
POSSIBLE EFFECTS AND INTER-RELATIONSHIP BETWEEN CHANGES OF ATMOSPHERIC OZONE CONCENTRATION AND GLOBAL WARMING

WL Sumathipala and KIA Kularatne
Montreal Protocol Unit, Environment Division,
Ministry of Environment and Natural Resources, Battaramulla

Halogenated organic compounds such as Chlorofluorocarbons (CFCs), Hydro fluorocarbons (HCFCs) and Halons are basically used as refrigerants, aerosol propellants, solvents, for fire fighting and as foam blowing agents. These gases are considered as the primary cause for depletion of stratospheric ozone layer. Carbondioxide, Methane, Nitrous oxide, CFCs, HCFCs, Halons and Hydrofluorocarbons (HFCs) are categorized as greenhouse gases and are leading to a global warming due to their heat trapping ability. According to recent researches, scientists have proven that there are both positive and negative impacts on global warming arising due to the ozone layer depletion.

Carbondioxide is the major contributor for achieving the global radiative equilibrium, which keeps the earth temperature above its black body temperature. In the stratosphere, ozone absorbs energy from solar radiation and cools via the infrared emission. Thin ozone layer will let more ultraviolet to troposphere where ozone concentration will increase. Hence the increase in concentration of ozone will lead to a cooling of the troposphere by emitting infrared radiation. This cooling will lead to two opposing effects. Lower temperature will slow down the reaction rates of the ozone destroying catalytic cycles in gas phase chemistry. On the other hand, lower temperature causes the increase of probability to have more stratospheric clouds and increase the concentration of CFCs trapped in the clouds. During the springtime CFCs are released from these clouds and they will in turn enhance rapid depletion of ozone layer.

Oxidation of methane in lower stratosphere leads to formation of water vapour and increase the possibility of polar stratospheric clouds in middle latitudes. This will help to provide activate chlorine and bromine radicals and enhanced ozone depletion. CFCs and halons are both ozone depleting substances and greenhouse gases. Inadvertently, alternatives for ozone depleting substances such as HFCs are greenhouse gases and as such enhance the global warming effect.