OZONE LAYER DEPLETION

What is Ozone?

- Ozone is a bluish gas that is formed by 3 atoms of oxygen.
- When found in the troposphere, it is a dangerous secondary pollutant.
- The highest regions of the stratosphere contains about 90% of all ozone.

Ozone Layer

- The ozone layer found in the stratosphere protects the Earth from the UV rays sent down by the sun.
- It absorbs the sun's rays in the stratosphere and thus they do not reach the earth.
- The ozone layer protects both plant and animal life on the planet from the intense heat of the sun.

Ozone Layer Depletion

- **Ozone depletion** refers to the slow, steady decline in the total volume of ozone in the Earth's stratosphere.
- The area in the stratosphere with the thinning ozone is called the OZONE HOLE.
- Ozone layer depletion was first discovered in the 1980s.

How is Ozone formed?

- Dissociation of oxygen in the presence of light to give nascent oxygen.

$$O_2 \rightarrow O + O$$

$$O_2 + O \rightarrow O_3$$

$$O_3 + O \rightarrow 2O_2$$

Thus the overall amount of ozone is balanced in the atmosphere.

What causes Ozone Depletion?

- Production and emission of CFCs is the major cause.
- Chemicals found in spray aerosols used by many industries is another major cause.
- These aerosols contain the oxides of sulphur, nitrogen, etc and CFCs.

How does ozone get depleted?

- Ozone can be destroyed by free radicals like $OH^{\cdot}$,$NO^{\cdot}$, atomic Cl, atomic Br, etc.

  $O_3 + NO \rightarrow NO_2 + O_2$

  $O_3 + Cl \rightarrow O_2 + ClO$

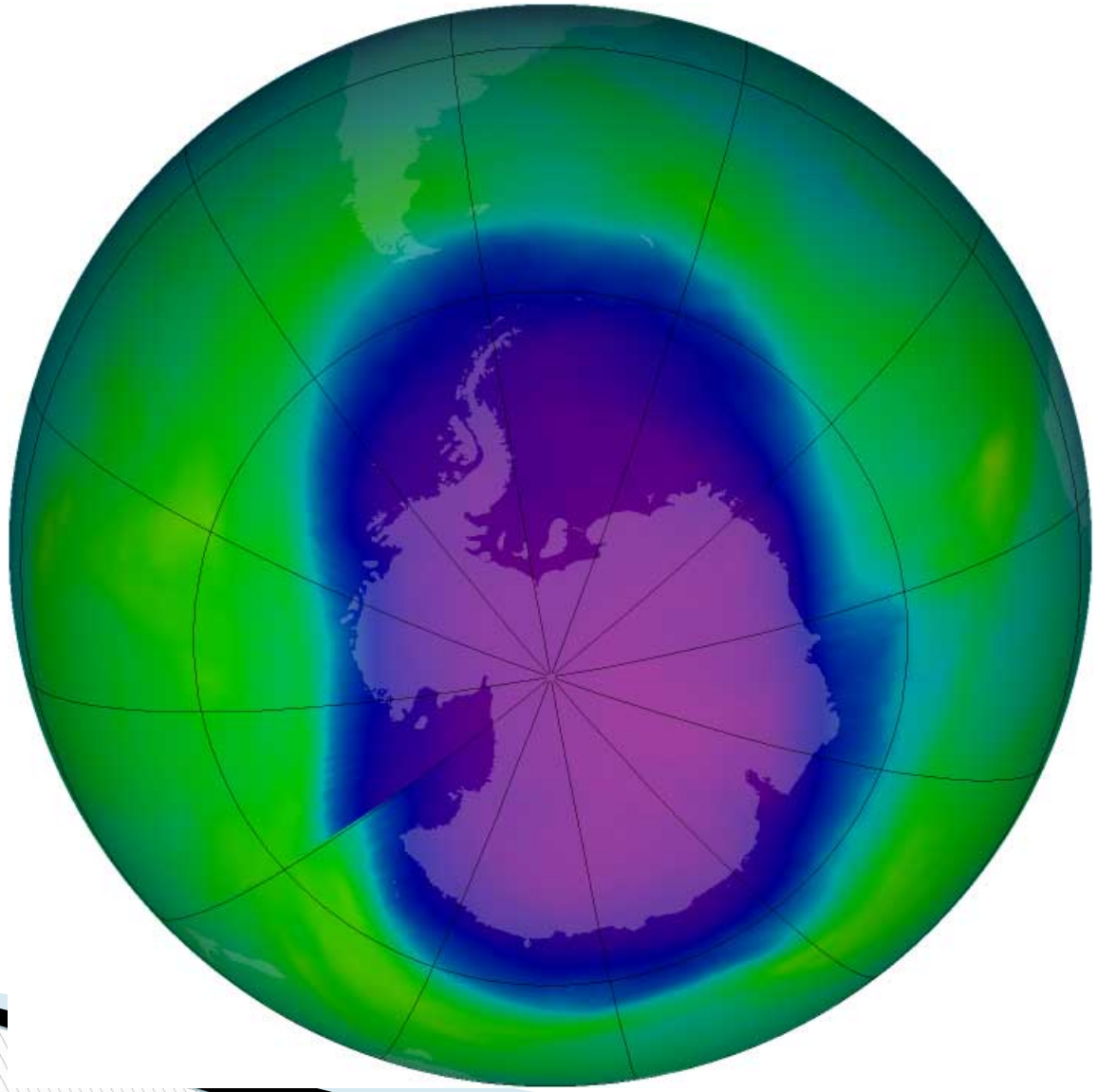
  $O_3 + ClO \rightarrow Cl + 2O_2$

- The overall effect is a decrease in the amount of ozone.
- Both chlorine and bromine contribute significantly to the destruction of ozone.

Chlorofluoro carbons

- CFCs are used in air conditioning or cooling units, etc
- They do not occur naturally and their presence in the atmosphere is entirely due to human manufacture.
- When they reach the stratosphere, they dissociate to give chlorine atoms.
- These act as catalysts and can destroy thousands of ozone molecules before being removed from the atmosphere.

Ozone hole over Antarctica



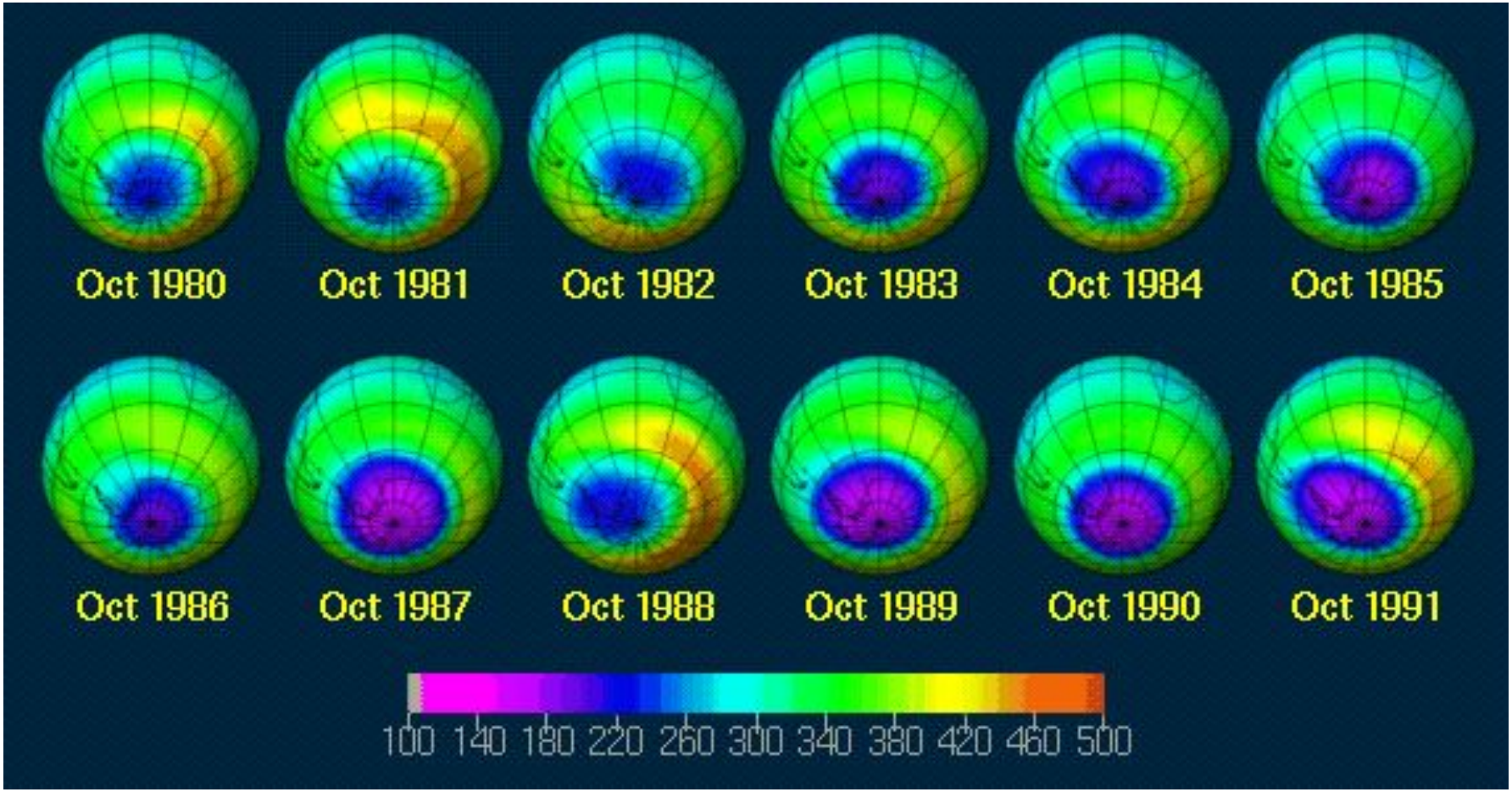
Effects of Ozone Depletion

- Ozone depletion causes more UV light to reach the earth.
- This causes skin cancer
- Genetic abnormalities
- Eye irritations and cataract problems
- Mutation
- Other infectious diseases

Environmental Effects

- Increase in temperature
- More exposure to solar radiation
- Formation of photochemical smog
- Affects the food chain
- Decreases crop yield

Depletion of ozone over the years



Solutions

- Limit the use of CFCs
- In the Montreal Protocol, 31 countries agreed to reduce usage of CFCs.
- Use of alternate chemicals for cooling and air-conditioning units
- Grow plants to increase amount of oxygen
- Use products labeled “Ozone friendly”