

Interactive comment on “Intercomparison of MAX-DOAS Vertical Profile Retrieval Algorithms: Studies using Synthetic Data” by Udo Frieß et al.

Anonymous Referee #1

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General comments

The manuscript by Frieß et al. is well-written, well-structured and easy to follow. The authors provide a thorough intercomparison of eight different well-established or new MAX-DOAS vertical profile retrieval algorithms. The intercomparison is based on synthetic data generated from the medians of forward modelled SCDs of the participating radiative transfer models. The model outcomes for vertical aerosol and trace gas profiles are compared to the true states for a large set of typical distributions, covering a wide range of atmospheric conditions and also including extreme cases. The results of this study improve the assessment of the accuracy of MAX-DOAS vertical profile retrievals. Due to the extent of participating profile retrieval algorithms and the broad base of initial conditions the study will likely serve as a reference work for the MAX-

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DOAS community. It will simplify the choice of appropriate retrieval algorithms in future projects and provides some clear recommendations, e.g. with respect to computational time or to use logarithmic retrievals for better stability.

Specific comments

Interesting findings are that horizontally homogeneous clouds in the free troposphere have little impact on the sensitivity of MAX-DOAS retrievals, the increased information content for trace gases caused by uplifted aerosol layers around 1 km and the weak dependency of the stability of the trace gas retrievals on the exact extinction profile. It is valuable to see that averaging kernels are quite similar for different positions of the sun.

p. 22, l. 2: Which sensitivity studies, reference?

Technical corrections

p.29, fig 16, l. 3: ... as blue vertical line -> ... as blue horizontal line p.31, l. 4: discrepancies are mainly occur -> discrepancies mainly occur p.36, l. 4: between retrieved and atmospheric state p.36, l. 10: ... have shown ... p.36, l. 13: About 54% of the data ...

Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2018-423, 2018.

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