An Updated Record of Long-lived Halocarbons

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In the mid-1970s, the National Oceanic and Atmospheric Administration's (NOAA) Geophysical Monitoring for Climate Change (GMCC) program made a commitment to measure and monitor trace gases such as carbon dioxide, nitrous oxide, and halocarbons including chlorofluorocarbons (CFCs). Over the next three decades GMCC grew into the Global Monitoring Division (GMD), and many trace gas measurement programs evolved into separate projects with different instrumentation. We present a statistical method developed to combine measurements from independent NOAA programs to construct continuous long-term global records that are used to estimate global growth rates and top down emission estimates of the CFCs.

When merging data from different programs, care is taken to place all measurements on common NOAA scales; likewise, systematic differences between programs are quantified. The combining technique uses monthly means or medians depending on the measurement program. Missing monthly data are linearly interpolated and co-located measurement programs are combined by the weighted average of their measurement precisions. Finally, a smoothing algorithm is used on the combined station data sets ultimately deriving a long measurement record for each measurement location (i.e. station). Uncertainties are estimated from monthly mean measurement precisions, systematic differences between measurement programs, and differences between the calculated combined data set.

This poster presents the statistical method to merge several long measurement records by following the example of CFC-12; however, there are several combined data sets available including CFC-11, CFC-113, SF_6 and N_2O where it is combined with CCGG.

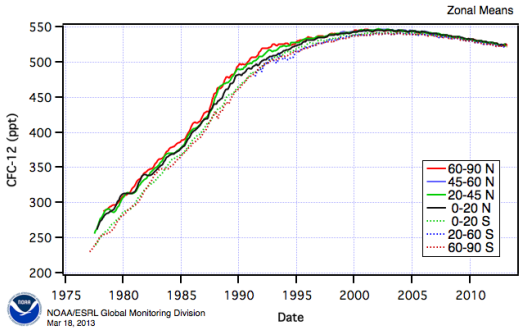

Figure 1. CFC-12 zonal means are calculated for four northern (solid lines) and three southern (dashed lines) bins.

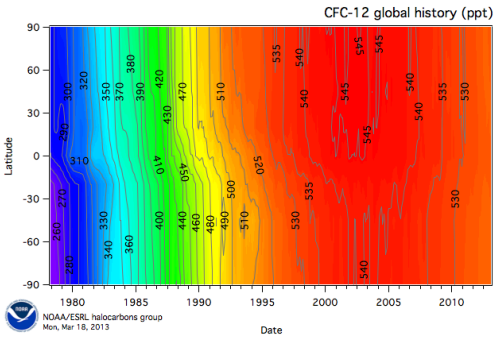

Figure 2. Global history of CFC-12 as a function of latitude (y-axis) and time (x-axis).