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Atmospheric Measurement Techniques Discussions

Interactive comment on "A hybrid method for reconstructing the historical evolution of aerosol optical depth from sunshine duration measurements" *by* W. Wandji Nyamsi et al.

Anonymous Referee #2

Received and published: 24 February 2020

In this work, a new method for estimating AOD from SD measurements under cloud-free days is proposed. The adopted method relies on a broadband DNI model that takes into account the local conditions affecting SD measurements. The work is well suited to the readership of AMT. However, there are a number of issues with the procedure developed in the paper that prevent its publication in the current form. The main issues with the work concern the decision to use daily mean of cloud cover data obtained only from four observations terms (every 6-hours).

There are also other meteorological databases which contain a variety of hourly meteorological data from weather stations located in Europe (e.g.

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https://www.ncdc.noaa.gov/isd). Therefore, the authors must quantify if there are significant differences between selecting the cloud-free days using hourly cloud data and ECAD dataset. Also, satellite cloud cover product data could be used in the analysis, as they provide hourly cloud cover data for more than twenty years (https://www.cmsaf.eu/EN/Products/AvailableProducts/Climate_Data_records/Climate_Data_Records_node.html)

Minor issues:

Page5Line20. The authors must mention the studies in which was performed the comparison between ECMWF reanalysis product and AERONET data.

Page6Line5. Which are the studies that demonstrate the performances of TOC estimates?

Page6Line15. The authors must motivate why they have used the MxD08_D3m Modis product instead of the higher spatial and temporal resolution Modis aerosols data (MxD04_L2 product).

Page10Line20. For which station the 12 000 the clear sky atmospheric states were built?

Page15Line5. The authors must discuss why most of the stations selected after applying the homogenization test are located in the Mediterranean climate. It is hard to believe that, excepting data from two stations, only the stations located in Spain provide homogenous SDF data.

Page18Line10. The authors must provide the burning thresholds computed for all the stations as an ESM table. This will add value to the paper.

Page19Line5. In order to better emphasise the results of the three models tested, trendlines for each model should be added on the scatterplot.

Some references mentioned in the text are missing from the Bibliography section (e.g. Qui, 1998).

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