Improvement and Additions to the Halocarbons & Other Atmospheric Trace Species Group (HATS) Combined Data Sets

G. Dutton[1], B. Hall[2], D. Nance[1], D.J. Mondeel[1], S.A. Montzka[2] and J.W. Elkins[2]

[1]Cooperative Institute for Research in Environmental Sciences (CIRES), University of Colorado, Boulder, CO 80309; 303-497-6086, E-mail: geoff.dutton@noaa.gov
[2]NOAA Earth System Research Laboratory, Boulder, CO 80305

The HATS combined data sets for nitrous oxide (N_2O), sulfur hexafluoride (SF

), CFC-11, and CFC-12 were developed and introduced in 2011. A key motivation was to create a consistent, continuous, long-term record of trace gases measured by the Global Monitoring Division ((GMD) and preceding NOAA laboratories such as CMDL and GMCC); and to combine these publicly available data without being subjective, with the idea that the sum of many data sources is better than any individual measurement program. The combined data sets are a compilation of multiple instruments and measurement programs with care that all data are on the same calibration scale. For some gases, measurements prior to 1990 have been adjusted to match current NOAA calibration scales due to difficulties in determining calibration lineages. Recently, combined CFC-113 and carbon tetrachloride (CCl_4) data sets have been developed and added to the GMD ftp site and, newly revamped website.

The combining technique uses monthly mean or median data for co-located measurements; where the measurements are weighted by instrumental precision and sampling frequency. To provide a continuous long-term record, missing data due to instrumental or sampling problems are gap-filled. The previous gap-filling method relied on linear interpolation, which would ignore non-linear trends and seasonality. A new least-squares spectral regression technique has been developed that also estimates uncertainties for gap-filled data; thus providing more realistic trends and errors where data is missing.

There are many benefits in developing the framework to combine GMD measurement programs into a single data set. Long-term records are developed and can be traced to original data sets; and are used in national and international assessments, as well as the NOAA GMD's AGGI and ODGI indices. Likewise, we have used these methods for quick comparisons of multiple data sets for quality control and verification of internal consistency. We will present updated combined data sets and highlight recent improvements.

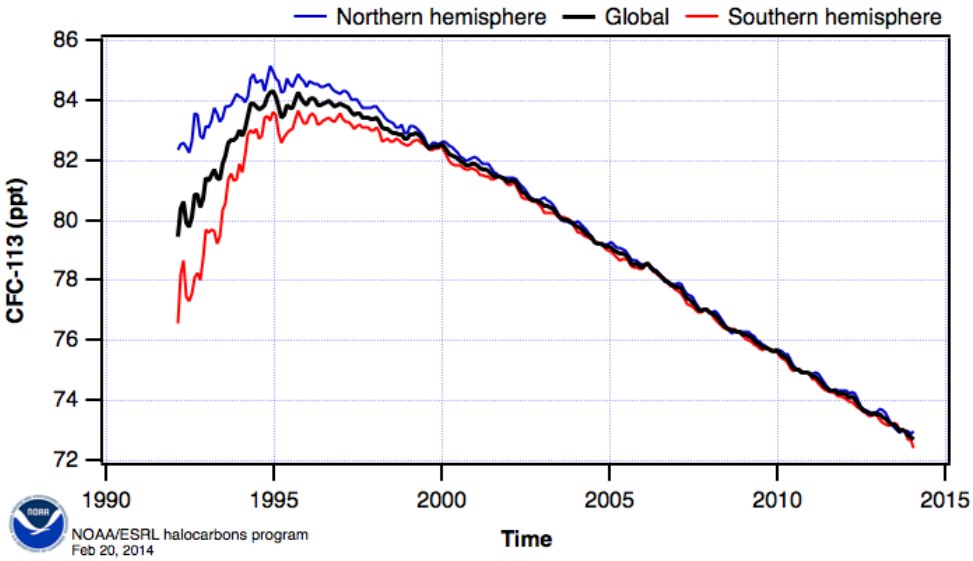

Figure 1. Hemispheric and global means calculated from the combined CFC-113 data set. Fewer and less precise measurements contribute to the variability in the early part of this record.