Review of the article « Climatology of the aerosol optical depth by components from the Multiangle Imaging SpectroRadiometer (MISR) and a high-resolution chemistry transport model ».

This paper presents comparisons of AOD by aerosol components obtained from the MISR sensor and the chemistry transport model (CTM) SPRINTARS for different regions (East Asia, West Africa and Sahara Desert). The approach is interesting but the method is not robust enough at this stage and it is not easy to judge the contribution of this method for improving the model used.

The methodoly proposed in this work is realized in a too simple and incomplete ways and based on comparisons of MISR AOD derived by particle types with those simulated by the CTM SPRINTARS model using single aerosol species. The SPRINTARS simulated AOD using carbonaceous aerosols only are combined with MISR AOD for weakly plus strongly absorbing aerosols. This comparison excludes the possible mixing of carbonaceous aerosols with secondary aerosols that could strongly affect the absorbing properties of aerosols. In addition and depending on the mineralogy and size distribution, desert dust aerosols are able to absorb solar radiations and are not taken into account for the comparisons. For non-absorbing particles, comparisons are based on sulfate particles only, while secondary organics and inorganic aerosols as well as fine sea-salt could also significantly contribute to AOD over polluted coastal regions as studied here over East Asia. These aerosol species are not taken into account and this approach can create important biais in the AOD comparisons.

In that sense, the presented simulations are not sufficiently complete to make realistic comparisons. As most of CTM models contain a detailed description of atmospheric aerosols, including secondary organic and inorganic particles, I recommend to carry out new more complete simulations to make further comparisons. A more adequate particle pairs must be defined from SPRINTAS (Table 1) to realize the comparisons.

Furthermore, it raises the question of why the simulations are carried out over a short period of time and directly compared with climatological mean MISR AOD. It would be more rigorous to perform simulations for a specific month or seasons directly comparable with MISR AOD for similar periods.

Based on these new findings, the authors must further discuss the contribution of this method on the improvement of the model used.

Important points :

A detailed presentation of the model CTM SPRINTAS used in this work is totally absent, although it is an important tool for the study. Authors should provide more detailed informations about the simulations, as the inventory emission, the processes used for primary dust and sea-salt emissions. What processes are included in the CTM SPRINTAS for secondary (organic and inorganic) aerosols ? Particles are representated by bins or log-normal ? Are they represented in external or internal mixing ways ? The deposition processes (dry and wet) should be also provided.

As most of the comparisons are based on AOD, the estimation of this optical parameter is necessary and the authors should indicate the optical properties used for each aerosol and the treatment of hygroscopicity.

As mentionned below, the period of simulations for each case studied (East Asia, Sahara Desert, South Africa) is not consistent with the period of MISR observations. I recommend to perform new simulations and comparisons for similar periods. It would be very interesting to include AOD simulated and observed over land for the Sahara Desert region.

Minor comments :

P33902, L5 : the « high-resolution » term is not adapted here for 7km of horizontal resolution. I would change by « ...and simulations with an horizontal resolution of 7 km from...»

P 33904, L8 : ... « only for AOD values less than about 0.02,... ». In figure 1, number of observations indicate absorbing AOD higher than 0.02 ?

P 33906, L24 : « ...because of the broad impact of Asian aerosols on the North... ». Please indicate the impact here : on air quality ? climate ?

P33907, L6 : « ...due to transport and deposition processes. ». This specific point should be detailed here. The deposition is due to dry deposition ? If scavenging occurs, authors should provide analyses of precipitation for this event.

P 3.3 : I would replace « West Africa » by « South-Africa »
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Figure 1. Please indicate the wavelenghts used for the MISR derived absorbing and non-absorbing AOD and simulated SPRINTAS AOD.

Figure 2. Please indicate the wavelenghts.