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Atmospheric Chemistry and Physics
Discussions

Interactive comment on "Accurate 3D radiative transfer simulation of spectral solar irradiance during the total solar eclipse of August 21, 2017" *by* Paul Ockenfuß et al.

Anonymous Referee #3

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The authors of this paper are trying to simulate the radiative transfer conditions under a total solar eclipse. To this direction they used the 3D model MYSTIC providing analytical explanation of almost all geometries and physical effects. The methodologies used are scientifically correct and the accuracy of simulations was precisely defined taking into account the majority of atmospheric parameters that affect solar irradiance.

However some assumptions made in the whole approach drive me to recommend the manuscript for publication in the Atmospheric Chemistry and Physics journal after minor correction. These assumptions have to do with the exclusion from the simulations of the aerosol and cloud effects.

Since the first word of the title is "Accurate", I totally agree that it is important to analyze e.g. the different impact of albedo dry grass vs spectrally steady albedo values or the impact of various mountain heights and the ozone profile. But at the same time it is at least equally important to adequately handle (page 8, lines 8-9; page 13, lines 3-6; page 18, lines 5-16) the aerosol presence and loading (measurements used just at 19:00). Simultaneously, based on images from satellites the potential impact from the wildfires and the presence of clouds (few but important for accurate 3D simulations) has to be specified and quantified in terms of contribution to the overall impact, and MYSTIC is ideal for cloudy atmospheres.

In particular, based on the satellite images there are both clouds and aerosols present in the atmosphere before, during and after the solar eclipse, but there was not performed a relevant simulation taking into account their potential contribution into e.g. the diffuse radiation. I suggest the authors to include some sensitivity analysis taking into account the microphysics and optical characteristics of the existing formations (possibly cirrus) and loads (biomass burning aerosols). It makes no sense to show 18 figures (some of them are difficult to understand) and not to provide a figure for the potential effect of clouds and aerosols.

Overall this is a valuable study for the radiative transfer modeling community and the approach and analysis followed is complete. As a result I believe that merits publication in the Atmospheric Chemistry and Physics journal taking first into account the above suggestions. The proposed revision will help in the direction of reaching the holism of the authors analytical thinking and for the paper to be one of the few that indeed provide such accurate and 3D radiative transfer simulations during a total solar eclipse.

Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2019-609, 2019.