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Discussions

Interactive comment on "Simultaneous detection of atmospheric HONO and NO$_2$ utilizing an IBBCEAS system based on an iterative algorithm" *by* Ke Tang et al.

Anonymous Referee #3

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Please check the attachment or the following comments:

Title: Simultaneous detection of atmospheric HONO and NO2 utilizing an IBBCEAS system based on an iterative algorithm Author(s): Ke Tang, Min Qin, Wu Fang, Jun Duan, Fanhao Meng, Kaidi Ye, Helu Zhang, Pinhua Xie, Yabai He, Wenbin Xu, Jianguo Liu, and Wenqing Liu MS No.: amt-2020-218 MS Type: Research article The authors reported an improved incoherent broadband cavity-enhanced absorption spectroscopy (IBBCEAS) system based on iterative retrieval algorithm for simultaneous detection of atmospheric nitrous acid (HONO) and nitrogen dioxide (NO2). The new algorithm is based on the concept of differential optical absorption spectroscopy (DOAS) retrieval,

which was used to obtain the effective absorption optical path length, thus IBBBCEAS system is insensitive to the fluctuation of absolute light intensity. Compared with traditional IBBCEAS, this method indicated some advantages, especially decreased the dependence on light intensity fluctuation. However, this manuscript includes some errors and uncorrected descriptions, major revision is needed to improve the paper quality. I do have some comments on the contents, interpretation, and conclusions of the work as below:

1. For detection limit, the authors used "2δ", this description is very strange. The common description is "2σ", which standards for signal to noise ratio of 2.

2. Page 2, Line 69, "IBBCEAS technology has been demonstrated to applied HONO" includes grammar error, "applied" should be "apply to"

3. Page 3, lines 84 and 85, "The key point of this technology is to determine the effective absorption path length, so as to correct the absorption cross section", this description is not right, absorption cross section (of HONO or NO2) can't be corrected in this measurement and they are cited from references or database.

4. Page 3, lines 101, "The Our instrument's capability of", "The" should be deleted 5. Page 4, line 127, "The IBBCEAS system in this study was developed based on Duan et al. work (2018) [25]." developed is a redundant word and should be deleted. 6. Page 5, lines 164-165, "it is necessary to ensure that the ambient temperature of the instrument is stable." This sentence is not right, ambient temperature is variant, but you need to stabilize the gas temperature inside the optical cavity or correct the result contributed from temperature changing to decrease the uncertainty. 7. It is better to use abbreviation for "figure" (Fig.) in the manuscript, for example: Fig.1 not Figure 1 in page 4, line 128; page 6, line 169 (Fig.2 not Figure 2); page 8, line 234 (Fig.4 not Figure 4); . . . 8. "The Allan deviation continuous its decrease for averaging times up to several hours." This sentence is not right, please pay attention to the grammar and description.

9. Kalman filtering section from Pages 10 to 11. Kalman filtering can improve measurement precision but can't enhance detection limit. The authors should discriminate "detection limit" and "precision". The used detection (or measurement) sensitivity is not accurate. 10. References, all journals should use abbreviation, for example, "Atmospheric Measurement Techniques" should be "Atmos. Meas. Tech.".

11. Pages 17, lines 555-561, there is a problem in gas handling system in Fig. 1. With your current setup, the purging flow of left side will continuously dilute the sample, which will lead to extra uncertainty, please estimate this uncertainty. If you used the sampling rate of 1 SLM, the purging flow is 0.1 SLM, flow rate ratio is 10:1, can't neglect, may increase extra 9.1% uncertainty.

12. Figure 5 on Page 19, it is so hard to discriminate L1 to L5, please prepare this figure clearer for readers.

13. Figure 6 on Page 20, the authors confused the colors for the observed data and fit, the description for the red lines and blue lines in figure caption don't match the figure.

14. Figure 11 on page 22, it is better to use different colors for data and linear fit.

15. Figure 12 on page 23, it is so crowd for the figure, the text has hidden the curves in the figure.

There are other errors or wrong descriptions in this manuscript, the authors must carefully check the whole manuscript and let it more readable.

In a word, this manuscript can be considered to publish in Atmospheric Measurement Techniques (AMT) if the major revision has made to improve its quality.

Please also note the supplement to this comment:
https://amt.copernicus.org/preprints/amt-2020-218/amt-2020-218-RC2-supplement.pdf

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Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2020-218, 2020.