

Atmos. Chem. Phys. Discuss., referee comment RC1
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Comment on acp-2021-796

Anonymous Referee #3

Referee comment on "A decadal assessment of the climatology of aerosol and cloud properties over South Africa" by Abdulaziz Tunde Yakubu and Naven Chetty, Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2021-796-RC1>, 2022

In this article MISR and MODIS products are used to characterize both the distribution of cloud and aerosol properties over South Africa during a multi-annual period and different seasons. Moreover, the data is used to analyze possible relationships between aerosol properties and clouds. The manuscript is well structured. However, some parts of the manuscript are hard to understand because of confusing word order or English grammar.

The study mainly focuses on the interpretation of MISR and MODIS products over South Africa. Only Chapter 3.5 introduces some novel scientific findings, which are of importance for the scientific community.

I can recommend a publication in ACP after major revision and after considering the following comments and suggestions for improvement.

Major comments:

Meteorological data: Please give a better overview of how you derive precipitation, wind speed and temperature for the three regions. Is it mean values for all meteorological stations within one region? How many meteorological stations or hours of measurements are incorporated in this analysis? Or is it just data collected by the stations in the cities you mention later in the manuscript (Bloemfontein, Durban, Upington, Cape Town, Port Elizabeth, Johannesburg, Polokwane, Nelspruit, Mafikeng). If so, this should already be summarized in section 2.3 (e.g. by adding a table).

Chapter 2.1. and Chapter 2.2 can be shortened: There is not really a need for such a very detailed description of the quality/algorithms/retrievals in MISR and MODIS products – if a

reader is more interested on how the products are processed, a simple reference to the corresponding documents/webpages should be sufficient.

The manuscript still has to be thoroughly revised regarding English grammar. In some parts of the manuscript I had a hard time to interpret what the authors want to describe.

Minor comments:

L18 and I23: Aerosols do not only interact with short-wave but also with long-wave radiation

L61: I don't understand the meaning of this sentence: 'Although climatology study is not holistic to diagnose the challenge of climate change, it identifies the next level of research that will clarify things for better understanding.'

L77: it is eight or nine years and not a 10-year period (2007-2015)

L79: What means 'descending north to south poles'? I guess there must also be an ascending part of the orbit

L80: what is a 'swarth dimension' Is it the ground footprint of the swath (not swarth – recurring in the manuscript)

L141: Here you state that the study is based on a period of 10 years (2007-2016) – however earlier you state that it is a period of 8 or 9 years (2007-2015) – please clarify

L148 – L152: can you give numbers (e.g. climatological means of min/max temperatures, rain rate, population) for the different regions – this would help the reader and would specify the terms 'warm', 'cold', 'dry', 'wet' and 'higher population'

Figures 2-10: an outline of the defined regions (Upper, Central, Lower SA) on the map would make it much easier to interpret the findings.

Chapter 3.1: you interpret the findings from MISR measurements by stating that biomass-

burning aerosol is responsible for the peaks in AOD, A_{abs}, and AE. Your hypothesis would be substantiated if you would highlight regions with high activity of forest fires from spaceborne observations (e.g. VIIRS, MODIS) on the maps.

L249: N_d has not been introduced

L262: what does 'lower temperature' exactly mean?

L464: Can the hypothesis that most of the pollutants are transported to South Africa from bordering countries be substantiated by literature? Otherwise it should be highlighted that this is just a hypothesis and not a fact – not to mislead the reader

L413: citation: (?)

Technical corrections:

L16: no brackets when citing IPCC

Throughout the whole manuscript: km (kilometer) not Km (Kelvin meter)

L141: remove dot after 'Figure 2.' (recurring in the manuscript)

Figures 2-4,7-8: The colorbars are labelled with 'none'. This might be confusing to the reader. Even though you show ratios, exponents and cloud fractions (which are without a unit), I would suggest to label the colorbar with the respective quantities (AOD, A_{abs}, CF, etc.)

L180 L236: 'than' not 'then'

L287: I guess it is CTH<4 km and not 4000 km

Figure 15 (a)-(c) are not indicated in the Figure

Some axes and colorbar labels are hard to read and should be enlarged