

Interactive comment on “Aerosol direct radiative forcing during Sahara dust intrusions in the Central Mediterranean” by M. R. Perrone et al.

Anonymous Referee #1

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General impression:

The paper is of low quality. Many people undertake strong efforts and they test many, many ideas in their simulations. Finally they present the essential results in compressed form. All this is not the case here. To my opinion, new aspects are absent.

Details.

- Introduction: A large amount of publications came out in the recent years with estimates of radiative forcing by Sahara dust following dedicated field experiments like SAMUM, DABEX, AMMA . . . while the authors make references to some earlier work this needs to be more comprehensive, see e.g. the tabulated literature values by Bierwirth et al., 2009 (Tellus)

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- Page 20678, bottom: Do I understand correctly, that the authors use the retrieved values for refractive index and size, convert them back into AODs by Mie calculations assuming spherical shape (which is wrong, and to my knowledge the Aeronet algorithm itself uses non-spherical shapes!) and derive AOD from the results? Why? Why not use the directly measured AOD instead?

- Figure 1e, 5a: to which number concentration would the fine mode translate from the volume concentration derived from Aeronet? Would the resulting numbers be realistic at all to represent pollution aerosol in the presence of dust? In particular as those would be from air masses out of desert regions not known for heavy pollution?

- It is mentioned in the text that the size retrievals from Aeronet may be overestimating the fine mode aerosol due to artifacts from the inversion method. Muller et al., 2010 (JGR) find substantial differences in fine aerosol mode from Aeronet inversions compared to aircraft measurements, whereby the Aeronet data were found to be a factor 2-3 higher than data from aircraft instruments. The fine mode Aeronet retrievals are highly uncertain in the presence of large dust particles. Thus as the authors themselves claim, the results for the fine mode aerosols are highly uncertain and should be used with strong caution, or better not be used at all until it is clarified where those differences come from. However, the forcing (or DRE) results are dependent on the fine mode aerosol. The results of this paper are thus not reducing uncertainties in forcing estimates in contrast to the claim by the authors.

- At least some sensitivity studies should be carried out. Eg., the forcing (or DRE) by the coarse mode aerosol could be separately computed for dust, to provide error bounds.

- The factor f (Eq. 1) is also very uncertain, basing only on the results of a single model. AEROCOM had shown years ago that there is huge spread in global aerosol model results on aerosol composition.

- The resulting numbers need to contain error bars to reflect the uncertainties that go

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into the estimates from the initial assumptions.

- In the Abstract the authors claim that their work leads to a better understanding of desert dust DRE, however this is not achieved by this paper. They give another estimate in addition to many estimates that already exist.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 20673, 2010.

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