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Atmospheric Measurement Techniques Discussions

Interactive comment on "Recent improvements of Long-Path DOAS measurements: impact on accuracy and stability of short-term and automated long-term observations" *by* Jan-Marcus Nasse et al.

Anonymous Referee #2

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In their manuscript "Recent improvements of Long-Path DOAS measurements: impact on accuracy and stability of short-term and automated long-term observations", the authors report on some improvements in long path DOAS instrumentation that lead to better measurements and longer instrument life time. More specifically, they describe the use of a new commercial laser driven light source which has a longer life time and creates a more stable and smaller plasma. This can be used to improve instrument throughput by exchanging in- and out-coupling fibres albeit at the price of higher atmospheric straylight. The smaller light spot also allows for a simple method to reduce

instrumental straylight by using the chromatic aberration of the coupling lens to limit the spectral range of the light coupled into the fibre. Finally, the authors test several methods of mode mixing in the fibre including an intentional degradation of the exit surface of the fibres which turns out to create the best results.

The paper is clearly written, reports on some relevant instrumental progress which is of interest to the long path DOAS community and provides demonstration of the value of the improvements on real measurements. I therefore recommend it for publication after minor revisions.

Detailed Comments

1. Several places: the term "measurement accuracy" is used in a way which in my opinion is better described by "measurement precision" as absolute accuracy of the mixing ratios is not discussed but rather the reduction in RMS of the residual. Please check and change where appropriate.
2. Page 4, line 2: comatic => chromatic
3. Page 4, line 18: Why is there scattered sun light in short-cut measurements? This should not be the case in my opinion.
4. Equation 1: For sake of consistency, it would be better to denote broad band absorption not with a subscript but with a dash or star like the differential part. Using ϵ for the scattering cross-section is also maybe not ideal as this would usually be read as extinction which is the sum of scattering and absorption.
5. Page 4, line 13: of gas => of a gas
6. Figure 7: amplification => magnification
7. Figure 8: Why is vibration not resulting in any improvements in reverse geometry, while roughening is very effective?

8. Section 5.2: I'm not convinced that the reader can learn anything from this section in addition to what is shown in Section 5.3 other than the specific characteristics of a specific LP-DOAS system and would therefore suggest to remove it.

9. Page 21, line 6: section number missing

10. Figure A1: I don't think this figure is needed.

11. Figure B1: If I read this figure right, measurements with filter WG 280 show larger intensities around 300 nm than measurements without filter. This points at the general problems of straylight measurements (stability of lamp and set-up) which should at least be mentioned in the main text.

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