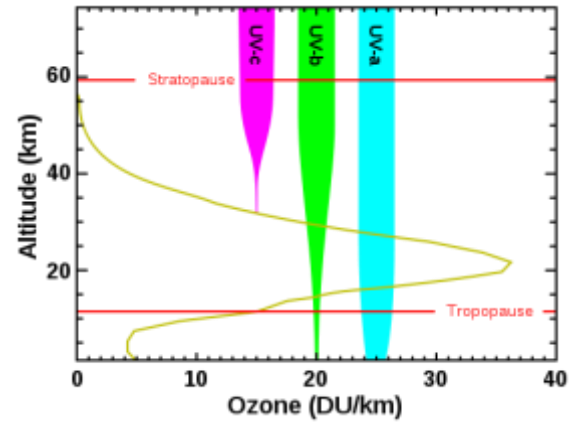
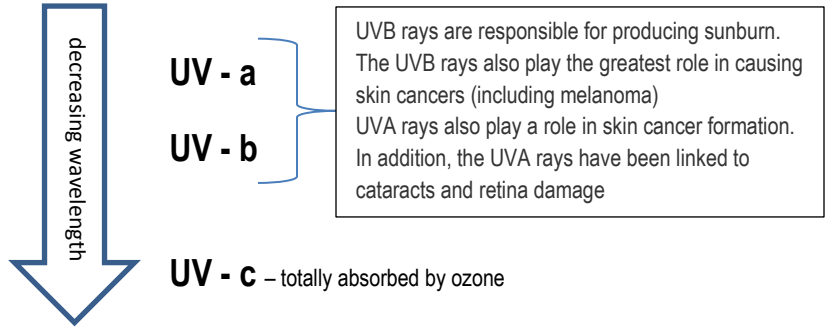





Aim: How has air pollution contributed to stratospheric ozone depletion?

Stratospheric ozone gas absorbs the harmful ultraviolet rays of the Sun



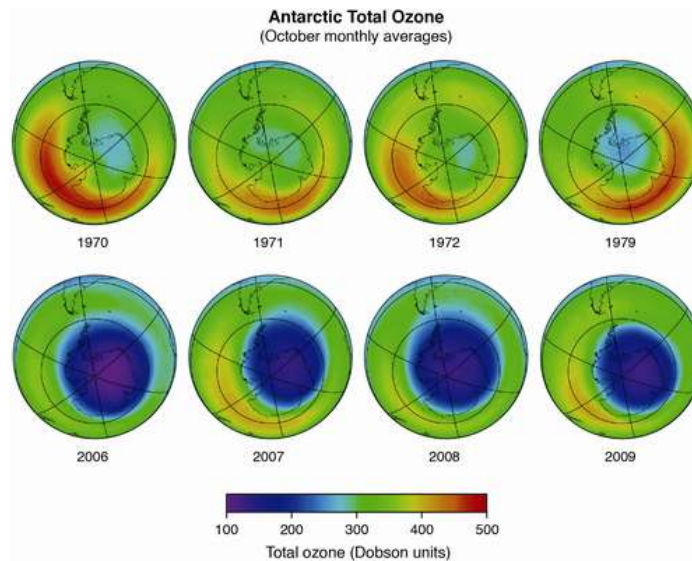
Ozone Depleting Compounds (ODCs)

ODC	Associated Information
halons	used in fire extinguishers 
methyl bromide	broad spectrum pesticide used in fumigants to control a wide variety of pests in agriculture and shipping, including fungi, weeds, insects, nematodes, and rodents (phased out in 2005, but still some exemptions allow use) 
<p>chlorofluorocarbons</p> <p>CFC-11 and CFC-12</p> <p>example chemical formulas: CCl₂F₂ and C₂Cl₃F₃</p> <p>long atmospheric residence times (persistent) (average of 100 years)</p>	 <p><u>Prior Uses:</u></p> <ul style="list-style-type: none"> - <u>air conditioning</u> - <u>refrigerants</u> - <u>polystyrene products</u> → brand name: Styrofoam - <u>aerosol-spray propellants</u> - <u>insulation foam</u> <p><u>Chemical Reaction with Ozone:</u></p> <p>Stage 1: Chlorine atoms freed by UV radiation</p> <p>Stage 2: Cl destroys ozone by pulling an O atom from O₃</p>

Location of Ozone Thinning

1. Antarctic Ozone Thinning - The Polar Vortex and Polar Stratospheric Clouds

During the Antarctic winter (June-September – no sunlight) PSCs form in the stratosphere which assist in the release of the Cl_2 molecules from CFCs that eventually contribute to ozone destruction. When the Sun rises at the end of September, the energy of the returning rays of the Sun break the Cl_2 molecules and the free Cl atoms have a catalytic effect on the breakdown of O_3 causing October (Antarctic spring) to usually have the largest “hole”.



2. Australia – world’s highest rate of skin cancer
– after the Polar Vortex breaks up, ozone-depleted air migrates northward

Effects of Ozone Depletion

1. human health - skin cancer (carcinoma, melanoma)
 - eye damage (cataracts – lens clouding)
 - immune system damage
2. decreased crop yield
3. kills surface phytoplankton (base of marine food web) → affects other marine life at higher trophic levels
4. degradation of materials (plastics, rubber, and wood)

Protection of the Ozone Layer

1. **THE MONTREAL PROTOCOL (1987)** – an international treaty designed to protect the ozone layer by phasing out the production of numerous substances that are responsible for ozone depletion
(U.S. stopped using CFCs in 1995)
2. CFC substitute development
HFCs – Hydrofluorocarbons – less damaging to ozone than CFCs, but have been found to contribute to global warming