

Interactive comment on “Two instruments based on differential optical absorption spectroscopy (DOAS) to measure accurate ammonia concentrations in the atmosphere” by H. Volten et al.

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The RIVM DOAS is a nice instrument, the minidoas seems even better. The RIVM team has done a good job in making a new design for an NH₃ measurement system that looks promising.

The presented paper provides a clear overview of the technical aspects of the two DOAS setups, their inter comparison and the performance versus the AMOR wet

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chemical instrument used in the Dutch monitoring network over the last decade. An important next step to be taken will be a version that does not have the large container anymore but a slim line version that would fit in the open frame towers that most teams use. Especially when using the system for a gradient method the containers used now for housing will disturb the measurements for a significant part of the wind direction. I do hope that with that step that instrument stability shown in this paper can be maintained. Temperature control and the optical alignment might become slightly more difficult to maintain in smaller boxes as compared with the setup in the larger and sturdy container. I look forward to more mini DOAS data.

Specific comments & questions.

For the RIVM DOAS you mention that the CCD has a wavelength mapping of 0.0306 nm per pixel. For the zinc lamp locking method you mention locking within 0.0025 nm so you will not “see that with the CCD I guess? Is it a calculated lock accuracy or measured in another way?

Section 3.2: at pg 5045 in line 7 you mention you only use the range 200-230nm and “to avoid edge effects and noisy part of the spectrum” So you use 205-229nm. At 205 here is a nice absorption line for NH₃ and a smaller one for NO that you now use for about 50%. So is that indeed providing better results compared with using the whole line shape down to say 204 nm ? figure 8 does not look that noisy just left of the 205 line? If 200 to 230 nm is the range, why choose the 206 centre wavelength filter (not a 215 one) is that related to availability or to the spectral shape of I₀?

In section 4 you describe that the lamp I₀ spectrum is specific for a lamp and that it will change over time. I₀(λ) is measured at the start and “the changes over the life span are accounted for in the moving average”. Does this imply that the spectral shape stays the same but only the total intensity varies? In your conclusion and out look:

You provide 3 different (fair) reasons why the AMOR would over estimate the concentration levels. I guess there is no hypothesis available at all on how a DOAS could

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somehow underestimate the concentrations is there? Please comment.

For gradient application you suggest to use two mini doas instruments at different heights. Will this be better than one instrument with a “flipping” mirror that selects either of two paths/heights? That might be economically attractive and avoid the problem of differences in drift in detector or lamps.

What about water vapor and density effects when using the open path setup for gradient measurements ? Do you suggest extra measurements there. You now use the 150 W lamp. Bigger lamps are available, could that enlighten research on NH₃ concentration levels even more?

Technical suggestions:

P5040 I4 suggestion: “for 5 min average” instead of “Over 5 min average”

P5041 I3 & 10 seem to tell the same thing twice.

P5045 I15: you did not mention sigma before this point so explain or refer.

P5050 I7 suggestion: annual instead of yearly

Figure 8: please enlarge (my eyes are getting older)

Figure 11: any clue for the low value at 75 ug/m³

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