

Recent Advances in the Preparation of Gravimetric Compressed Gas Standards

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The ability to maintain consistent, reproducible calibration scales is a critical component of any atmospheric measurement program. Most trace gases measured by the Global Monitoring Division of the NOAA Earth Systems Research Laboratory are referenced to compressed gas standards prepared by gravimetric methods. A number of calibration scales, each defined by a unique set of gravimetric standards, have been developed over the last couple of decades. New standards are prepared as older standards are depleted, or as better analytical techniques are developed.

In the last 18 months, new gravimetric standards related to six calibration scales were prepared. A new scale was developed for HFC-152a (CH_3CHF_2) and standards for CS_2 are under development. Existing scales for CFC-12 (CCl_2F_2), HCFC-22 (CHClF_2), N_2O , SF_6 , and halon-1211 were improved. The motivation to improve these scales was the fact that many of these scales were based on standards that were nearing the end of their useful lives. Furthermore, the acquisition of a new electronic balance, a new dilution manifold, and a developmental GC-MS offered improvements in quality control. Preliminary analysis suggests that these recent standards are much more consistent than their earlier counterparts. Calibration scales developed from these new standards will improve (a) the results of CFC-12 comparison experiments between NOAA and other laboratories, (b) our knowledge of linearity issues associated with halon-1211 measurements, (c) our ability to measure SF_6 , (d) our ability to maintain the WMO N_2O reference scale at a level near that requested by the N_2O measurement community, and (e) previously uncalibrated measurements of HFC-152a and CS_2 .

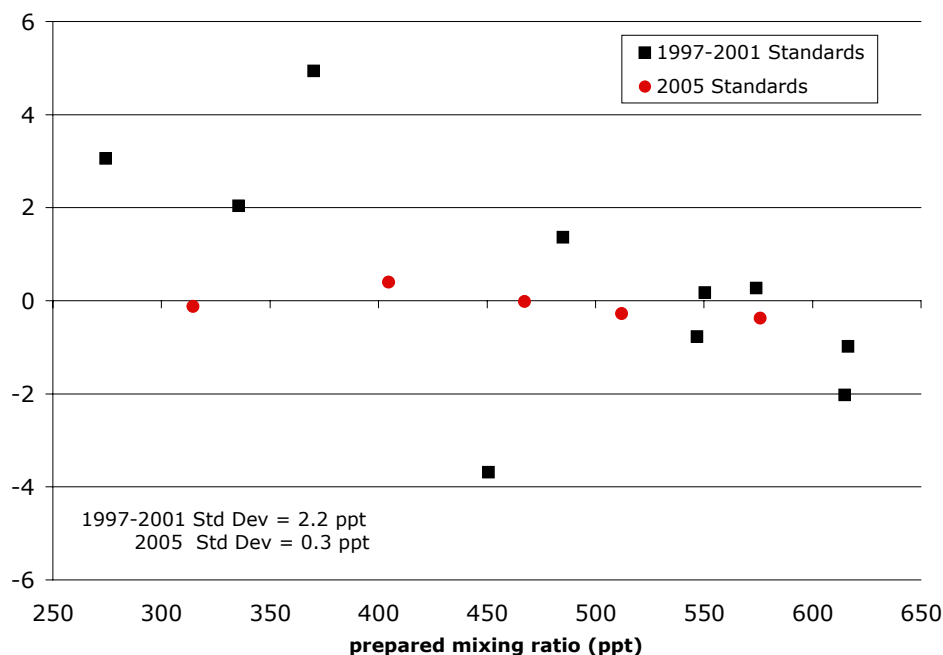


Figure 1. Comparison of residuals for recent (red symbols) and previous (black symbols) CFC-12 standards. Residuals are defined as the difference between assigned and prepared mixing ratios, where assignments were derived from a polynomial fit of response vs. prepared mixing ratio.