

Interactive comment on “Stratospheric Aerosol Climatology over Ethiopia and Retrieval of its Size Distribution” by Milkessa Gebeyehu Homa et al.

Anonymous Referee #2

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Title: Stratospheric Aerosol Climatology over Ethiopia and Retrieval of its Size Distribution
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General Comments:

I read all the paper, and I am so confused, there is a mixture of inconsistent issues about stratospheric and tropospheric aerosols during the introduction, analysis, discussion and conclusion in the text. I think that the study bases are wrong. Authors assumed in the study the human industrial generated aerosols are related with the stratospheric aerosols. This is not true, it is widely studied, recognized and established that the principal contribution for the stratospheric aerosols are the volcanic eruption

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and the surface human generated aerosols contribute to the aerosols concentration in the troposphere. These issues were explained and well established since the first IPCC report (IPCC, 1990). Recently, the last year a comprehensive assessment of the stratospheric aerosols was published (Kremser et al., 2016). This report mention “there are evidence of that stratospheric aerosol can also contain small amounts of nonsulfate matter such as black carbon and organics” But also mention that large uncertainties remain with respect to the contribution from anthropogenic sulfur dioxide emissions. So, I think if the objective of the author of the revised paper is to study the stratospheric aerosols above Ethiopia, first they need to read this paper and make use of the results reported there. For example, the main question: How do you demonstrate that human – industrial aerosols produced in Ethiopia influence the stratospheric aerosols? The aerosols from volcanic eruptions mask the influence of other source on the background of stratospheric aerosols, so you need to separate these two periods to study the influence of the human produced aerosols.

The method to study the stratospheric aerosols is not so strict and it is not well explained in the text. There is a mixture in the analysis, between stratosphere and troposphere again, without well explained relation. Authors analyze stratospheric profiles of extinction coefficient and the column AOD (troposphere plus stratosphere), I guess because this is not explained in method section. There is not information about which version of the SAGE II dataset used the authors. Together with these points the method to separate the aerosols and clouds are not analyzed or mentioned. Also, there are a lot of papers and reports studying the stratospheric aerosols with SAGE II, specifically related with SPARC project with an Assessment of Stratospheric Aerosols (ASAP), WCRP-124, 2006). So, the results in the paper in review it is so questionable.

My conclusion and recommendation is the paper should not be accepted for publication.

IPCC, 1990, Climate Change: The IPCC Scientific Assessment. Report prepared for IPCC by Working Group 1. J. T. Houghton, G. J. Jenkins and J. J. Ephraums (eds.).

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Cambridge University Press, Cambridge, Great Britain, New York, NY, USA, and Melbourne Australia. 410 pp.

Kremser, S., et al., 2016, Stratospheric aerosol – Observations, processes, and impact on climate, *Rev. Geophys.*, 54, 278–335, doi:10.1002/2015RG000511.

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