

Two Decades of ESRL/GMD In Situ Trace Gas Measurements

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From 1986-87 the GMD Halocarbons and other Atmospheric Trace Species (HATS) group deployed a global in situ trace gas measurement program. Motivated by the signing of the Montreal Protocol in 1987, the HATS group focused on frequently measuring some of the regulated ozone depleting and greenhouse gases such as chlorofluorocarbons (CFC-11 and CFC-12), methyl chloroform (CH_3CCl_3), carbon tetrachloride (CCl_4) and nitrous oxide (N_2O). The original in situ program, the Radiatively Important Trace Species (RITS) program, focused on these five gases. The RITS gas chromatographs (GCs) were deployed to the NOAA baseline observatories and the University of Colorado station at Niwot Ridge, Colorado and remained in operation for the next 13 years.

Throughout the 1990s, the HATS flask and RITS programs documented the steady decline in global growth rates of the major chlorinated solvents and chlorofluorocarbons as a result of the Montreal Protocol. Widespread use of the replacement compounds to the now banned CFCs prompted improvements to the HATS in situ program. The RITS instruments were replaced from 1998-2000 by the four-channel Chromatograph for Atmospheric Trace Species (CATS) GCs. In addition to the gases measured by RITS, the CATS GCs added nine compounds including CFC alternatives such as HFC-142b and HCFC-22.

Since the RITS instruments have been taken offline, efforts have been focused on finalizing this important data set. A number of calibration scale changes and improvements with the data reduction algorithms have facilitated comparing and combining the RITS and CATS data sets.

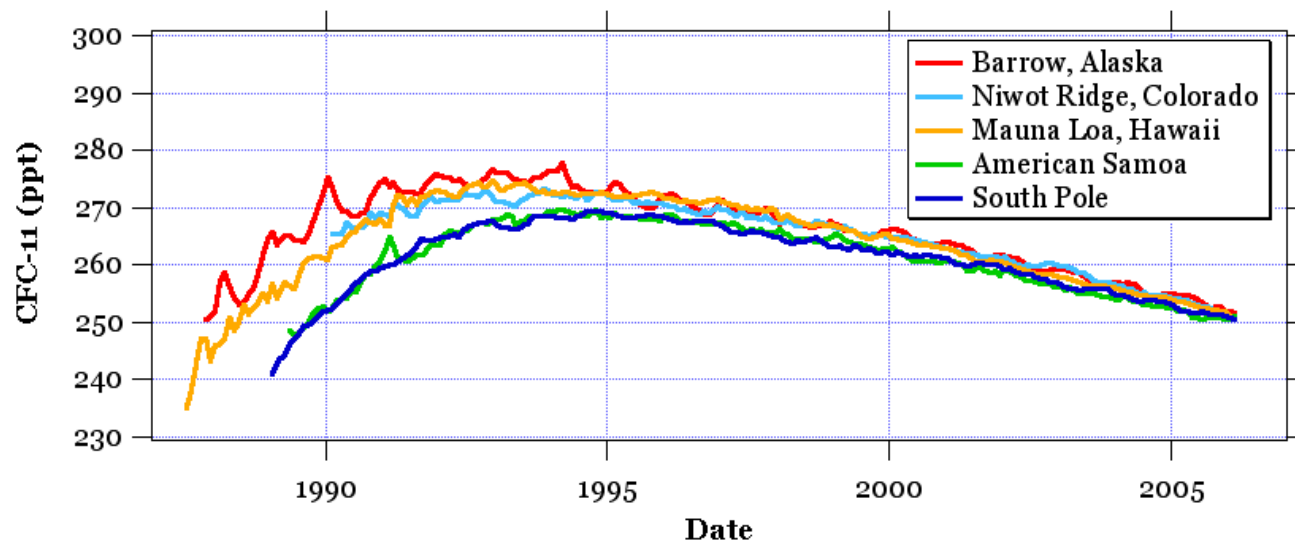


Figure 1. Combined RITS and CATS CFC-11 monthly means calculated from hourly measurements at five stations spanning the globe. The turn around in CFC-11 concentration in the early 1990s is attributed to reductions in production and use by developed countries as agreed upon by the Montreal Protocol.