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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Modeling of Saharan dust outbreaks over the Mediterranean by RegCM3: case studies" *by* M. Santese et al.

Anonymous Referee #1

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Santese et al., Modeling of Saharan dust outbreaks over the Mediterranean by RegCM3: case studies, to be published in ACP

General

The manuscript is appropriate for ACP. Keeping the recent literature in this field into considerations, I found the paper not very interesting. What is new? ..is my main question. Results are described, but interpretation is poor. There is enough room for improvements.

Details

Abstract, line 18: LW forcing unit percent of what? Introduction: What is the main step forward in view of the literature dealing with atmospheric modelling in this field of research including feedback mechanisms?

The reasoning why to use regional models to look at the radiative effect of dust and other aerosol processes rather than use GCMs is not really convincing for this setup. The authors use the model with a grid spacing of 50km, which is not that much higher than the ability of some GCMs that contain an aerosol module but those global models could in turn provide the response at large spatial scales and response of sea surface temperatures in addition. At 50km grid resolution parameterizations of e.g. boundary layer and convection processes are required that may lead to similar shortcomings compared to global-scale models.

Section 2.2 Dust Model: Even though the optical properties of dust used in this model are described by Zhang et al., 2009, some information should be given here as well (at least on particle size, single scattering albedo), and compare those to other publications. In several instances the authors mention the importance of dust optical properties for its radiative effect, so it needs at least some description.

Figure 1: What is the significance of showing the sand source for the dust model description?

Section 3.1: Using the Navy Web address as reference for the (NASA) SeaWifs product is strange. In fact, why the comparison with true-color imagery (Figure 2), when actual aerosol optical thickness products are available (e.g. from MODIS, which is used later in Figure 4 anyway)?

Figure 4 would be more instructive if (1) the model results would be shown subdivided for the different aerosol components (dust, other aerosols), to show the importance of the dust components, and (2) show additionally the Angstrom parameter from the Aeronet data to give an indication of the presence of dust at individual times/locations.

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Figure 5: Why limit the comparison with MODIS AOD to Aeronet locations? Both MODIS and model AODs are available at other places!

Figure 7, Comparison to Lidar at Lecce, particularly at 17. July: The authors attribute the model underestimate at low altitudes to insufficient dust transport however the dust should be expected at higher altitudes, it appears that the model in this case underestimates (local?) anthropogenic aerosol . The description of the forcing results(section 4) reads rather tedious. Maps of forcing efficiencies would be interesting rather than just showing the total forcing results, as this might highlight differences due to different aerosol composition.

Section 5, Aerosol feedback: The whole feedback part is rather confusing. If the effect of forcing on aerosol transport is discussed, this should be shown by differences in AOD or mass loads rather than by differences in TOA forcing, which can depend on many things. In Figures 13 and 14 the aerosol extinction profiles should be included. What is actually the effect of including the dust forcing on dust emissions? Earlier regional model results consistently show decrease in dust emissions due to decreasing wind speeds. If this is the case here it should be clearly stated (and shown). Comparisons of the meteorology with actual measurements are missing.

Interpretation of the changes in atmospheric dynamics due to the aerosol forcing is only very superficial.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 19387, 2009.