EGUsphere, referee comment RC1
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Comment on egusphere-2022-145

Anonymous Referee #1

Referee comment on "Development of a broadband cavity-enhanced absorption spectrometer for simultaneous measurements of ambient NO_3, NO_2, and H_2O" by Woohui Nam et al., EGUsphere, https://doi.org/10.5194/egusphere-2022-145-RC1, 2022

This paper reported a newly developed IBBCEAS system to measurement NO3, NO2 and H2O near 662 nm, in which the detection of NO3 with high accuracy is the key target. The non-linear absorption of water vapor near 662 nm is a large interference and lead to the retrieval of weak NO3 absorption challenging. Several studies have been trying to address this issue. In this study, the design of the optical system was adopted from a well-established instrument for measuring the glyoxal and nitrous acid (Min et al., 2016), and added a purging flow on high-reflection mirror surfaces. I believe the novelty of work is making effort to retrieve the ambient absorption of water vapor by establish H2O absorption cross section by the instrument measurement in advance. Overall, this topic is within in the scope of AMT, and this manuscript is well written with a comprehensive characterization in the lab as well as a good performance in the field test. The authors did a good job, I would like to recommend this paper to be published subject to a minor revision.

General comments:

- Line 187-195, I am very confused how did you established the H2O absorption cross section. Are you measured the water absorption at a certain RH or a series of RH level at room temperature? We know that the temperature and pressure in the detecting tube would influence the water absorption cross section, how to deal with these variations in ambient conditions? Given the importance of this issue, I suggest the authors provide more details about it in the revised version.
- How about the influence of the mirror reflectivity change in the water cross section? If the R decreased to 0.99999 for example, the previous measured water cross section still working?
- How about the temperature range in the field campaign in Arctic regions, is it possible lead to a bias in retrieving H2O absorption?
- Line 320, how the transmission efficiency determined in the field campaign, especially

the loss in the sampling tube, is it scaled by the residence time in this part?

Technical corrections:

- Line 240, the unit of aerosol loading should be μg rather than μg cm-3? Please clarify it.
- Line 146-147, typo error.
- The dot size in figure 7(b, d, f) is too small