

Trends of Halocarbons and Implications for Total Chlorine

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Since the early to middle 1990s, the growth rates of all major chlorofluorocarbons (CFCs) have been declining, with the exception of CFC-12 (CCl_2F_2). These chlorine-containing compounds have a variety of uses that take advantage of their inertness and low toxicity. However, their inertness has allowed these gases to survive in the atmosphere for decades, thus allowing them to be transported into the stratosphere where they play a major role in ozone destruction.

Developed countries responded to the Montreal Protocol by reducing and ultimately eliminating production of CFCs and other halogenated gases and solvents. By 1994, total atmospheric chlorine peaked and is now decreasing. Early and rapid decreases in total chlorine were a result of the swift decline of methyl chloroform (CH_3CCl_3). However, in recent years methyl chloroform's decline has slowed to its present-day global growth rate of -4.7 parts per trillion (ppt) per year. The largest CFC contributor to total chlorine, CFC-12, and the only CFC that was still increasing in the 21st century, dropped below zero growth at the end of 2002 (Figure 1). It remains to be seen whether this negative growth will continue in 2003. As methyl chloroform's contribution to total chlorine diminishes, CFCs will be increasingly important to the steady decline of atmospheric chlorine.

The CMDL Halocarbons and other Atmospheric Trace Species (HATS) in situ programs have been monitoring the concentrations and growth rates of CFC-11 (CCl_3F), CFC-113 ($\text{CCl}_2\text{FCClF}_2$), CFC-12, CH_3CCl_3 , carbon tetrachloride (CCl_4), and sulfur hexafluoride (SF_6) since 1987. In particular, the Chromatograph for Atmospheric Trace Species (CATS) has been making continuous hourly air measurements at the NOAA baseline sites. An update on current trends of these gases is presented.

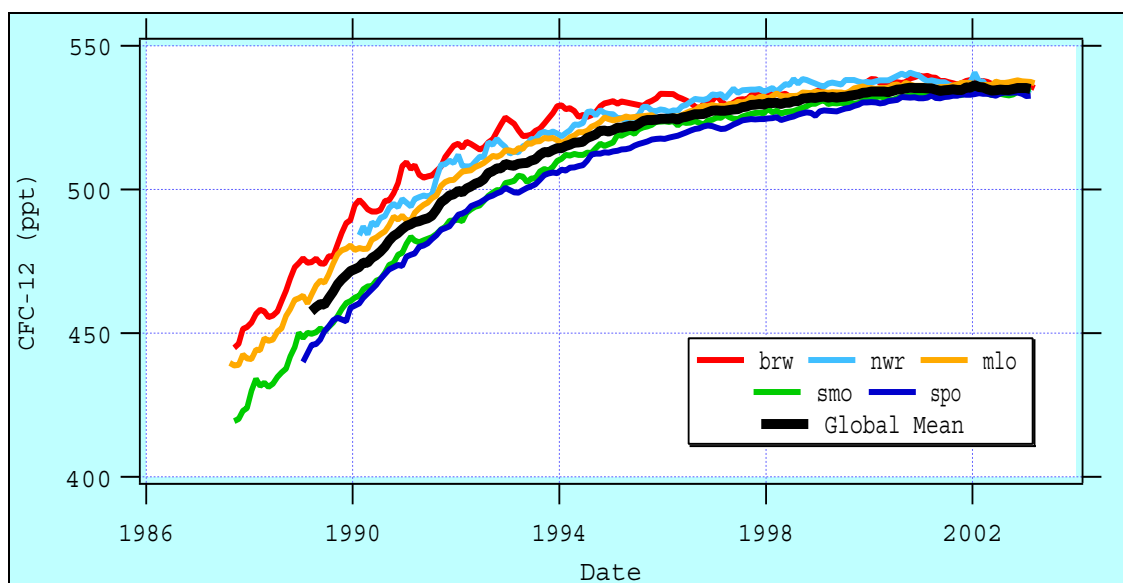


Figure 1. Measurements of CFC-12 since 1987 by the in situ program in the CMDL HATS group. With global mean atmospheric concentration of 535 ppt, CFC-12 is the largest single contributor to total chlorine.