EFCTC
EUROPEAN FLUOROCARBONS TECHNICAL COMMITTEE

cefic
sector group

LEARN ABOUT…

The ozone layer and ozone depletion

Created: April 2003
Updated: January 2016

Chlorine loading of the stratosphere

Chlorine loading gives a measure of the actual environmental impact of an Ozone Depleting Substance (ODS) that is impossible to obtain just using Ozone Depletion Potential (ODP).

Chlorine loading is the contribution of the compound to the real quantity of reactive halogen in the stratosphere. For an ODS that contains chlorine, it is the atmospheric concentration of that compound expressed as its chlorine content. For an ODS that contains bromine, the concentration is multiplied by a factor of 45 to take account of the higher potency of bromine for ozone depletion.

Unlike chlorine and bromine, fluorine is inert in the stratosphere and does not deplete ozone.

The peak in chlorine loading of the atmosphere has passed. The Montreal Protocol has effectively reduced emissions to near zero allowing normal atmospheric processes to remove ozone depleting substances from the atmosphere.

Chlorine loading evolution shows not only the current concentration and impact, but also exactly the way the impact will change with time as the compound is removed by atmospheric chemical processes. It is explicitly time-dependent. On the other hand, ODP is simply the potential potency of the Ozone Depleting Substance.

Chlorine loading is a far better guide to future impact on the ozone layer than "ODPtonnes" or "time dependent ODP" and, for this reason, has been used in every Scientific Assessment conducted for UNEP since 1991[1, 2, 3, 4, 5, 6, 7]

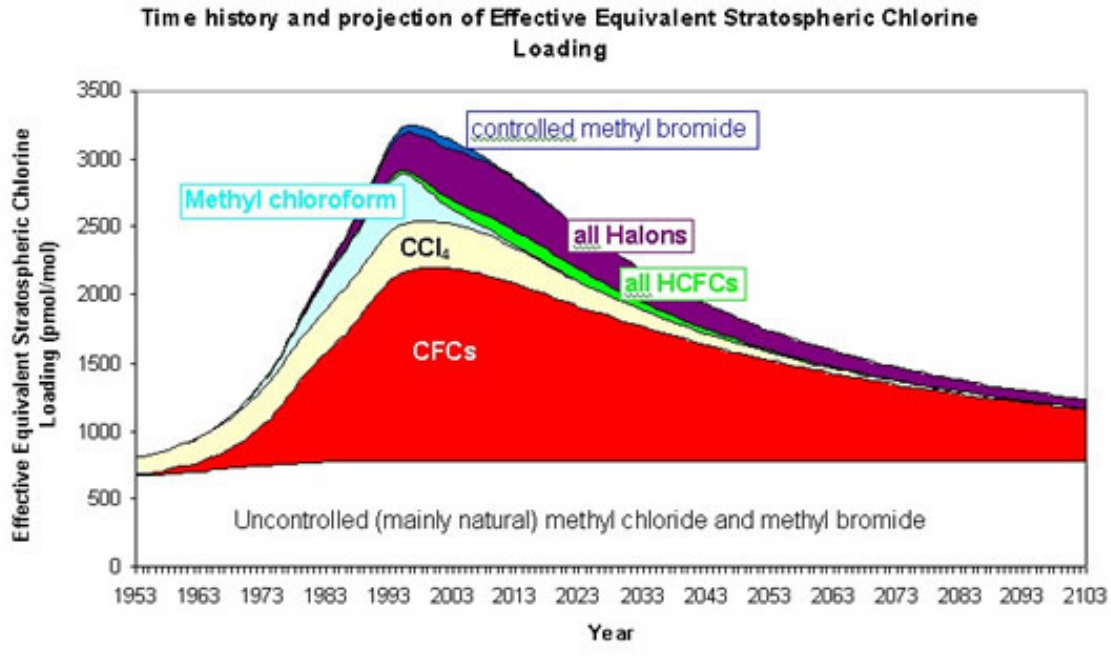
The impact on stratospheric ozone of a particular ODS can be gauged explicitly by incorporating the stratospheric effectiveness of chlorine, which is different for each ODS. The resulting parameter is the Equivalent Effective Stratospheric Chlorine contribution of the substance. This is directly related to ozone depletion and was used in the Scientific Assessments after 2002 to gauge the effectiveness of control measures[4, 5, 6, 7].

There is general agreement between the estimates of global production and emissions of ODS made by regulators, industry and scientists. These show that the Montreal Protocol is working and fit with the observed reduction in chlorine loading [7]

Contributions from HCFCs have increased in recent years but their effect on chlorine loading is relatively small because :

- HCFCs have a lower intrinsic effect in the stratosphere because they contain less chlorine and it is less effective in ozone depletion than the chlorine in CFCs;
- HCFCs decompose in the lower atmosphere so that, while CFCs are transported completely into the ozone layer, a smaller proportion of HCFCs reaches the ozone layer.

Historical and anticipated Stratospheric Chlorine Loadings from all ozone depleting substances over the period 1950 to 2100 (adjusted for transport time to the stratosphere) are illustrated in the accompanying picture (from reference 4, subsequent Assessments had similar overall loadings, without distinguishing individual contributions).



Sources:

1. Scientific Assessment of Ozone Depletion: 1991, World Meteorological Organization, Global Ozone Research and Monitoring Project Report No. 25, WMO, Geneva, 1991.

2. Scientific Assessment of Ozone Depletion: 1994, World Meteorological Organization, Global Ozone Research and Monitoring Project Report No. 37, WMO, Geneva, 1995.

3. Scientific Assessment of Ozone Depletion: 1998, World Meteorological Organization, Global Ozone Research and Monitoring Project Report No. 44, WMO, Geneva, 1999.

4. Scientific Assessment of Ozone Depletion: 2002, World Meteorological Organization, Global Ozone Research and Monitoring Project Report No. 47, WMO, Geneva, 2003
5. Scientific Assessment of Ozone Depletion: 2006, World Meteorological Organization, Global Ozone Research and Monitoring Project Report No. 50, WMO, Geneva, 2007
6. Scientific Assessment of Ozone Depletion: 2010, World Meteorological Organization, Global Ozone Research and Monitoring Project Report No. 52, WMO, Geneva, 2011
7. Scientific Assessment of Ozone Depletion: 2014, World Meteorological Organization, Global Ozone Research and Monitoring Project Report No. 55, WMO, Geneva, 2014