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Atmospheric Measurement Techniques Discussions

Interactive comment on "Rapid methods for inversion of MAXDOAS elevation profiles to surface-associated box concentrations, visibility, and heights: application to analysis of Arctic BrO events" *by* D. Donohoue et al.

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Donohoue et al. discuss and compare rapid methods converting differential slant column densities into surface-associated vertical column densities. Comparisons like this are very interesting in terms of light path independent quantifications of MAX-DOAS measurements. Yet, in this manuscript it was not always clear what actions exactly were performed (e.g. the elevated viewing SA-VCD estimation method is not transparent).

The authors claim having developed the three methods discussed in the study. We agree with reviewer #1 that these were introduced in literature before: To our knowledge, box profile fitting method: Sinreich et al., 2005; elevated viewing VCD estimation method: Hoenninger and Platt, 2002; horizon viewing surface concentration estimation: Volkamer et al., 2009. This is currently not discussed accurately in the manuscript.

Also, the authors indicate that the horizon viewing surface concentration method is a universal method to derive trace gas concentrations. It might be true for the reported measurements in Barrow (with a relatively high surface albedo). However, such conditions are relevant over a limited portion of the globe. Volkamer et al. (2009) showed that in other scenarios (e. g. low surface albedo) deviations of a factor of 2 can occur. Therefore a general validity as claimed by the authors cannot be concluded, and the data presented in this paper must rather be considered as a case study with limited scope for generalization.

Hopefully these comments will be addressed in a revised version of this paper.

Hönninger, G., and U. Platt, The Role of BrO and its Vertical Distribution during Surface Ozone Depletion at Alert, Atmos. Environ. 36, 2481-2489, 2002.

Sinreich, R., U. Frieß, T. Wagner, and U. Platt, Multi axis differential optical absorption spectroscopy (MAX-DOAS) of gas and aerosol distributions, Faraday Discussions, 130, 153-164, doi: 10.1039/b419274p, 2005.

Volkamer, R., S. C. Coburn, B. K. Dix, and R. Sinreich, MAX-DOAS observations from ground, ship, and research aircraft: maximizing signal-to-noise to measure 'weak' absorbers, Proceedings of SPIE, The International Society for Optical Engineering, Vol. 7462, 746203, doi:10.1117/12.826792, 2009.

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