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Atmospheric Measurement Techniques Discussions
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Interactive comment on "The CU Mobile Solar Occultation Flux instrument: structure functions and emission rates of NH_3, NO_2 and C_2H_6" *by* Natalie Kille et al.

Anonymous Referee #3

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General

This paper is describing a low resolution optical multichannel spectroscopic system for mobile column measurements using direct sun measurements in the infrared and UV/visible region. It includes a theoretical analysis of the infrared spectroscopic measurements and the ability to detect gases in the atmosphere. The paper also describe column measurements of NH3, NO2, and C2H6 and subsequent flux-estimates based on these measurements. It also includes a motivation of the importance to measure the above mentioned species. Even though solar infrared measurements have been used for decades to retrieve atmospheric columns of various species, within the network NDACC, Flux measurements using solar occultation technique has only been

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Discussion paper

carried out by few researchers. Considering the large potential for such flux measurements, this paper provides a welcome and needed contribution to improving the common knowledge about this technique. The language is good and figure and tables clear. The paper gives a nice illustration how the solar occultation flux method can be applied and in particular focuses on its sensitivity towards measuring various species and in the application of ammonia measurements of cows. However, a few general points that need improvement are given below: First of all it is not stated so well what is the objective with this paper in terms of novelty and originality compared to what has been published elsewhere. The Solar occultation Flux method has been published in several scientific papers and reports, see papers below. It is also described in the US EPA handbook on Optical Remote Sensing for Measurement and Monitoring of Emissions Flux and it is also Best available technology in Europe for measurements of fugitive emissions, as part of the mineral oil BREF. It is also used operationally used to monitor fugitive emissions since more than 10 years. There is a short statement about the wind error in the conclusions and reference to earlier work but this could be improved. Even though the author has included some previous work the background description in the paper should be improved to better reflect work and applications that has already been carried out with the solar occultation flux method. Alos some more references to other work applying sky DOAS or direct sun DOAS for flux measurements should be included.

The instrument is similar to what has been used in other papers and also how the flux method is obtained. In my mind its originality therefore lies in the sensitivity calculation (structure functions) and in performing flux measurements of ammonia from cows with the per head analysis I think that what makes this papers unique should be much better stated in the introduction of the paper and also how the papers is organized.

Specific:

Page Row 42 (Introduction): 1. Line 88: Include more background about how the solar occultation flux method is applied since more than 10 years fro measurements of

fugitive emissions , NH3 etc.

2. Line 115: Describe the focus of this papers better here

3. Line 115: Strange language in sentence, pleas rephrase.

4. Line 130: I would like a brief (few sentences) explanation about the NO2 system , since these measurements are carried out here.

5. Line 188: I would like a brief (few sentences) explanation about the NO2 system , since these measurements are carried out here.

6. Line 226: This appears to be somewhat difficult measurements with considerable risk for errors that you have not discussed. Please add something about this.

7. Line 240: The usage of model wind when measuring close to cattle farms will add quite some uncertainties to the measurements. The author states a comparison between some wind measurements and the model at the lower layers, but in my experience this needs some more discussion and uncertainty of the errors.

8. Line 320: Define ONG storage tank

9. Line 354: Same as line 240. The fact that two consecutive days resulted in the same value does not prove anything about the uncertainty in the wind since there may be considerable systematic uncertainties. Please improve

10. Line 358: You claim 30%/sqrt(2) as error. Please explain. Appears small !

11. Line 491: The section about ethane appears somewhat inconclusive. It needs improvement; I suggest by more comparison to other studies and better discussion about the uncertainty.

Some References SOF method

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