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Atmospheric Measurement Techniques Discussions

Interactive comment on "Replacing the AMOR by the miniDOAS in the ammonia monitoring network in the Netherlands" *by* A. J. C. Stijn Berkhout et al.

Anonymous Referee #3

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The manuscript by Berkhout et al. titled "Replacing the AMOR by the miniDOAS in the ammonia monitoring network in the Netherlands" describes a network of the LP-DOAS instruments for measuring ammonia installed as a part of the Ditch National Air Quality Monitoring Network. The DOAS instruments were replacing an outdated AMOR instruments, which quality ammonia in-situ using wet chemistry. The manuscript also analyzes a dataset collected during a 16-months-long intercomparison measurements between DOAS and AMOR instruments at six sites throughout the country.

Overall, I was pleased to learn about the Dutch air authorities using optical remote sensing (ORS) technology for air monitoring. ORS methods, including DOAS, offer a number of advantages over "traditional" measurement techniques, however, they have been largely underutilized by governmental agencies. This manuscript provides an ex-

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ample of how DOAS method can be successfully used for contentious, long-term, near real-time measurements by a regulatory agency; and hence, this article is interesting for publication. I also envision that this paper will be of interest for scientists who rely on the Dutch ammonia network data for their research. However, in my opinion, this paper has a number of deficiencies that have to be addressed, before paper can be published.

Sections below provide a list of specific comments for authors to address. Additionally, I believe that this manuscript can greatly benefit from English language editing. I encourage the authors to take advantage of the English editing services offered by AMT, or have the manuscript edited by a native English speaker.

Finally, I think that paper can be significantly strengthened by expanding the analysis of the collected data, data interpretation, and discussion of the results.

Major comments

Section 2.3.2 – Add a figure with the example of the DOAS spectral fit. List all parameters included in spectral evaluation.

One of the major strengths of the DOAS technique is that calibration is not necessary and concentrations can be determined from first principles; however, authors significantly diminished such advantage by devising a cumbersome method for measuring a reference spectra. Authors should explain why they chose to use reference calibration rather than spectral fitting using literature absorption cross-section convoluted with the instrument function.

Authors should provide a more detailed explanation for the reference DOAS instrument, as well as highlight how it differs from the miniDOAS's used in the network.

I am also surprised that authors did not encounter issues with using an uncooled CCD array. On page 3 authors briefly mention that use of an uncooled array leads to certain sacrifice of the instrument's performance (page 3, lines 11-12), but later on the same

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page (page 3, line 28) authors state that choice of the CCD instrument performance.

It is clear that 1 minute data reporting for AMOR instruments is meaningless, I therefore recommend to remove 1min comparison between the DOAS and AMOR datasets as it bears no statistical significance. Instead, it should be highlighted that transition to the network of DOAS instruments will result in a dataset with much higher temporal resolution.

Authors should expand the description and discussion of data intercomparison with passive samplers. Table 5 should be replaced with a table of monthly averaged ammonia concentrations measured by passive samplers. Detection limits for passive samplers shall be stated. Analysis/intercomparison of passive samplers and monthly averaged DOAS and AMOR ammonia concentrations also should be presented.

Authors should provide R2 values for correlation plots in Figures 9 and 12.

I imagine that such a long intercomparison of co-located AMOR and DOAS instruments was partially conducted in order to aid future interpretation of long-term ammonia concentration trends. For this purpose, it would be also interesting to see a more in-depth analysis of the collected data. For example – the analysis of seasonal and geographical trends and/or differences in AMOR and DOAS datasets. Figure 13 shows monthly averages obtained by both instruments at all stations throughout the country. It is obvious that datasets for some stations agree better than for others. I found it disappointing that analysis was only limited to a correlation plot.

Authors should add s description of the expected maintenance schedule and expected lifetime for DOAS instruments and their major components for the DOAS instruments.

Minor comments

Replace “Uptime” with “Data capture rate”

Replace “life-expired” with outdated in reference to old instrumentation; and with “burned-out” in reference to burned-out LP-DOAS lamp

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Page 2, line 16 (and through the rest of the document) - abbreviations shall be presented in parenthesis when first used in the text, and not another way around. E.g. – Differential Optical Absorption Spectroscopy (DOAS).

Page 4 – combine sections 2.2.1 through 2.2.4 into single section 2.2.

Page 6, Equation 6 - should be 2l in denominator.

Page 10, line 28 – replace “overview of the situation” with “measurements setup”.

Pages 13-15 – combine section 4.1 and 4.2, and 4.4.

Pages 14-15 – eliminate sub-section in 4.3 and make a more fluid narrative (e.g. section 4.3.1 can be reduced to a single sentence or illuminated completely as it was already discussed in section 3.2).

Please provide explanation for describing the DOAS instruments deployed in the network as miniDOAS. What is the main feature that differentiates the miniDOAS from a “traditional” LP-DOAS instrument? Table 1 can be augmented to include physical dimensions of the different instruments.

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