Atmospheric Measurement Techniques Discussions

Atmos. Meas. Tech. Discuss., author comment AC1
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Reply on RC1

Ryan Thalman et al.

Author comment on "Detection of Sulfur Dioxide by Broadband Cavity Enhanced Absorption Spectroscopy (BBCEAS)" by Ryan Thalman et al., Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2021-172-AC1, 2021

We appreciate Reviewer 1's diligence in responding to our article and the feedback given. We would like to respond to the following points outlined in the reviewer's comments:

The instrument presented represents no significant progress compared to previous reports about BBCEAS instruments.

The presented instrument moves BBCEAS detection further into the Ultra-violet region than previous applications. This is important for several reasons, which we have added to our discussion of the motivation of the paper: A wider variety of species have structured absorption cross-sections in the deeper UV regions and thus the BBCEAS technique can be utilized to measure these, specifically the 305-310 nm region includes absorption lines for hydroxyl radical (OH) an important short-lived reactant in nearly all reactions of organic molecules in the atmosphere, and finally the instrument extensively utilizes 3D printing technology to reduce cost and increase availability of cavity enhanced instruments for atmospheric monitoring and research. These points are expanded upon in the updated draft of the paper.

"In the paper there is no hint that the application of BBCEAS has a major advantage compared to other methods that are used for atmospheric detection of SO_2."

We discussed other techniques in detail in the Introduction including interfering species specifically for fluorescence-based detection instruments. We have updated this section to add more details to this effect and elaborated the advantages of direct absorption measurements with DOAS analysis in the results and conclusion sections.

"The investigation of the applicability of the instrument in ambient air is missing"

Originally, ambient measurements were not completed due to the lack of variability of SO_2 in the vicinity of the locations of our testing (Richfield and Provo, UT, historical data for the last 6 months shows almost no measured concentrations in excess of 1 ppbv over that period). In response to the reviewers, ambient data was acquired to assess fitting of interfering species (such as NO_2) as well as performance in an ambient matrix. SO_2 was injected into the inlet line to provide varying SO_2 levels to measure. The description of these experiments was added to the Experimental, Results and Conclusion sections.