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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Development and testing of a desert dust module in a regional climate model" *by* A. S. Zakey et al.

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Thanks for your comment !

1 : Change in title : accepted .

2 : We were talking about a low pressure system , abstract will be modified.

3 : Modification accepted

4 : Soil aggregate distribution Soil texture in the model are described from a 'classic' soil classification (12 soil texture listed in table 1) widely used in meso-scale model (mm5 , RegCM, MesoNH etc) to determine soil physical properties . The corresponding geographical distribution of these texture can be retrieved on the site ftp://ftp.ucar.edu/mesouser/MM5V3/TERRAIN_DATA) and it is public. Each of this soil type is then characterized by an aggregate distribution given in table 1. Thus in the

standard version of the model, the soil texture classification is not specifically developed for dust use. However this provide an option that can be used on any domain of the globe, and consistent with treatment of soil physics (humidity) in the model.

5 : Model description. We felt that it was necessary to provide the equation used to better show the theoretical context in which the different soil and atmospheric model parameter were used, and as a support and condensed documentation for someone interested to use RegCM -dust option (a UNESCO public model). We agree that this theoretical background is directly taken from published work and we acknowledged that many time in the text (it will be reemphasized in the revised version) . We will shorten the corresponding text in the revised version.

6 : Choice of bins: As this comment is recurrent in the different reviews, this point has been addressed and will be presented in the revised version. The distribution used in aerosol optical properties will be consistent with the emission distribution, and the link between emission sub-bin and transport bins will be more explicit (see also other replies to referees).

7 :The Northeast Africa case.

The model is in fact forced by ERA40 data . We did a mistake in the description of the simulation set up (see reply to referee 3) .

8 : Meteorological comparison.

(i) The ERA40 forcing is applied only at the boundaries of the model. Inside the domain, wind field are calculated by the model (climate model as opposed to CTM) and can differ from reanalysis field. The interest is to address the feedback of aerosol on the dynamic. The ERA40 fields presented are just interpolated on the model grid and used as a reference fields to evaluate the quality of the calculated fields. (ii)In the coupled model, the 10 m wind are indeed used by the dust (and surface) schemes. 10 m wind are calculated from the lowest level prognostic wind field and surface roughness.

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However we don't have the 10m wind in the ERA40 data interpolated on the model level grid (the lowest being around 25 m) . For consistency we thus presented a comparison at the first model level.

9 : Conclusion

The SHADE Lidar observation shows the existence of a high dust layer between 2000 and 5000 meters in relation with 'remote' sources . This layer is also referred as the Saharan dust layer in quite a lot of studies. It is difficult to know by observation if the model dust layer is consistent at the seasonal time scale, and what could be its real spatial variability. Between 2000 and 5000 m , there are about 5 to 6 model sigma-level : it is likely that the model misses some possible stratification patterns, as observed for example in the SHADE case.

Interactive comment on Atmos. Chem. Phys. Discuss., 6, 1749, 2006.