We would like to first express our thanks to the REFEREE #1 for his/her constructive comments. The point-by-point responses are below after each reviewer's point. The reviewer points are in bold.

General Comments

The manuscript proposes an improved algorithm to better account for the impacts of absorbing aerosols in OMI/TROPOMI surface UV products. This proposed scheme can be easily implemented to correct the systematic effects caused by SZA and AAOD in the current OMI operational surface UV algorithm. This paper is interesting and well written.

1. **It seems that the correction algorithm developed in this work is targeting OMI and TROPOMI satellites, it would be helpful to add this information in the title of the manuscript.**

   The title in the revised manuscript has been modified.

2. **How applicable is this proposed algorithm to be used in other satellite derived surface UV products? It would be helpful to add some comments on this.**

   The correction is targeting OMI and TROPOMI satellites as its basic features are linked with the OMI and TROPOMI instruments measuring the sum of cloud reflected and aerosol backscattered spectral radiance. The correction could be applicable for future satellite based instruments having the same measurement principles. This has been further stressed in the revised manuscript.

3. **Line 64-67: Here could discuss a little bit on what the surface UV estimates would be without accounting for the SZA dependence and the non-linearity in the correction scheme, such as whether they would be systematically overestimated or underestimated compared to the current operational algorithm.**

There can be both over- and underestimation, depending on the SZA (and AAOD as well). This was discussed in the manuscript related to the Figure 3, because the most natural place for this discussion seemed to be in the context of the results in illustrated by that plot.

4. **Line 98-99: how are the new aerosol climatology data different from the current climatology data? How is it going to affect the results?**

As we mentioned in the manuscript, we plan to update the aerosol climatology in the future re-processing of OMI surface UV records. For the interest of our reviewer we spent some time to compare MAC V2 and V1 aerosol climatologies and the corresponding correction factor, Ca. Overall, the differences were relatively small, but some localized larger differences were apparent. These regional patterns were most typically in Sahara/Sahel region and in South-East China and

could reach up to 10% (both positive and negative differences were found, depending on the season and region).

5. **Section 2 has a lot of texts and it is hard to go through. It would be helpful for the readers to read through it if it can be better organized such as showing a flowchart of the algorithm or reorganizing some of the long paragraphs.**

A new figure (Figure 1) and equation (Equation 3) have been included in the revised manuscript, which both hopefully clarifies the revised discussion in the section 2.

6. **Line 228-229: It would be interesting to see the plots in other months.**

The new figures have been included in the appendix.

7. **Line 35: a reference is needed here.**

Reference is added into the revised manuscript (Schmalwieser et al., 2017)

REFERENCES

Schmalwieser AW, Gröbner J, Blumthaler M, Klotz B, De Backer H, Bolsée D, Werner R, Tomsic D, Metelka L, Eriksen P, Jepsen N, Aun M, Heikkilä A, Duprat T, Sandmann H, Weiss T, Bais A, Toth Z, Siani AM, Vaccaro L, Diémoz H, Grifoni D, Zipoli G, Lorenzetto G, Petkov BH, di Sarra AG, Massen F, Yousif C, Aculinin AA, den Outer P, Svendby T, Dahlback A, Johnsen B, Biszczuk-Jakubowska J, Krzyscin J, Henriques D, Chubarova N, Kolarž P, Mijatovic Z, Groselj D, Pribullova A, Gonzales JRM, Bilbao J, Guerrero JMV, Serrano A, Andersson S, Vuilleumier L, Webb A, O'Hagan J. UV Index monitoring in Europe. Photochem Photobiol Sci. Sep 13;16(9):1349-1370. doi: 10.1039/c7pp00178a. PMID: 28848959, 2017.