Uncertainties and standardization in the absolute reference frame

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Mass spectrometric methods for clumped isotopes have evolved considerably over the past decade, in large part because of the need to correct for various “nonlinearities”, which may be negligible in conventional analysis of singly-substituted isotopologues but manifest as large bias in clumped isotope measurements. In the case of CO₂ and carbonates, correcting for these nonlinearities yields Δ47 values expressed in the "absolute" reference frame of Dennis et al. (2011). There is, however, no precise consensus regarding the actual implementation of these various corrections, including the use of in-lab and international standards.

We propose that a useful way forward is to quantitatively assess the statistical uncertainties associated with the various corrections we all perform in one form or another. Comparing the merits and limitations of various standardization strategies illustrates how the optimal one will vary between laboratories, and highlights the critical need for one to three reliable international carbonate standards. Although several of these strategies are already used, more or less formally, we believe that this comparison exercise provides a good starting point for discussion.