

Atmos. Meas. Tech. Discuss., referee comment RC1
<https://doi.org/10.5194/amt-2021-430-RC1>, 2022
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Comment on amt-2021-430

Anonymous Referee #1

Referee comment on "Ozone Monitoring Instrument (OMI) collection 4: establishing a 17-year-long series of detrended level-1b data" by Quintus Kleipool et al., Atmos. Meas. Tech. Discuss., <https://doi.org/10.5194/amt-2021-430-RC1>, 2022

General comments:

Congratulation to the entire current and former team of OMI for such an excellent system providing - even long passed its foreseen mission lifetime - very valuable data. This paper gives a good overview of the adaptations to the processing including the degradation correction to improve the data quality. I recommend publication, after some corrections, incl. descriptions of the reached improvements for all changed processes.

Specific comments:

Page 1/ line 6: '... until the eventual end of the mission.' Is this to be understood including possible extension even beyond 2023? In line 3 you mention: 'for many years more.' Suggestion to be more specific and possibly state the limitation on the extension of a mission, which is most likely here also the case due to remaining necessary fuel for deorbiting. Later you mention this on page 4/ line 91,92.

Line 8,9: In combination with the title, is the assumption correct, that data of the past 17 years is planned to be reprocessed? Maybe worth mentioning in the abstract already, if reprocessing is planned/ done. Later in the conclusions page 38/line 814 it is mentioned: 'the reprocessing of the entire 17 year mission up until now is in progress'.

Line 17, 18: Is the understanding in combination with the statement in line 3 correct, that TES and HIRDLS are not operated anymore? Suggestion to state more explicitly the current status of TES and HIRDLS.

Page 2/ line 39,40: ‘..instrumental effects that are common’ suggestion to state the main differences between the optical paths between sun and Earth port, e.g. diffuser.

Line 48, 49; ‘For collection 4 the TROPOMI naming convention was adopted, referring to the UV1, UV2 and VIS channels as band 1, band 2 and band 3 respectively.’ Can you add an explanation why this has been adopted?

Page 3/ line 54, 59: Suggestion to add references for collection 1 and collection 2 dataset, e.g. Oord, 2006 SPIE and Oord, 2006, IEEE, vol 44, no 5, see also page 6/ line 154 where one of the references is provided, but here for collection 3, which was earlier referenced to Dobber, 2008.

Page 4/ line 114, 115: you mention completely understandably, that the updates of the KNMI and NASA L2 processors fall outside the scope of this paper, but could you possibly add some references?

Page 5/ line 132: To get a better understanding what 70 000 orbits mean in time, could you add in the introduction to OMI, how many orbits per day OMI performs, e .g. around page 2, paragraph starting at line 30?

Page 9/ line 240 / section 3.5: Might it be, that an angular dependence correction is non-optimal leading to this ‘striping’? Is a seasonal effect observed? Suggestion to also add a figure to illustrate this observed effect.

Page 15, 16/ section 5.2: It may be worthwhile stating, that even if the QVD degraded more than the ALU diffusers, the degradation shown over those 12 years (table 4), 16 years page 17 (figure 4) is very low compared to other instruments, especially considering its daily use.

Generally not for all described changes to the processor from collection 3 to collection 4 the improvements are described/ shown by absolute, error bar reductions or end-product improvement. Here some examples:

- Section 6.2 you mention ‘Furthermore, this over-fitting can result in unexpected behavior for extreme values of other input variables like the OPB temperature as well.’ but no numbers provided and improvement not clear;

- Section 6.1 what is the advantage of the difference implemented in collection 4?

- Section 6.2.1 improvement of changing the method on end-product not clear;
- Section 6.2.3 Improvement not clear;
- Section 6.3 other method described, but improvement not clear;
- Section 6.4 'resulted in a large amount of ground pixels that were flagged unnecessarily' without giving e.g. percentage improvement;
- Section 6.5 transient signal flagging.

Suggestion to amend graphs and/or values of significant improvements, where missing.

Page 35/ line 774: 'bias is expected due to the Earth-Sun distance normalization that is present in collection 4 and not in collection 3.' If understood correctly a bias is introduced by the different method in collection 4. And, the bias is basically the improvement implemented by the new correction, but not shown in comparison with the former data from collection 3. Previously on page 8/ line 213 it is only stated that now both radiance and irradiance are corrected for Earth-Sun distance. Please consider to make the text more explicit. And please describe the value of the bias which is understood as the improvement in collection 4.

Line 776, 777: Is the mentioned 'aggressive flagging' linked to page 12/ line 310 section 4.5 Detector pixel quality flags? If yes, suggestion to add reference to that section here.

Page 39/ line 821: 'that the observed Earth reflectance is not affected by instrumental artifacts' might this be a too strong argument, since also the text describes there remain some effects, which are not able to be identified in flight, e.g. folding mirror, telescope mirror? Suggestion to change the wording slightly, e.g. is 'not significantly affected'.

Technical corrections:

Page 3/ line 67: 'trend and calibration monitoring system (TMCF)' is it TCMF or trend monitoring and calibration system?

Page 9/ line 237: CKD file, please provide abbreviated text.

Page 15/ line 394, 395: QVD, quasi volume diffuser ALU1 and ALU2 diffusers made from aluminium.

Page 16/ line 403: 'ratio From' à ratio. From

Page 36/ figure 21: suggestion for visualization to use the same y-scale for the ratios from 1.00 to 1.40 as for the UV1 for all channels and to use dots instead of lines for better visibility and comparison.

Figure position: The figures positioning sometimes interrupts a sentence of the text, or , e.g. page 34/ figure 19 are placed in the next section. Consider repositioning the figures closest to their description in the text.

Last but not least: Maybe it would be nice to refer also to one of the early OMI papers by its optical designer Huib Visser, e.g.

Smorenburg, C., H. Visser, and K. Moddemeijer, "OMI-EOS: Wide field imaging spectrometer for ozone monitoring", Europto/SPIE conference, Berlin, 1999, SPIE volume 3737, 1999

and/or

Piet Stammes, Pieter F. Levelt, Johan de Vries, Huib Visser, Bob Kruizinga, Kees Smorenburg, Gilbert W. Leppelmeier, and Ernest Hilsenrath "Scientific requirements and optical design of the ozone monitoring instrument on EOS-CHEM", Proc. SPIE 3750, Earth Observing Systems IV, (24 September 1999); <https://doi.org/10.1117/12.363517>.