

Revision to Author response to Referee #1 comment #6: original response in blue, revised response in green

C1.6 P. 6246 From figure 3 it looks like 2 ppt is the theoretical 1 sigma precision at high photon numbers ($2E9$), which based on the 8 minute data is roughly 1 hr. Is 1 sigma precision equivalent to limit of detection? Also, the experimental data do seem to trend away from this and be slightly higher. Mainly I think a better explanation of the 2 ppt in 1 hr would be helpful.

R1.6 The text in the abstract has been changed to reflect the ~6 pptv value for the ~8 min spectra cited in Section 3.2.

R1.6 Upon more detailed inspection of this reviewer comment, we realized that the reviewer's comment contained some confusion. We feel that addressing this comment is better served by adding discussion to explain the stated detection limit; the number listed in the abstract is 'smaller 2.5 pptv over one hour'. The following text was added in Sect. 3.2: "Figure 3 indicates that the reduction in the achievable 1-sigma precision follows the theoretical RMS over several minutes. It becomes limited by the photon shot-noise of the reference spectrum at longer times (rolling-off in the 'theoretical RMS' trace). In absence of this reference-noise limitation, a photon count over 1 hr (3×10^9 photons) corresponds to an extrapolated 1- σ precision of 0.8 pptv, which corresponds to a detection limit of ~2.4 pptv glyoxal over one hour. If, instead, the 3- σ detection limit is calculated based on the statistical variability in the 40 sec or 8 min glyoxal VMR data, the detection limit for one hour data is ~2.2 pptv. Thus, a conservative estimate for the detection limit over one hour is <2.5 pptv."