2.6. Where is the ozone layer? How and why is it changing? What can we do about it?

The ozone layer is not really a layer at all, but has become known as such because most ozone particles are scattered between 19 and 30 kilometers (12 to 30 miles) up in the Earth's atmosphere, in a region called the stratosphere. The concentration of ozone in the ozone layer is usually under 10 parts ozone per million. Without the ozone layer, ultraviolet (UV) radiation from the Sun would not be stopped from reaching the Earth's surface, causing untold damage to most living species. In the 1970s, scientists discovered that chlorofluorocarbons (CFCs) could destroy ozone in the stratosphere.

Ozone is created in the stratosphere when UV radiation from the Sun strikes molecules of oxygen (O_2) and causes the two oxygen atoms to split apart. If a freed atom bumps into another O **2**, it joins up, forming ozone (O_3). This process is known as photolysis. Ozone is also naturally broken down in the stratosphere by sunlight and by a chemical reaction with various compounds containing nitrogen, hydrogen and chlorine. These chemicals all occur naturally in the atmosphere in very small amounts.

In an unpolluted atmosphere there is a balance between the amount of ozone being produced and the amount of ozone being destroyed. As a result, the total concentration of ozone in the stratosphere remains relatively constant. The amount of ozone within the stratosphere varies according to altitude. Ozone concentrations are highest between 19 and 23 km.

Most of the ozone in the stratosphere is formed over the equator where the level of sunshine striking the Earth is greatest. It is transported by winds towards higher latitudes. Consequently, the amount of stratospheric ozone above a location on the Earth varies naturally with latitude, season, and from day-to-day. Under normal circumstances highest ozone values are found over the Canadian Arctic and Siberia, whilst the lowest values are found around the equator. The ozone layer over Canada is normally thicker in winter and early spring, varying naturally by about 25% between January and July. Weather conditions can also cause considerable daily variations.

Where is the ozone hole? What can we do to stop the the destruction of the ozone layer?

Loss of ozone high up in the atmosphere occurs when there is more ozone being destroyed by CFCs than there is being created naturally. Scientists believed that ozone levels were quite stable until the late 1970s. Since then, a general decline in ozone levels has been seen. However, every year during September and October (the Southern Hemisphere spring), ozone loss is much greater over Antarctica, where an ozone “hole” forms. The hole forms because the air above Antarctica is cut off from the rest of the world by a natural circulation of wind called the Polar Vortex. This prevents mixing in the atmosphere and so any ozone depletion is concentrated here. In addition, the very cold temperatures in the air high above Antarctica speed up the destruction of ozone. In summer (December and January), the ozone hole repairs itself, but forms again the following spring.

Recently, an ozone hole has been seen forming above the Arctic during the Northern Hemisphere springtime. Fortunately, this ozone hole is not as big as the one that forms over Antarctica, but more people live in the Northern Hemisphere who could be affected by it.

Following the Montreal Protocol most ozone depleting chemicals (ODCs) have or are being phased out of use in most target applications such as aerosols, refrigeration and air conditioning. However, consumer products bought prior to international agreements may still be in use in our homes and offices and cannot easily be replaced. Large appliances, such as refrigerators, have long lifetimes and early replacement would entail great cost. Proper care and maintenance of equipment to ensure that the CFCs they contain are never released to the atmosphere should be applied. Remember that a single CFC molecule can destroy 100,000 ozone molecules.

In addition, if purchasing fire extinguishers try to avoid any that contain halons, which have bromine in them. Purchase carbon dioxide, water, or dry chemical extinguishers instead. Finally, although foam packaging is CFC-free, some products contain HCFCs (hydrochlorofluorcarbons), which while far less damaging to the ozone layer, could contribute substantially to global warming. Avoid those that do. Use and re-use non-disposable packaging.