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Commentary

Effects of Ultraviolet Rays and Ozone Depletion

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DESCRIPTION

The word ozone meaning is derived from ground level, which emits a pungent, acid odour. This definition reflects the ozone problem in the lower atmosphere. However, ozone can be found in the stratosphere. The stratosphere is a region that exists between ten and fifty kilometres above the Earth's surface, above the planetary boundary layer.' The middle portion of the Ultra Violet (UV) spectrum is absorbed by this layer. Ozone absorbs all UV radiation with wavelengths shorter than 290 nanometers (UV-C), the majority of it between 290 and 320 nanometers (UV-B), and very little above 320 nanometers (UV-A). While UV-A is relatively harmless, UV-C is lethal, and UV-B is harmful to many living things. Because oxygen and other gases absorb wavelengths only below 200 nanometers, ozone is our only line of defense against the middle ultraviolet. The maximum ozone concentration is only a few parts per million and occurs between twenty and thirty kilometres above the Earth. Because the air at that altitude is only about 5% as dense as it is at ground level, the ozone concentrations are better described as a veil rather than a layer. Dobson units (DUs) are used to measure ozone levels. The DU is a convenient way to express the total thickness of the ozone layer if measured at sea level. At standard temperature and pressure, one DU equals one-thousandth of a centimetre. A hundred DUs is equivalent to one millimetre of ozone at the temperature and pressure found in the Earth's atmosphere. Three hundred DUs (the global average) represent the abundance of molecules that would form a 3 mm thick layer at sea level, with the weight of the atmosphere compressing it and the normal amount of ozone is around 400 DUs in summer and 300 DUs in late summer. Winter and early spring this distinction reflects seasonal changes in the ozone layer. These differences were discovered in 1968.

Hydrogen oxides

Depletion of the Ozone Layer Sydney Chapman, an English scientist, attempted to explain how ozone was formed and destroyed in the atmosphere in 1930. According to the 'Chapman mechanism,' ordinary oxygen molecules absorb short-wavelength ultraviolet light. Oxygen molecules account for 21% of all atmospheric molecules by volume, while nitrogen accounts for 78%. Chapman proposed that sunlight splits oxygen molecules into two oxygen atoms the oxygen atoms would then join with other oxygen molecules to form ozone Chapman also proposed that oxygen atoms could split oxygen molecules by colliding with them, resulting in two oxygen molecules. As a result, the rate of ozone production equals the rate of ozone destruction at any given time the constant conditions, ozone settles into a dynamic steady state in which the rate of formation equals the rate of removal. The ability of small amounts of chlorine or bromine to destroy ozone in quantity is the chemical phenomenon at the heart of the ODS theory. By hastening the conversion of ozone into two oxygen molecules, chlorine shifts the balance and reduces the amount of ozone in the stratosphere. More importantly, because it is unchanged in the process, chlorine (like nitrogen and hydrogen oxides) acts as a catalytic agent. As a result, each chlorine atom has the potential to destroy thousands of ozone molecules. UV light has greater access as ozone DUs decrease. By the late 1980s, more than five times the amount of UV-B light (from before the ozone layer was depleted) was penetrating the Earth in certain places at certain times. 'It is a 4% increase in Northern Hemisphere mid-latitudes in summer/autumn and a 7% increase in winter/spring compared to (sub-burning) UV radiation hitting the Earth in the mid-1970s. It is 22% higher in the Arctic. There is a 6% increase in the Southern Hemisphere over the entire year (and up to 12% in some regions, such as New Zealand8 or at the bottom of South America) 9 and a 13% increase in the Antarctic in the Spring.

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