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Atmospheric Measurement Techniques Discussions

Interactive comment on "Reducing cloud contamination in AOD measurements" *by* Verena Schenzinger and Axel Kreuter

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This is an interesting paper on cloud elimination or cloud flagging (CF) techniques used for sun-photometric measurements. The paper contributes towards improving such measurements. It fits the scope of the journal.

Introduction

Before starting describing the CF methods I would start the paper with some sentences like the paragraph below to show the importance of this study in combination with AOD related research and use:

AOD is the most comprehensive aerosol parameter for radiative forcing studies. Surface based AOD measurements are conducted from various surface base networks (e.g. aeronet, gaw-pfr, skynet) (e.g. Holbern et al., Nakajima et al., 2020 AMT). The

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Discussion paper

series are used for local, sort term or long term aerosol studies and for satellite validation. One of the main problems of such measurements is the fact that they can not be conducted under cloudy conditions at least when present in the detector- sun path of photons. For that case there are algorithms that are used in order to eliminate the possibility of cloud-present measurements to be included in the AOD data series. Such algorithms contribute substantially to the quality of AOD data worldwide.

Authors use the PFR instrument in their analysis but the introduction is mainly for aeronet/cimel. The latest publication describing the PFR CF algorithm can be found here: https://gi.copernicus.org/articles/7/39/2018/

Also it is essential to mention the PFR algorithm more explicitly as it differs in some aspects from the aeronet. In general different networks are using slightly or more different algorithms for CF For example in https://acp.copernicus.org/articles/18/3185/2018/ there is a comparison of different CF algorithms at synchronous AOD measurements from different instruments/networks.

In general the methodology is based on one minute data as derived from PFR. If the authors want to generalize the method being important for other AOD measuring networks some discussion on the measurement frequency vs method quality has to be presented. This is because for most other than PFR instruments, measurements are more than 1 minute apart increasing the possibility of cloud contamination in N consecutive measurements.

The Angstrom parameter a: It is a very good proxy for cloud flagging. However its variability depends also in AOD. Low AOD measurement days lead to much more "sensitive" and variable angstrom a than the ones with higher AOD. In low AOD days small but real AOD variability in combination with AOD measurement uncertainties can lead to high angstrom fluctuations.

Dust AOD variability could be an issue. Cuevas et al., discuss the 1 minute variability https://amt.copernicus.org/articles/12/4309/2019/amt-12-4309-2019.pdf in this pa-

per and the supplement. The example presented here is a good example but probably some discussion should be included based on the above mentioned 10 year time series of AOD cases.

Main effect of the non correct CF in an AOD series is the data cloud "contamination" that leads to a systematic higher instant AOD values but also affects daily, monthly AOD averages. Such systematic effects could have an impact on long term series statistics and much more to trend analysis of AOD related changes. I think this could be mentioned in the conclusions. It is an aspect that methodologies such as the paper presents, contribute towards better quality results.

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