

## ***Interactive comment on “Mineral dust aerosol from Saharan desert by means of atmospheric, emission, dispersion modelling” by F. Guarnieri et al.***

**Anonymous Referee #2**

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The authors developed a 3-D transport model by combining three different modules: an atmospheric model, a dust emission model and a transport / deposition model. Each of these three modules is described but for detail the reader is referred to the literature. The model is applied to compute dust distributions over the domain of validity for June 2006 and the results are qualitatively compared with AOD obtained from GOCART computations and with data from three in situ stations in Tuscany.

It is not clear what the authors are presenting here. Combining three existing modules into a single model is not novel enough to justify publication. The application to 1 month is not clear: why was this month selected? What do the authors want to illustrate with

C6385

this case? The header of section 4.1 suggests that an analysis is presented but I fail to see what has been analysed: I see only model computation results, no interpretation or application. None of the effects mentioned in the introduction are addressed. What are the consequences of dust transport over the domain of interest?

Next the model is “evaluated” by comparison with GOCART, and the authors claim a “very good agreement” (p. 7322, line 15). This is very hard to see from comparison of Figures 7 and 10: the scales are different, the colour schemes are different and it is hard to judge whether even the spatial patterns are qualitatively reproduced: there seem to be different features across the domain. Another question is how dust concentration (even when vertically integrated) can be compared with AOD?

The comparison with in situ data is also qualitative since dust concentrations are integrated over a different size range than measured. Why was the size range used in the integration not matched to the measurements? What dust size distributions were used in the model? (note that this is important to evaluate the physical processes): some properties are given in Table 1, but I could not find how the effect radius and size range was used in a size distribution model. Why was the comparison restricted to only three stations, all of which are in Tuscany, why wasn't this extended to more stations across the computational domain? Why were lidar measurements not used to evaluate the vertical distribution? Why were no satellite data used for comparison?

In summary, the model development is not novel, I see no validation, no interpretation and no application, and therefore suggest rejection of the manuscript.

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