

## Reply to Reviewer 1 (Antti Lipponen)

Thank you very much for your kind review and comments. We have addressed your concerns in the manuscript as follows (reviewer comments are in red, authors comments are in black beneath the corresponding reviewer comment):

I.12 "L1.5" please write in full "level 1.5"

We have updated "L1.5" to "level 1.5" in line 12.

I.15 "...MODIS MAIC SLSTR SYN..." comma missing

We have added a comma to line 15.

I.45 "...can accurately monitor aerosol properties in the atmosphere directly above the site location.." To be precise, especially with larger solar zenith angles, the AERONET is also sampling some nearby station locations, not just the pointwise location. You may want to modify the text accordingly, to be precise.

Thank you for this clarification, we have updated line 45 from "...can accurately monitor aerosol properties in the atmosphere directly above the site location" to "... can accurately monitor atmospheric aerosol properties in the area above the site location".

I.64 "..in recent years. such as..." extra .

This was a typo in the manuscript, the full stop should have been a comma. This has been updated in the manuscript.

I.88 Please add the wavelength for the CALIOP AOT

The CALIOP AOTs were found from the 532 nm channel. Line 88 has been updated to include this information.

I.89 Please add the wavelength for the AOT listed on this line

The AOT values were at 550 nm and this information has been added to the manuscript.

I.95 Please mention if the Zhuravleva et al. (2017) estimates were AERONET or satellite (which instrument/algorithm) estimates

The AOT values described on this line are derived from L3 MODIS daily products, which are based on the Dark Target and Deep Blue algorithms, presented in Table 5 of Zhuravleva et al. (2017). However, the authors do not clarify which algorithm the value is taken from, so we have updated lines 95 and 96 as best as we can from, "...The 2012 Western Siberian fires were found by Zhuravleva et al. (2017) to reach  $AOT_{550\text{ nm}}$  of approximately 3.54 with subsequent significant cooling effects on the surface..." to "...The 2012 Western Siberian fires were found by Zhuravleva et al. (2017) to reach  $AOT_{550\text{ nm}}$  of approximately 3.54 in MODIS level 3 daily data, with subsequent significant cooling effects on the surface...".

I.130 Please confirm/clarify what exact AERONET data you use, the Direct Sun or Aerosol Inversions data? Now, it is not clear.

We have used the Direct Sun measurements for this study. Line 134 has been updated from "... version 3 level 1.5 AOT data..." to "... version 3 level 1.5 Direct Sun AOT data...".

I.158 Please consider changing SLSTR to Sentinel-3 Synergy as the Synergy data is (mostly) based on both SLSTR and OLCI instruments' data both flying on Sentinel-3 satellites. If you decide to change, also change SLSTR throughout the manuscript to "Sentinel-3 Synergy" or similar.

Thank you for this clarification, we agree with you about the choice of name throughout the manuscript. We have updated all instances of "SLSTR SYN" to "Sentinel-3 SYN", updated the heading in line 158 to "Sentinel-3" and updated the label in Figure 5.

I.161 Please clarify if you use the SYN surface reflectance and aerosol parameter (SY\_2\_SYN) or SYN AOD data (SY\_2\_AOD) product that are different Synergy products. If you used the SY\_2\_SYN data product, please justify why this data product, whose primary use is not aerosol information but surface reflectance, is used instead of the dedicated aerosol data product (SY\_2\_AOD).

The SYN AOD data is not available for the time period we are interested in. The data in the [Copernicus Data Space Ecosystem](#) [last access: 20 December 2023] starts around 19 Feb 2020; the first file available seems to be:

S3A\_SY\_2\_AOD\_\_\_\_20200219T053103\_20200219T061449\_20200220T124211\_2626\_055\_105\_\_\_\_\_LN2\_O\_NT\_002.SEN3

We have included this information in the manuscript by updating line 161 to read “For the period of this study, the L2 AOD product is not available, but the SYN product is available,...”.

I.400 Please define "NN"

Thank you, we have added the definition to line 400.