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Atmospheric Measurement Techniques Discussions

Interactive comment on "A miniDOAS instrument optimised for ammonia field-measurements" *by* J. Sintermann et al.

Anonymous Referee #2

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The paper describes further development of the miniDOAS instrument by Volten et al. (2012). The developments include construction of a stand-alone, field-applicable miniDOAS system, which does not need an air conditioned container or monitoring station for reliable operation. Furthermore, the novel version of the miniDOAS can measure SO2 and NO besides NH3 (however, the instrument is optimized for NH3 measurements). The authors also provide results of several field measurements to prove practical applicability of the instrument.

The information given in the manuscript is of high interest for the scientific community, and is definitely worth publishing in Atmospheric Measurement Techniques. However, in the current form the manuscript is not easy to follow; the presentation quality has to be improved substantially before publication.

Specific comments:

- Section 2.4.: The order of the field experiments in Table 1 and in the text is different, and different types of information are given for each experiment. He authors should give a name for each experiment, or use the abbreviations (W2, W3, R1, R3, HAFL) also in the text, to prevent confusion.

- Table 1: More than one mini DOAS instruments were used in most experiments, but the number of instruments is not given in Table 1. There are also discrepancies between path lengths given in Table 1 and in the text in Section 2.4 (e.g. 72 m and 76 m for the experiment W3).

- Figure 2b: Please give the concentration of SO2 and NO as well.

- Figures 2, 3 and 4: Can you evaluate, whether the differential absorption cross sections above 0 are within the expected uncertainties, or do they show a significant systematic bias of the instrument?

- Figure 4: Could you give differential absorption cross sections instead of differential optical density, to make the figure directly comparable to Figures 2 and 3?

- Page 11 lines 4-5: How do you determine the errors from the 1 minute spectra? For which instruments do these errors apply? Are the errors for both instruments comparable?

- Page 11 line 19: The intercept is indeed rather small, however, "practically zero" would mean that zero is within the 95 % confidence interval limits. This is not the case in the presented example.

- Page 12 lines 1-3: Is it possible to record the zero spectrum at a remote place, and use it afterwards in experiments carried out at other sites? Or does re-location or transport of the instrument affect the zero spectrum? How often do you recommend checking the zero spectrum?

- Section 3.3.1.: In my opinion, comparison of the DOAS instruments to an impinger system gives information about the instrument performance. I would recommend moving this part to Section 3.2.

- Figure 7: What does NH3 on the y axis mean? Is it ammonia concentration or ammonia gradient? If it is concentration, with which instrument did you measure it? If it is gradient, the unit should be μg/m3m, i.e. concentration difference divided by the distance of the instruments.

- Figure 9: How do you explain the negative NO concentrations? Is it a cross-sensitivity to SO2?

- Please make sure that you use uniform units for concentration throughout the paper. In the current version ppb, ppm, μg/m3 and μmol/m3 are alternately used, making it difficult for the reader to compare the different values.

Technical comments:

- Page 2 line 9 and page 16 line 2: The generally used expression is source apportionment, not source appointment.

- Page 3 line 27: “trace gas concentration”, instead of amount

- Page 4 lines 15-16: It is not clear from the sentence, whether the authors mean one cuvette containing all the listed compounds, or four different cuvettes.

- Page 4 line 21: “operated at -10°C”, instead of “with -10°C”

- Page 6 line 11: “to” is missing from “in order to”

- Page 9 lines 4-5: “This individually for NH3, NO, SO2 (Fig. 2b), but also for all three gases combined.” – The sentence is grammatically not correct and the meaning is not clear.

- Page 13 line 5: Please add the year (2015) to the dates.

- Page 13 line 18: “μg” instead of “ug”

- Figures 2, 3, 4, 5, 6, 7, 8, 9 and S4: The units on the axes do not appear correctly in the pdf version of the manuscript. The negative signs in the superscripts and “μ” are missing.

- Figure 3: The colors are not clearly distinguishable.

- Figure 4: a, b, c, etc. are missing from the Figure. It is not clear what the numbers in the legend of the figures in the second raw represent. Are they concentrations with uncertainties? In which units?

- Figure 5 and 9: a and b are missing

- Figure S1 refers to the experiment R2, however, in Table 1 you only have R1 and R3, no R2.

- The axis labels in several figures are not statisfactory:

o Figure 2d: Do you mean relative intensity?

o Figures 5-8: What does NH3 refer to? NH3 concentration?

o Figure S4: The y axis label is missing, only the unit is given

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