

Interactive comment on “Continuous and high precision atmospheric concentration measurements of COS, CO₂, CO and H₂O using a quantum cascade laser spectrometer (QCLS)” by Linda M. J. Kooijmans et al.

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Please also consider the following issues when revising the manuscript:

In Figure 7, the stability improvement after the temperature stabilization measures on March 25 is clearly visible. But while for CO and OCS, the data scatter nicely around the respective assigned cylinder values, the measured CO₂ values are significantly (by about 13 ppm) below the assigned cylinder values. Please explain this in the revised manuscript!

In the introduction, precision is defined "as the standard deviation over a two minute

period". It would be more useful to look at precision achieved with different averaging times, because i) you have various sources of random noise with different time scales (e.g. temperature fluctuations), and ii) the time scales of the uncertainties are important in the context of different scientific applications of the data (this issue is raised by referee #2). It would be nice to construct and show an Allen plot to show how the random variability varies with time. With the amount of measurements you have made, this should be fairly easy to do.

In the same context, a one-second-precision and an overall uncertainty for one second data of 4.3 ppt and 7.1 ppt respectively are given for OCS. Looking at Figure 7, the scatter for 1-hour-averages looks larger, and it also seems peculiar that the standard deviation for 1 minute averages given in Table 3 should be larger than the standard deviation for one-second-data. Please look at this carefully and explain how you calculated the averages and corresponding standard deviations on different time scales!

Did you ever try to calibrate with higher concentration OCS standards? As far as I know, the OCS standards that can be purchased from NOAA are typically secondary standards (ambient air samples that NOAA measures and certifies). However, in your acknowledgements, you mention the preparation of gravimetric standards. Can you indicate where in your study such gravimetric standards were used? Using one or two standards with higher concentration would certainly make the response curve for OCS shown in Figure 2 even more useful than the two-point-curve.

For the H₂O correction, where do you obtain quantitative information of the water broadening coefficients? If this information is not published, the experimental derivation should be described. And I find the discussion somewhat confusing, because on page 9, line 13 you state that "optimized broadening coefficients are equal to 1.0, 2.15 and 1.0 for COS, CO₂ and CO". But a water vapour broadening coefficient of 1.0 would mean that the water vapour effect is the same as for air, so water vapour broadening does not play a significant role, correct? It would be nice to get a quantitative feeling how much the water vapour broadening actually affects the measured mixing ratios...

I understand the numbers given as °C/°C in Section 2.5 in a way that you reduced the response of your system to ambient temperature variability? Was it not possible to stabilize to a fixed temperature? This seems not so difficult...

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