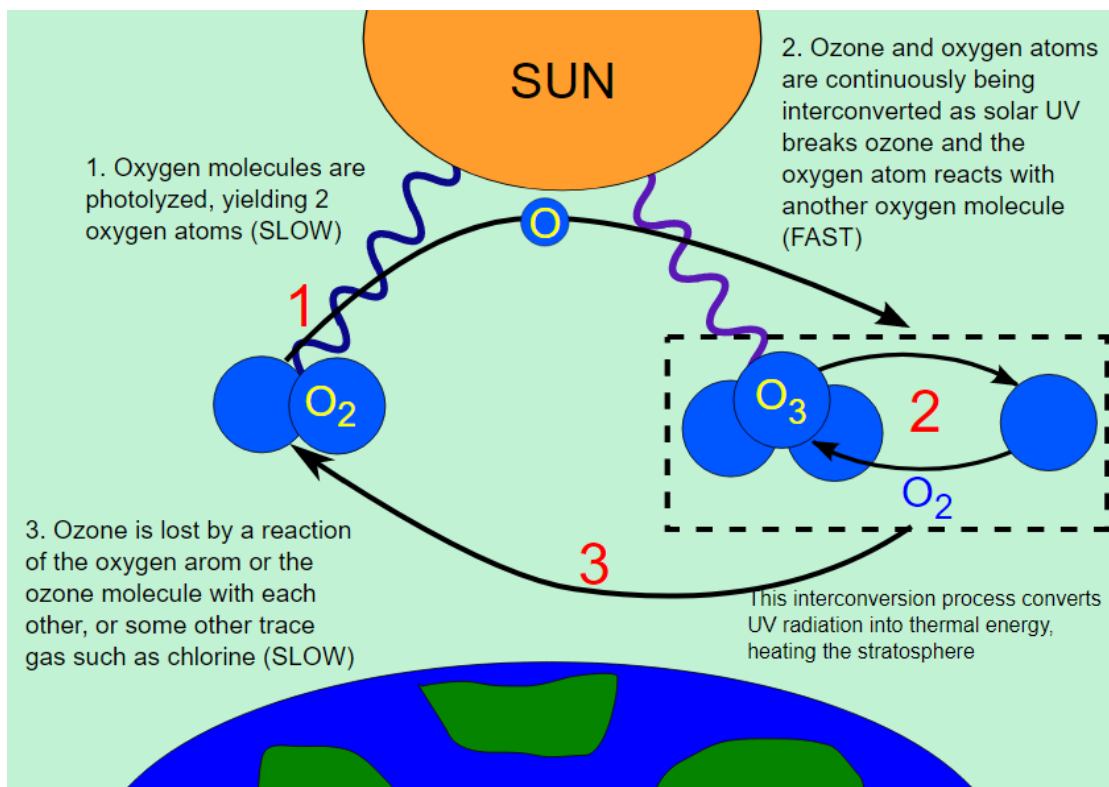


Figure 4. Ozone cycle.

1-3 Ozone Layer Depletion

Depletion of atmospheric Ozone probably results from chlorine-releasing pollutants such as CFCs (chlorofluorocarbons): refrigeration, air conditioning, fire extinguishers, cleaning solvents, aerosols (spray cans of perfumes, medicine, insecticide).

How free chlorine in the atmosphere destroys ozone

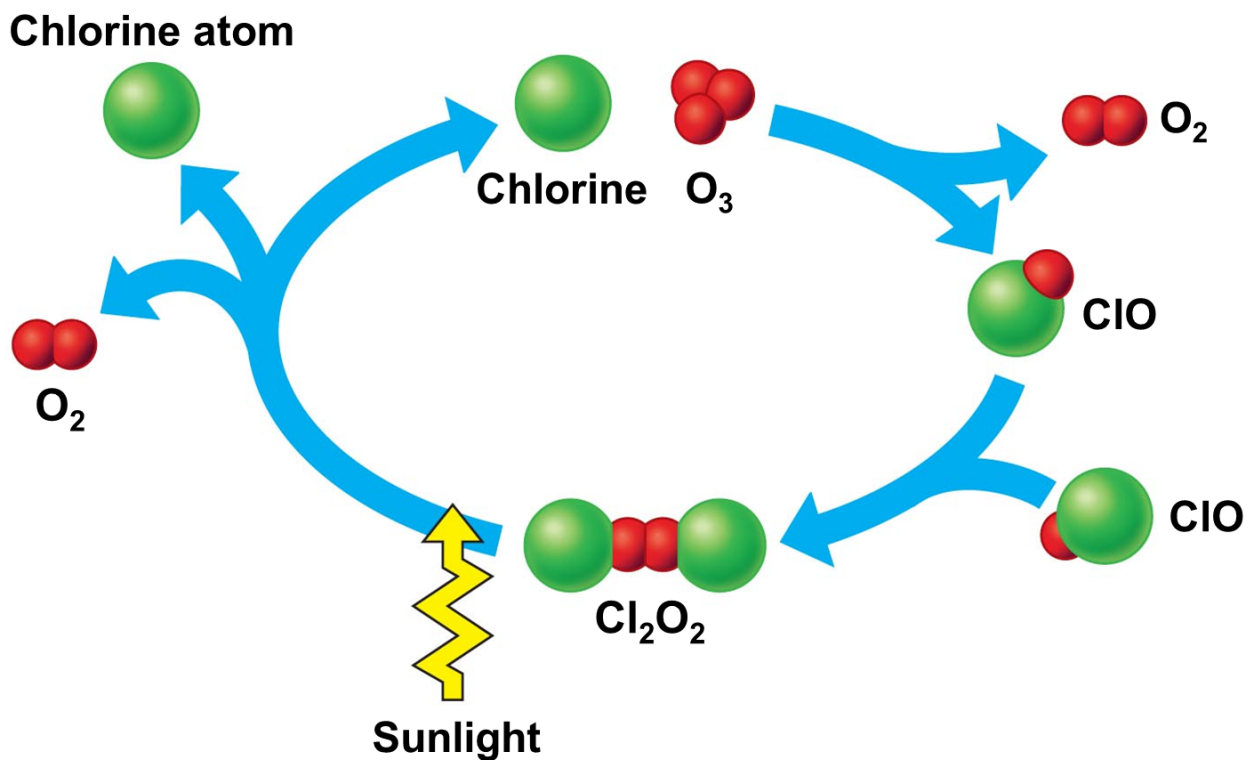


Figure 5. Diagram of Ozone layer depletion by chlorine.

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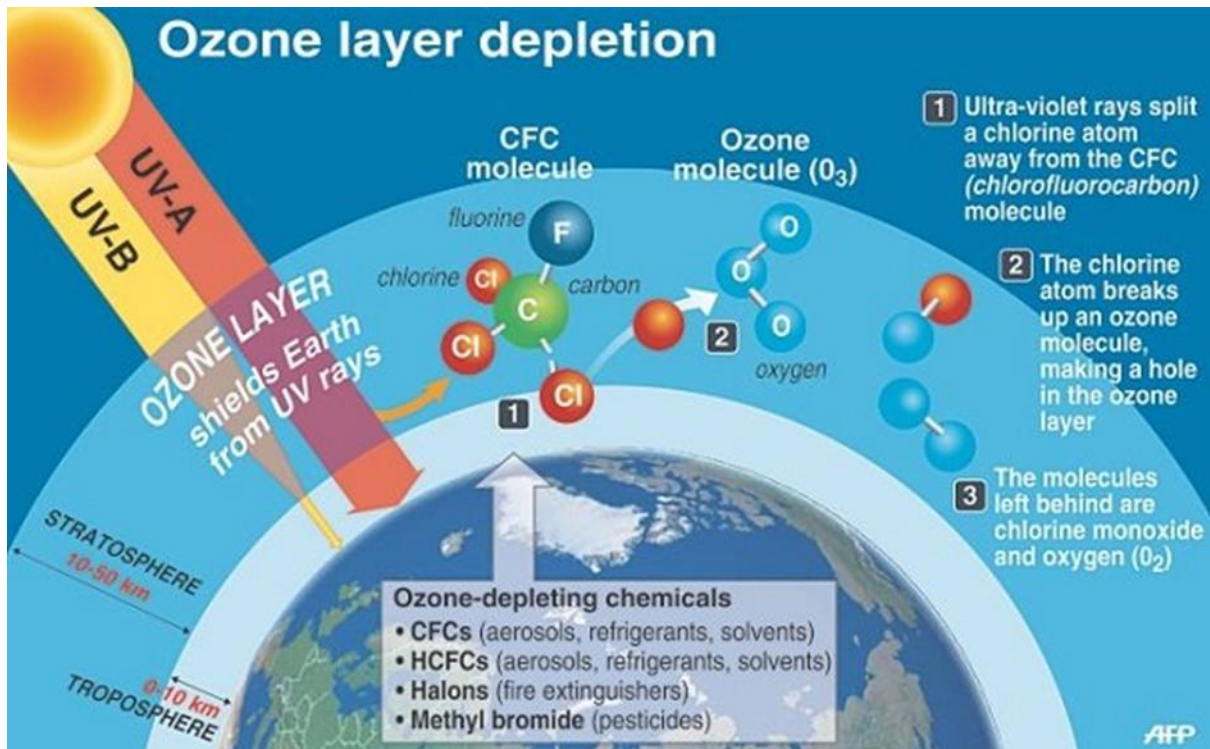


Figure 6. Ozone layer depletion by CFC.

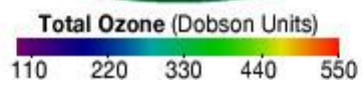
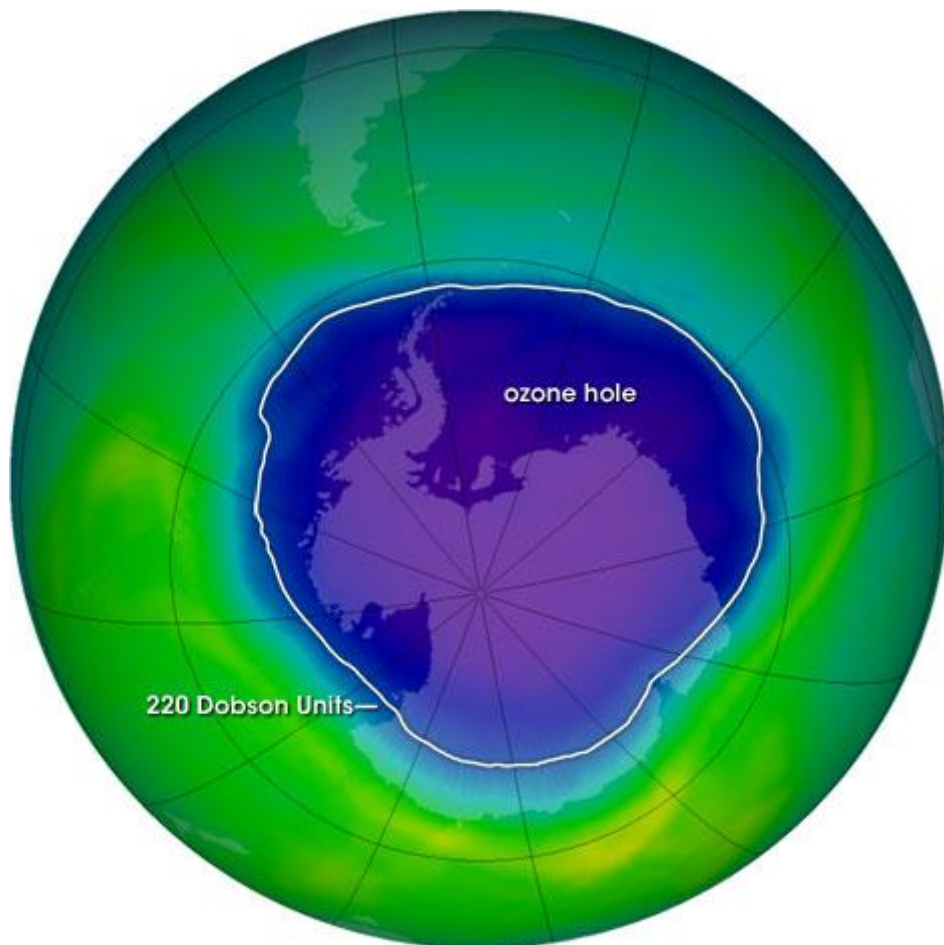
When was the ozone hole discovered?

Researchers at the British Antarctic Survey discovered the ozone hole in 1985. NASA's satellite estimates of total column ozone from the Total Ozone Mapping Spectrometer confirmed the 1985 event, revealing the ozone hole's continental scale.

Where is the ozone hole stated?

In the atmospheric ozone layer over the Antarctic. South Pole

Antarctica



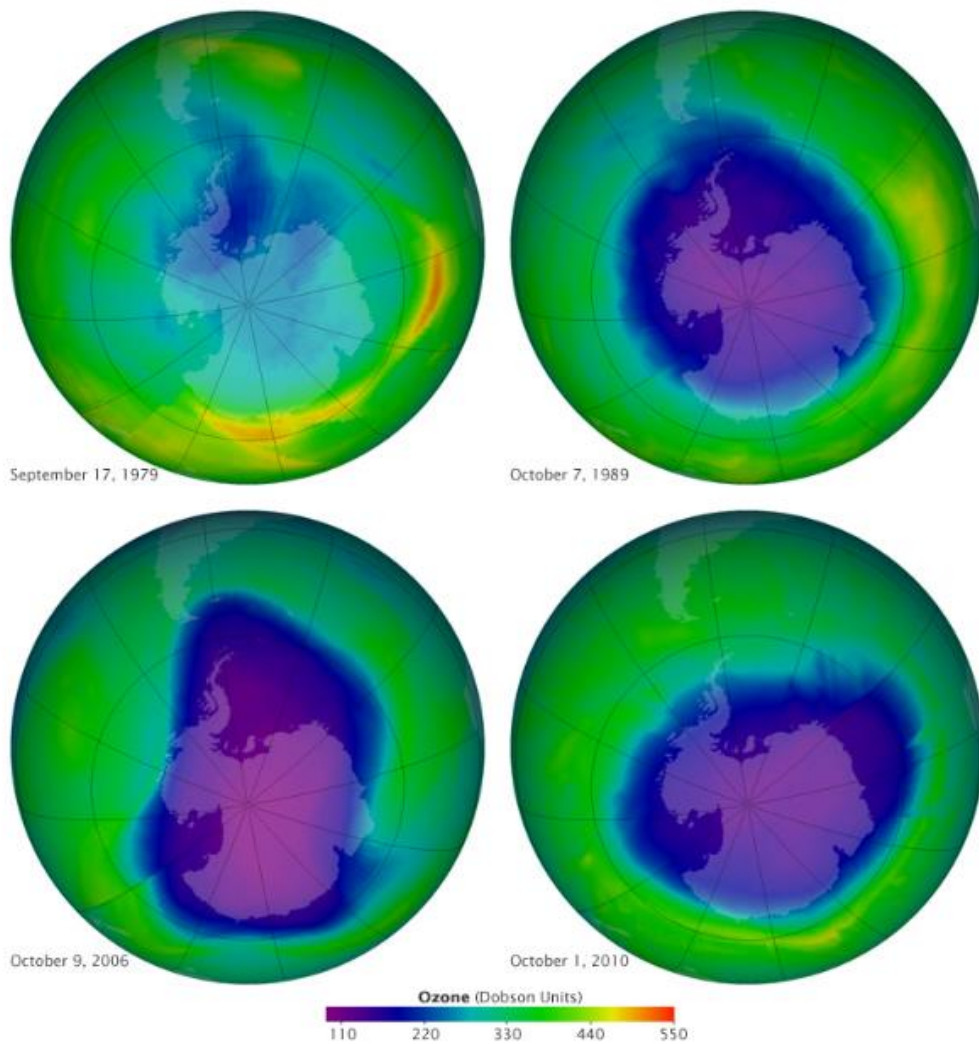


Figure 7. Ozone Hole through the years.

The color view of total Ozone over the Antarctic pole. The purple and blue colors are where there is the **least** Ozone, and the **yellows** and **reds** are **more** Ozone.

<https://svs.gsfc.nasa.gov/11644>

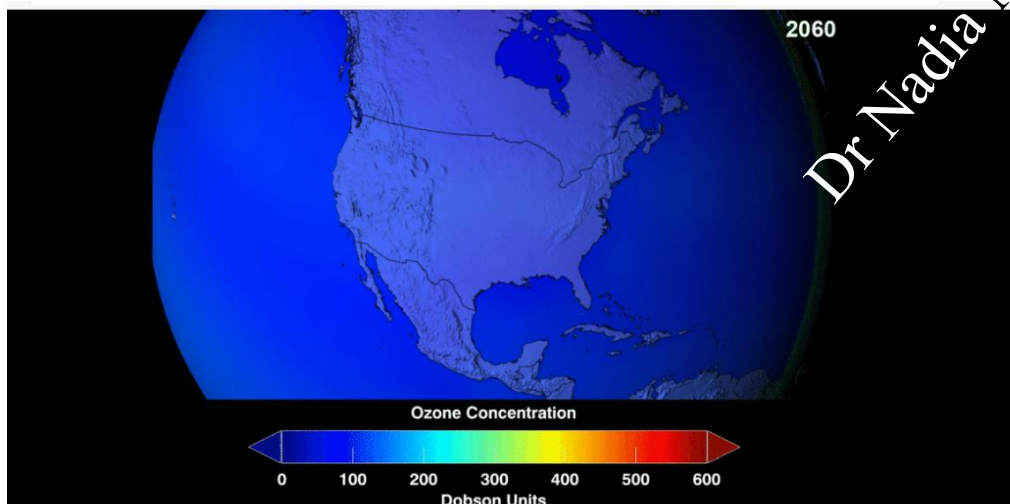
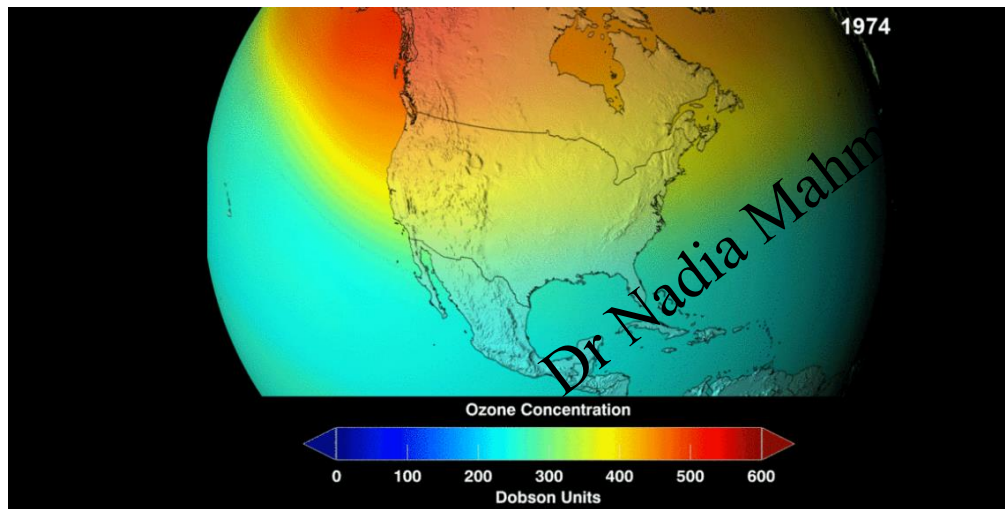


Figure 8. What is the differences in Ozone concentration between two years.

https://en.wikipedia.org/wiki/Ozone_layer#/media/File:Future_ozone_layer_concentrations.gif