

Interactive comment on “Impact of mineral dust on shortwave and longwave radiation: evaluation of different vertically-resolved parameterizations in 1-D radiative transfer computations” by Maria José Granados-Muñoz et al

Anonymous Referee #1

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The paper presents an analysis of the optical and microphysical properties of dust particles observed from ground and from airplane on 16-17 June 2013 above south-eastern Spain during the ChArMEx/ADRIMED campaign. The observations were conducted during a moderate Saharan dust event. Using a 1-D radiative transfer model, the author makes comparison of the output results obtained with different input data. They consider both shortwave and longwave radiation for the calculations. They concluded that the dust produces a cooling effect both at the surface and at the top of the atmosphere, as expected.

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Discussion paper



The paper is well written, the methodology and the results are clearly presented. The discrepancies coming from the different parametrizations are well analyzed. The authors conclude that global model estimate needs to consider the complete radiation spectrum to avoid an overestimation of the cooling effect produced by dust.

I have just one major concern. The same dust event was observed at almost the same location and at the same time by a balloon borne aerosol counter LOAC (Renard et al., Atmos. Chem. Phys., 18, 3677-3699, 2018, <https://doi.org/10.5194/acp-18-3677-2018>). Such counter measurements can be considered here for the estimate of the vertical distribution of the dust plume, and for the size distribution of the particles.

The paper can be published if the comments below are considered.

1. Abstract: A sentence must be added on the cooling effect found by the authors.
2. Instrument and data: Perhaps a map of the ground-based and airplane locations could be added.
3. Page 8 line 25: Such observations were also reported by Renard et al. 2018.
4. Page 10 line 9: The authors say that the concentration profiles of the main absorbing gases were taken from the US standard atmosphere. Nevertheless, real profiles can exhibit a significant variability from the standards for several reasons (local event, perturbed atmosphere. . .). Can you evaluate the effect of this variability on your results?
5. Page 10 line 15: The authors could consider the LOAC measurements, and the detection of large particles that produce a third mode.
6. Page 13 line 10: The authors say that the refractive index of the dust is assumed to be constant with altitude. I understand that it is difficult to detect a possible variation of the index with altitude. Nevertheless, the authors must discuss the limit of this assumption, and how a variation of the refractive index can affect their results. They can consider the variability of the refractive index for different natures of dust and for the possible presence of pollution particles.
7. Page 13 line 12: Is it "interpolation" or "extrapolation"?
8. Page 13 line 23: The authors must also consider the LOAC balloon borne aerosol counting data.
9. Page 17 line 26: Do you think that the presence of large dust particles, not always detected from aircraft instruments, could partly explain the large differences you

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observe?

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2018-700>, 2018.

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