

Atmos. Meas. Tech. Discuss., referee comment RC1
<https://doi.org/10.5194/amt-2021-61-RC1>, 2021
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Review of "Total ozone column retrieval from OMPS-NM measurements" by Orfanoz-Cheuquelaf et al.

Anonymous Referee #2

Referee comment on "Total ozone column from Ozone Mapping and Profiler Suite Nadir Mapper (OMPS-NM) measurements using the broadband weighting function fitting approach (WFFA)" by Andrea Orfanoz-Cheuquelaf et al., Atmos. Meas. Tech. Discuss., <https://doi.org/10.5194/amt-2021-61-RC1>, 2021

This paper presents a modified version of the WFDOAS algorithm to retrieve total ozone columns from the OMPS-NM instrument. The ultimate goal is to combine the nadir and the limb OMPS instruments to derive tropospheric ozone columns. In addition to the realized algorithmic developments, the study also investigates the quality of the retrievals by comparing them with ground-based data as well as with independent OMPS and TROPOMI retrievals.

The topic of this work fits well for AMTD and, from the presented results, the product quality appears to be good. However, I find that the section on the retrieval algorithm description currently lacks of details, justification and illustrations for the different choices that have been made. Details are provided below as major comments. I encourage consolidating the manuscript and to submit a revised version to AMTD.

Major comments:

Retrieval algorithm:

- The modifications made to the retrieval algorithm should be better justified and illustrated. I understand that the lower spectral resolution of OMPS may lead to more important cross-correlation and that there is a need to extent the fitting window. However, why considering one every two wavelengths only, which is expected to reduce the benefit of extending the fit window? Could you illustrate the cross-correlation between fitted parameters for the different options (small and large windows, wavelength selection)? In addition, it seems very strange that taking all

wavelengths or the other set of wavelengths has such an impact. How do you justify this? Is there any physical or instrumental reason to do so?

- It would be beneficial to present the product issues with the original WFDOAS algorithm and the impact of all individual changes and/or choices made.
- In addition, it is mentioned before that only the central FOV bins, 17 to 20, are used. Can you really assess the across-track variability using only 4 measurements?
- It is also unclear what is the additional fitted parameter to account for the slope of the ozone absorption signature? Is the polynomial of first order and not a constant? This parameter is not mentioned any longer in the list you give at line 136. Please clarify this.

O3 profile climatology:

- While the total column dimension may reliably account for the O3 variability in the stratosphere, this is not the case in the troposphere. There may be significant longitudinal and time variability in the tropospheric ozone content, which is not covered by the climatology as currently built. For example, in Tropics, there is a significant wave-one pattern in the tropospheric columns with an amplitude of up to 20DU. This should be acknowledged and further discussed in the paper. What are the consequences of this limitation on the retrieved total ozone columns?

Validation:

- Why do you limit the validation to the period 2016-2018? In section 2, you mention that data from 2012 to 2018 have been processed. It would be beneficial to extend the ground-based validation to the full available period to better evaluate the product stability.
- The added-value of Fig. 8 is limited, especially for differences seen on the orbit edges where sampling differences likely dominate. I encourage making similar plots based on a larger amount of data. The latitudinal dependence aspect is already covered by Figure 9. In Figure 10, the discussion would be easier to follow if you would show similar time series of the relative differences in addition to the current panels. As for the ground-based validation, extending the comparison with the operational OMPS product for the full period 2012-2018 would be beneficial.

Minor comments

- p. 2 Line 28: Chiou et al. does not include any DOAS algorithm, but relies on the GTO/Direct-fitting CCI (not DOAS-based) algorithm. The latter is not cited at all while applied to most of the sensors mentioned here. Please correct this and add proper references for DOAS algorithms for each of the sensors.

- p. 2 Line 41: please add a reference for GOME-2.
- p. 2 Line 56: replace as "a three-part instrument, namely a nadir mapper (OMPS-NM), a nadir profiler (OMPS-NP) and a limb profiler (OMPSLP), collecting data since January 2012."
- p. 3 Line 66: As the limb profiler is not described, it is not clear to the reader what are the implications to have only data "from the central of the three vertical slits". What does it mean in terms of coverage/spatial resolution?
- p. 5 Lines 110-115: Please better specify what temperature parameter you fit exactly since I do not think you fit a T° profile but most likely a single parameter.
- p. 8 Line 192 : 3.5 km x 5.5 km since August 2019.
- p. 8 Line 192: Unclear sentence. OFFL and RPRO are produced similarly and both include a cloud correction. Heue et al., 2016 is not an appropriate reference for LIDORT I believe.
- p. 10 Line 234: "De Bilt" instead of "Debilt »