A nice structured work, developed by the utilization of CALIOP and MODIS retrievals for the establishment of a global aerosol-speciated 3D distribution. Typical aerosol properties are derived and collocated against ground-based stations (AERONET). Finally, SDRF values (under clear sky conditions) are retrieved and compared against results in previous studies for the estimation of aerosol induced perturbations on the Earth-Atmosphere radiation budget.

1 Introduction

I think the revised V4 types of CALIPSO and some weaknesses of CALIOP and MODIS retrievals - not only the limited wavelength information and the strong surface reflectance, respectively - should be mentioned (these preferences would probably have a reasonable contribution to the uncertainty in some CALIOP-MODIS retrievals).

In Figure 8 the different strong aerosol sources (e.g. dust source in the region of Bodélé) are not visible. For example, a well-known problem of CALIOP-CALIPSO retrievals is the sufficient underestimation of AOD over strong aerosol sources, an inadequacy strongly related to the presence opaque layers completely attenuating the laser beam. Probably a colorbar with a lower AOD limit (less than 0.8) or with modified bins or just a different colorbar could help with the visualization of this result. If a filter is applied for the smoothness of the colors on the map, this filter maybe contaminates the AOD over the sources especially if the surrounding regions have substantially lower AOD.

In Figure 9 an aerosol-speciated distribution is not clear. It's like having 2 groups of SSA values (land-ocean). A narrower colorbar (starting e.g. from 0.8) could help with the distinguishing of some areas. For example, over the Northern and the Central Africa a lower and a higher SSA value should be visible (dust and more absorbing particles-like smoke from biomass burning-respectively). The same problem is visible for AF.

In Figure 12 it's not clear for me some hotspots of coarse DS particles over the Norway and Sweden

In Figure 13 AOD shows a good agreement with AERONET, but the other parameters rather deviate. In comparison with Figure 9 maybe the results for the other properties need further investigation, since these parameters are also used for the radiative simulations and furthermore for the heating rate.