



EGUsphere, referee comment RC2
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Comment on egusphere-2022-145

Anonymous Referee #2

Referee comment on "Development of a broadband cavity-enhanced absorption spectrometer for simultaneous measurements of ambient NO₃, NO₂, and H₂O" by Woohui Nam et al., EGU sphere, <https://doi.org/10.5194/egusphere-2022-145-RC2>, 2022

General Comments:

This paper details the development of a new BBCEAS system for simultaneous measurements of the trace gases NO₃, NO₂, and H₂O. Unlike previously developed absorption-based sensors for NO₃, this study emphasizes the utility of retrieving the water vapor signal, which has strong absorption features in the detected spectral region around 662 nm, instead of correcting for water vapor as an interference in the NO₃ signal. The instrument demonstrates superior precision and comparable accuracy as compared to existing BBCEAS NO₃ measurements. Overall, this paper presents a thorough characterization and evaluation of the instrument performance and its field operation. It is well within the scope of AMT, and I recommend publication subject to the minor revisions detailed below.

Specific Comments:

- I agree with RC1 that the description of measuring the H₂O absorption spectrum in the original text is unclear. I believe the authors have sufficiently addressed this concern in their response, as well as any concerns relating to temperature control of the instrument.
- L207 states a "Fourth-order polynomial was applied to account for the optical drift and/or unaccounted extinctions such as absorption by ambient ozone." Was there any basis for selecting this functional form? The retrieval demonstrates that the polynomial fit is a quiet a large component of the overall signal. Please elaborate or clarify why this is the case.
- How reproducible are the NO₃ transmission results to the field environment? It seems this has been clarified in the author's response to RC1, but I'm curious if this would

have to be characterized in each new environment.

- The description of the NO₃ dilutions in the linearity test are somewhat unclear. Where is the drift in the NO₃ concentration evidenced in Figure 7? Or have the data in Fig 7a,b already been corrected for the linear drift? Please be explicit as to what the red and black dots indicate in these figures. It is not stated in the text or in the figure caption.
- L321: The wording is unclear. Was the total transmission efficiency reduced by 65% of the lab-based value? Or reduced to a total transmission efficiency of 65%?

Technical Corrections:

- It would be helpful to see all the detection limits in Table 1 for the same integration time if possible (for ease of comparison).