

Interactive
Comment

***Interactive comment on* “Dust emission size distribution impact on aerosol budget and radiative forcing over the Mediterranean region: a regional climate model approach” by P. Nabat et al.**

Anonymous Referee #3

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Overall comments:

The manuscript “Dust emission size distribution impact on aerosol budget and radiative forcing over the Mediterranean region: a regional climate model approach” by P. Nabat et al., explores the extent to which RegCM-4, a regional climate model, is sensitive to the different approaches used in representing dust emission distribution and the impact these different approaches have on the dust budget, aerosol optical depth and aerosol direct radiative forcing both in SW and LW radiation focusing in the Mediterranean region. To find the most realistic distributions, authors perform two simulations for the

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year 2008. In a next step they carry out ten-year simulations to characterize the aerosol optical depth, emission and deposition in the Mediterranean, in order to estimate their potential impact on climate through direct SW and LW radiative forcing.

Although the effect of dust on the Earth's radiative budget has been quite extensively examined, still, there is a lot of uncertainty associated with it. Much of this uncertainty arises from the approaches used in models to represent the size distribution of the dust particles. Towards this, the present study employs a new scheme for representing the dust size distribution that is independent of wind speed, a hypothesis that has been shown to produce result that agree well with observations.

The manuscript is very well written and is a step towards the improvement of the estimation of the effect of dust on the Earth's radiative budget. The work presented is comprehensive, including evaluation of modeled AOD with satellite records, data from AERONET and LIDAR, and simulations for different time scales that address both seasonal and inter-annual variability. Overall, the manuscript is publishable in ACP after some minor issues will be addressed.

Detailed comments:

1. Page 17848, line10: Please state where these AERONET stations are located.
2. Figures 9 and 10: Please add the scale bars.
3. Figure 11: Please add "Latitude" and "Longitude" titles.
4. Conclusions: Although the manuscript is quite extended and the results have been clearly presented, a quantitative presentation of the basic findings (e.g., improvement of modeling results using the new framework) would be also useful.
5. As also the authors point out, the effect of not using a model that has a two-way interaction between atmosphere and oceans, involves some limitations. Please discuss in a quantitative manner how different would the results be if such a model was used.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 17835, 2012.

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