

## ***Interactive comment on “Development of an incoherent broadband cavity-enhanced absorption spectrometer for measurements of ambient glyoxal and NO<sub>2</sub> in a polluted urban environment” by Shuaixi Liang et al.***

**Anonymous Referee #1**

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Liang et al., (2018) presented an IBBCEAS at 425-475 nm for measuring the ambient NO<sub>2</sub> and glyoxal simultaneously. The detection capacity is as good as previously works reported by Min et al., (2016). This study showed the improvement of retrieving NO<sub>2</sub> and glyoxal by measuring and applied the NO<sub>2</sub> cross section in field measurement, as the convolved NO<sub>2</sub> cross section affected the retrieve of glyoxal due to the grating spectrometer had nonuniform dispersions when NO<sub>2</sub> is high. While the paper seems missed several important details, such as the introduction of the retrieve method (DOASIS or others?); the production of the glyoxal standard, the experimental descrip-

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tion of the measurement of NO<sub>2</sub> cross section in field condition without the absorption of glyoxal. Additionally, the cross section of glyoxal is encouraged to measure by the developed IBBCEAS system and glyoxal standard at lab, which may also improve the measurement. All the details should be given and the following comments should be addressed before published at AMT.

What is the purpose of section 3.4.2, the five lower normalized CHOCHO concentrations are calculated by the dilution flow? What the offset -2.14 ppb mean in figure 6(b)?

Page 3 line 18, here the purge flow is added in each end of cavity with the same flow rate of 0.1 sL/min?

The details information of high reflectivity mirrors should be given, such as the radius of curvature of mirrors, as well as the details of the LED.

What is the role of rotameter value in this system in Figure 1?

How about the change frequency of the filter membrane in field measurement?

Eqs(3): please add  $(\lambda)$  as  $\alpha_{abs}(\lambda)$  and  $\sigma_i(\lambda)$

Page 5 line 16, the HITRAN database 2012 should add the reference.

Page 5 line 11, reword “greater than 0.99994” and give the exact value.

Page 6 Eqs(4), the O<sub>4</sub> signal is the measured spectrum signal or the retrieve concentration of O<sub>4</sub> at purge on or off condition?

Figure 4, why the same dataset for the NO<sub>2</sub> and glyoxal Allan variance has such a big difference?

Figure 6, is the normalized mixing ratio calculated by the dilution flows?

This paper highlights the importance of the using of measurement-based NO<sub>2</sub> reference spectrum, while the determination of the measurement-based NO<sub>2</sub> reference

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spectrum is missed, how about the NO<sub>2</sub> standard and the quantification of NO<sub>2</sub> standard.

Page 13, line 13-14 this sentence is confuse, please reword it.

Page 11, line 4, Fig. 9. The standard deviation of the fit residual from fig.7, fig. 7 change to fig. 8.

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