Comment on amt-2021-178

Anonymous Referee #3

Referee comment on "Retrieval algorithm for OClO from TROPOMI (TROPOspheric Monitoring Instrument) by differential optical absorption spectroscopy" by Jānis Puķīte et al., Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2021-178-RC3, 2021

Review of 'Retrieval algorithm for OClO from TROPOMI by Differential Optical Absorption Spectroscopy' by Pukite et al. submitted to AMT

This manuscript presents a retrieval algorithm for OClO slant columns from TROPOMI measurements using the DOAS technique. To improve the accuracy of the retrieved data, the authors introduce additional fit parameters accounting for spectral effects which have previously not been accounted for and they provide a discussion of the uncertainty estimates including a novel application of an autocorrection analysis.

The authors show that their retrieval of TROPOMI OClO slant columns is in good agreement with ground-based zenith sky measurements made at two polar stations. They also compare their TROPOMI product with preliminary data retrieved with the operational TROPOMI OClO retrieval algorithm and discuss the observed differences.

The study is clearly presented in the manuscript, and in addition, the authors also provide substantial material describing relevant retrieval concepts and settings (Appendix A) and an extensive sensitivity study investigating the effect of the different retrieval settings on the OClO slant column data in comparison to a standard scenario (Appendix B). The paper is recommended for publication in AMT.

General comments:

While some of the aspects included in the uncertainty analysis of the retrieval include a novel approach (the application of autocorrelation for the systematic error analysis), stating that this is overall a new retrieval algorithm seems to me somewhat exaggerated since my understanding based on the manuscript is that the difference to existing

algorithms is mainly that additional fit parameters have been used. If that is not correct, and the algorithm is indeed novel then please describe this clearer in the text.

Also, in the conclusions, the authors state that 'the detection limit is similar to the detection limits of earlier instruments' – i.e. that this has not really improved – but then, also in the conclusions, they state that 'Including these terms improves the retrieval results especially for low OClO SCDs'. Aren't these 2 statements contradicting each other?

Specific (minor) comments:

Page 1, line 5: Should read 'From the measured spectra, highly resolved …'

Page 1, line 11: Just use OClO since this has been already introduced in the paragraph above.

Page 1, line 15: '… effects, a higher order …'

Page 1, line 21: typo: 'operational'

Page 10, line 125: left bracket is missing

Page 12, line 250: '… zenith sky …'

Page 12, line 252: '… in a fit window of …'

Page 12, line 252: replace 'considered' with either 'included' or 'used'

Page 17, line 306: '.. are listed: The retrieval …'

Page 17, line 309: '.. terms are applied (or used).'

Page 17, line 311: '… within the 89 ….'

Page 17, line 316: '(Sect. ??)' needs to be fixed

Page 17, lines 318-319: '… with the correlation … has an offset …'

Most pages have sentences where commas are missing but I assume that this will be addressed anyway during the proof-reading phase.