

An Update on the WMO CO X2014A Scale

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With the release of the WMO carbon monoxide (CO) X2014A scale revision in 2015, ESRL/GMD changed the method of maintaining the WMO CO in air scale. Previous scales were defined by repeated gravimetric sets made every 4 - 6 years. With X2014A, we maintain a single set of primary standards and all calibrations since January 2011 are traceable to this single set. This is more consistent with how other calibration scales are maintained by ESRL/GMD. However, the lack of stability of CO mixing ratio in high pressure aluminium cylinders (cylinders typically show CO growth rates of less than one ppb per year) means we had to develop a method for periodically evaluating drift in the CO primary standards.

We use an internal tracer technique to monitor the slow growth of CO in the primary standards. Percent-level gravimetric mixtures of CO and methane (CH₄) in air are used as “parent” tanks. We assume growth of CO has no significant impact on the gravimetrically determined CO: CH₄ ratio. Static dilutions from these parent tanks were made to create suits of standards with CO covering the range of interest (30 – 1000 nmol mol⁻¹). CH₄ in these daughter products is measured and CO is calculated using the known CO: CH₄ ratio of the parent. The parents are considered stable and by making fresh daughter standards twice a year, we determine the growth rate of CO in the primary standards.

Here we present results from the internal tracer method and the latest update on the most recent determinations of the drift rates in the CO primary standards, implications for the WMO CO scale, and future plans to ensure scale stability.

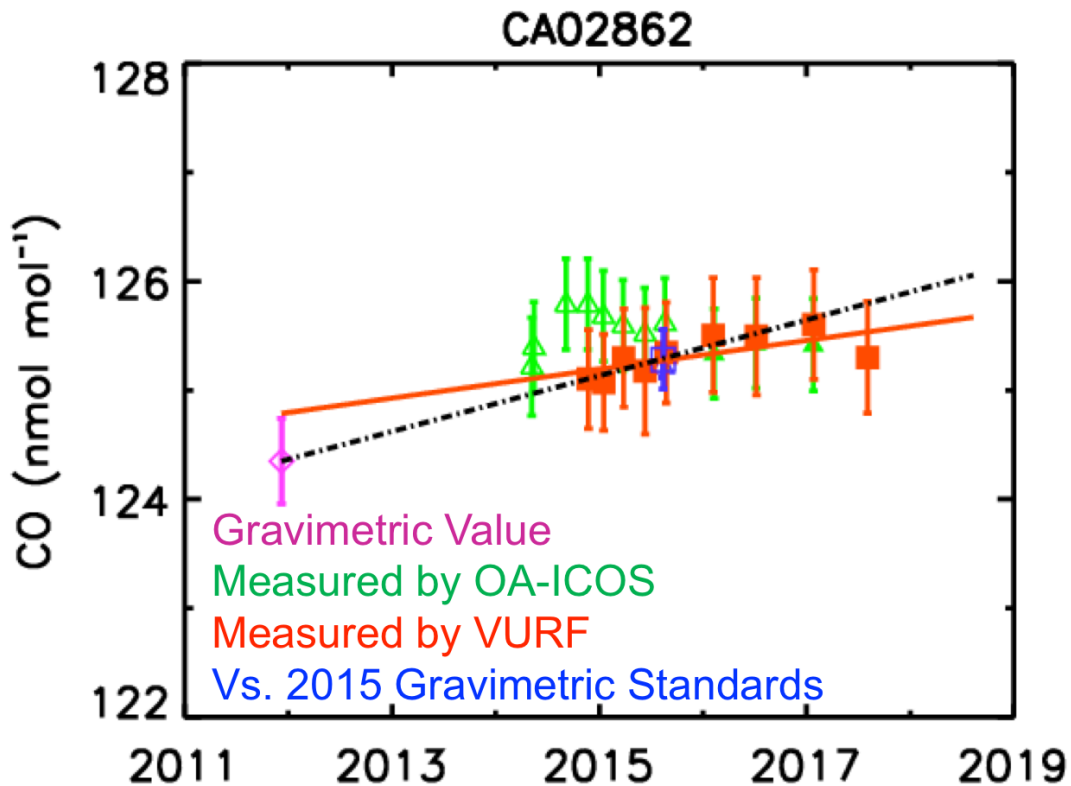


Figure 1. Example of results for one of the CO primary standards. The initial gravimetric assigned value (pink symbols), the measurement results using the internal tracer method on two different instruments (green and red symbols) and 2015 gravimetric standards (blue symbol) are plotted vs. time.