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Atmospheric Measurement Techniques
Discussions

Interactive comment on "A broadband cavity-enhanced spectrometer for atmospheric trace gas measurements and Rayleigh scattering cross sections in the cyan region (470–540 nm)" *by* Nick Jordan et al.

Anonymous Referee #1

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This paper presented a LED based cavity enhanced absorption spectroscopy at 470-540 nm. Different with previous CEAS instruments. The CEAS moved the window to cyan region (470-540 nm) and measure Rayleigh scattering cross-sections of several pure gases. This part is fundamental and very meaningful to the dataset. The authors applied the instrument to measure NO2 and I2 simultaneously. The measurement of ambient NO2 by CEAS was compared with CRDs and presented the feasibility. With respect to the I2 measurement by CEAS, which has been reported in the neighbor or the same wavelength region (e.g., Vaughan et al., 2008; Bahrini et al., 2018). Although

the detecting capacity is not well improved compared with previous works, this work provides a possible way to measurement ambient I2. The following comments should be addressed before the consideration of publishing in AMT.

Major comments:

1. Section 3.3, it's interesting that using the saturated water vapor absorption to derive the effective optical absorption path determination. Are the authors make sure the water vapor was saturated by measured the RH? The sample flow of the water vapor gas keep the same with the ambient sampling flow or not (1.5-2.5 slpm). The authors should provide more details of the d0 determination, such as the convolution of effective water vapor cross section.

2. The scatting cross section of N2 (Peck and Khanna, (1966)) was used in the calculation of reflectivity, but not included in the following intercomparison in figure 4(b), the author should clarify it.

3. Noticed that the cyan region was affected by the strong narrow absorption of water vapor (Bahrini et al., 2018). Here the author used a "new" zero that include the same water vapor concentration to avoid the interference (mentioned that in line 231). I think it's a good way to avoid the water vapor absorption problem, but the zero spectrum should be carried out more frequently in ambient condition and the reason why dynamic zero carried out should be addressed clearly in the text.

4. Line 407, it's hard to make sure the wall loss of I2 in the inlet tube by just taking a look at the time series. The statement should be more conserve or just simply deleted as the author did not carry out more lab experiments to quantify the loss.

Specific comments:

1. Keywords are not necessary in AMT.

2. Line 48, please make up the reference. (2010) as well as in line 220.

3. Line 370 and line 394 , “an example” should be change to “a spectrum retrieve example” or “a spectrum fitting example”

4. Line 392, R2 is 0.70.

5. Line 422, is “60 s and ±50 pptv for 5 minutes, respectively.”

6. The residual plots in Figure 5 and Figure S5 should be united to the style in Figure S3.

7. I suggest the authors put the figure S7 in the main text though the ambient I2 below the instrument LOD.

Reference: Bahrini, C., Gregoire, A. C., Obada, D., Mun, C., and Fittschen, C.: Incoherent broad-band cavity enhanced absorption spectroscopy for sensitive and rapid molecular iodine detection in the presence of aerosols and water vapour, Opt Laser Technol, 108, 466-479, 10.1016/j.optlastec.2018.06.050, 2018.

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