

## Ozone Depleting Substances, Emissions and Trends Derived by Long-Term Continuous Measurements at a European Site

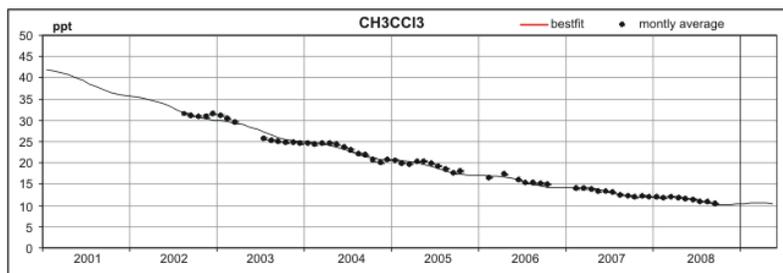
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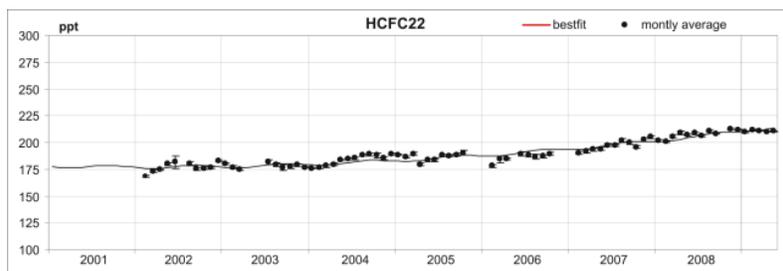
Chlorofluorocarbons, methyl chloroform, carbon tetrachloride, methyl bromide and halons are the principal ozone depleting substances. In response to the United Nations Environmental Programme Montreal Protocol on Substances That Deplete the Ozone Layer and subsequent amendments, production and consumption of these gases have been prohibited in developed (non-A5) countries since 1996, with the exception of methyl bromide, for which the Protocol asked for a complete phase-out in 2005. The Protocol also regulates the hydrochlorofluorocarbons (HCFCs), i.e. low-ozone-depletion potential substitutes classified under the Protocol as "transitional substitutes," to be used during the time it took to commercialize new ozone-safe alternatives and replacements. HCFCs are being progressively phased out in non-A5 countries, meanwhile in A5 countries they will not be regulated before 2016. In the absence of regulations in developing countries, the demand for HCFCs in many applications is expected to increase (Montzka et al., 2009; Velders et al, 2009).

Continuous high-frequency measurements of a wide range of ozone depleting substances (ODSs) have been made at the Consiglio Nazionale delle Ricerche Atmospheric Research Station of Monte Cimone, on the highest peak of the Italian Northern Apennines, since 2001, using an automated gas chromatographic-mass spectrometric system. The activity has been carried out within the European Union funded project "System for Observation of Halogenated Greenhouse Gases in Europe." Long time series are therefore available, showing different trends according to their different lifetimes.

However, for methyl chloroform and halons differently than expected in a phase out regime, elevations from the baseline are recorded, indicating that ODSs are still being released even if not reported. Elevations above the baseline, together with air mass back trajectories analysis, allow the identification of source regions. For the HCFCs, high values of acceleration in the growth rate have been found, reflecting the increase in global emissions resulting from the increase of demand in Asian countries.



**Figure 1.** Long term trend of methyl chloroform recorded at the mountain site of Monte Cimone, Italy.



**Figure 2.** Long term trend of HCFC-22 recorded at the mountain site of Monte Cimone, Italy.