Atmos. Meas. Tech. Discuss., 7, C3307–C3310, 2014
www.atmos-meas-tech-discuss.net/7/C3307/2014/

Atmospheric Measurement Techniques Discussions

Interactive comment on "MAX-DOAS observations of aerosols, formaldehyde and nitrogen dioxide in the Beijing area: comparison of two profile retrieval approaches" *by* T. Vlemmix et al.

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Received and published: 22 October 2014

This manuscript provides a nice and very detailed overview of the limitations and possibilities for the MAX-DOAS profile retrievals. I agree with the other reviewer that there are some sections which can be improved, but that there is otherwise no reason why this manuscript should not be accepted. There is one detail I would like to see addressed beforehand though: the manuscript lacks a few basic explanations of the MAX-DOAS technique and hence might be difficult to understand for someone outside the field:

- P. 9675, l. 17-20: Please add that the profile information is obtained from scanning the atmosphere at several elevation angles.

- P. 9676, l. 23-24: 'higher uncertainties' in comparison to the tropospheric column and also in comparison to the rest of the profile. Still this lowest point of the profile has the highest sensitivity. Please add explanation.

- P. 9677, l. 4-7: Please give a range/estimate for the degrees of freedom for signal usually obtained with MAX-DOAS.

- P. 9677, l. 27-28: Isn't also another reason for not being able to compare the profiles directly the dependency of the retrieved profiles on the input parameters such as the grid used for the retrievals due to the limited degrees of freedom? Please add some discussion.

- Throughout the manuscript, 'aerosols' is used synonymously for 'aerosol extinction' and p. 9677, l. 20 even labels aerosol extinction as a 'species'. Please correct.

Further more general comments:

P. 9682, 1st paragraph: How does the uncertainty calculated in this way compare to the smoothing error that can be obtained from the optimal estimation framework?

Section 3.2.1, all the numbers are stated in the table and don't need to be repeated here. It makes it quite difficult to follow this section.

Maybe the authors should consider providing some of the information in the result sections in bullet point lists.

Technical comments:

* MAX-DOAS, UV, Vis, VIS, BIRA, DAK, vmr, and the molecular abbreviations of the trace gases have not been introduced.

* use 'slant column densities' instead of 'slant columns'

* P. 9676, l. 9: ‘gases’ instead of ‘gas’

* P. 9676, l. 18: move bracket

* P. 9676, l. 19: ‘has been’ instead of ‘was’

* P. 9677, l. 12-14: remove second ‘of MAX-DOAS profiles’. Maybe use ‘usability’/’usefulness’ instead of ‘use’.

* P. 9679, l. 9: ‘From 2010 until present, the instrument was/has been stationed. . .’

* P. 9679, l. 22-23: 20 min for a scan? Please explain.

* P. 9679, last 2 sentences: The causality is a bit off. Please rephrase

* P. 9680, l. 4: Why ‘forward simulations of differential slant column’ (only)? What about weighting functions?

* P. 9680, l. 8: ‘uppermost‘ instead of ‘most upper’

* P. 9680, l. 16: ‘specific’ instead of ‘certain’

* P. 9681, l. 14: ‘fraction’ instead of ‘part’

* P. 9681, 2nd and 3rd paragraph: ‘decreases to zero’ instead of ‘goes to zero’

* P. 9683, l. 25: ‘estimate’ instead of ‘estimates’

* P. 9685, l. 22: remove ‘time’

* P. 9686, l. 5: ‘retrievals’

* P. 9686, l. 6, 7: ‘are’ instead of ‘is’

* P. 9686, l. 13-14: Check sentence

* P. 9688, l. 2-3: either remove ‘sometimes’ or ‘occasionally’

* P. 9689, l. 4: ‘. . . Beijing. From. . .’

* P. 9692, l. 12: ‘1.5 km is’: space missing

* P. 9697, l. 4: ‘profiles grow higher than a priori’: maybe ‘extend higher’ instead. Also a bit further, ‘shrinking of profiles’, is rather an unusual expression.

* P. 9697, l. 19: ‘This study also makes clear. . .’

* P. 9700, l. 29: ‘values are higher’ instead of ‘above’

Table 3 caption: ‘methods’ instead of ‘method’; ‘abscissa’ instead of ‘x axis’

Figure 3 caption: remove first ‘of’

Figure 7, 8 caption: ‘the’ instead of ‘te’

Interactive comment on Atmos. Meas. Tech. Discuss., 7, 9673, 2014.