

## ***Interactive comment on “Comparing two years of Saharan dust source activation obtained by regional modeling and satellite observations” by I. Tegen et al.***

**Anonymous Referee #3**

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### General Comments:

The manuscript “Comparing two years of Saharan dust source activation obtained by regional modelling and satellite observations” present the results of comparing two-year regional model simulation of Saharan dust distribution against observations of dust source activation (DSA) data derived from brightness temperature differences obtained from the Spinning Enhanced Visible and InfraRed Imager (SEVIRI) onboard the geostationary satellite Meteosat Second Generation (MSG). In addition, the simulated aerosol dust load was compared to satellite and ground based observation. A qualitatively analysis was done against the Ozone Monitoring Instrument (OMI) aerosol

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index (AI) and a quantitative one against aerosol optical depth (AOD) from the Aerosol Robotic Network (AERONET). The results point to the importance of low-level jets (LLJs) in simulating dust emissions in the Saharan desert and the features the model has difficulties to reproduce. The paper describes the context of the work and exposes the relevant concepts in a clear and understandable way. The methodology of the work is clearly described and the results are also presented in a clear and comprehensible way to the reader. I therefore suggest the paper to be published after some minor corrections.

### Specific Comments:

-To validate the horizontal dust load distribution, the authors compare the simulations to the AI from OMI. This is a qualitative analysis and does not allow to conclude on intensity of the load. I suggest the authors include another quantitative analysis besides the one done with three AERONET stations. MODIS Deep Blue delivers information over the Saharan desert that can be used for a quantitative validation.

-The authors clearly illustrate the importance of LLJs for dust emission in terms of frequency but they do not provide much information of these dust events in terms of emitted quantity. How much of the 1870 and 2330 Mt for 2007 and 2008, respectively, are emitted by LLJs? How much does the amount of emitted dust vary from one event to the other? The authors should extend the analysis in terms of the amount of emitted dust.

- It is not clear from the manuscript whether simulated DSA events need to coincide with observed ones. It seems from sections 3.1. that the only requisites that need to be reached in order to have a dust event is that the daily emission flux in the model grid cell be larger than  $0.6 \times 10^{-4} \text{ kg m}^{-2} \text{ s}^{-1}$  and that the simulated cloud cover be lower than 50%. Could it be that a dust event was selected even if no event was observed that day? Please clarify and if so please include in the analysis.

-The simulated cloud cover is used to include in the analysis the fact that satellite

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cannot detect dust when cloud cover is present. Why not sample the model data according to the availability of observations? If cloud cover data are used the authors should include in the analysis the model performance to simulate cloud cover. What is the impact on the results?

-Pg. 27674, line 24: Authors state that 65% percent of the dust in the model is simulated before noontime. Is here the same definition of dust event applied than for the definition of DSA (i.e. emission flux during the day exceeds  $0.6 \times 10^{-4} \text{ kg m}^{-2} \text{ s}^{-1}$ )? Please clarify if throughout the paper whenever referring to dust event it will always be using the above criteria.

Technical Comments:

-Pg. 27674, line 6: “regions of in the Saharan desert” choose one.

-Pg. 27680, line 14: replace “Ehile” with “While”.

-Page 27691, Figure 5: Time series for Dakar is presented but not addressed in the text. I suggest the authors include Dakar in the analysis of pages 27679 and 26680.

-Pg. 27691, Figure 5: change time axis from Julian to calendar day and black dots are hardly seen, maybe changing colour would make them easier to be seen.

-I recommend to include the location of the AERONET stations in one of the maps

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Interactive comment on Atmos. Chem. Phys. Discuss., 12, 27667, 2012.