

Interactive comment on “Aerosol distribution over the western Mediterranean basin during a Tramontane/Mistral event” by T. Salameh et al.

Anonymous Referee #1

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This paper uses two models and a variety of observation data to analyze the aerosol distribution during a Tramontane/Mistral event. While the event is interesting, the analysis has very little physical explanation for the discrepancies between model and measurement. Some paragraphs are one-page long, without focusing on any central questions. Furthermore, the paper lacks the scientific importance needed for publication in ACP. The paper should be rejected in the current form. My major concerns are listed in below

1) The objective of this paper is unclear. In the introduction part, the authors stated that the article is designed to (a) analyze dynamical processes driving the Mistral flow and its relationship with aerosol distribution observed by lidar and satellite, and (b) aerosol source, composition and distribution over the whole Mediterranean basin. However,

their findings as stated in their abstract and conclusion part don't echo these two objectives, in particular, the second objective. Under the Tramontanel/Mistral wind and their interaction with topography, would that be expected that the aerosol distribution is less stable? I don't see anything new in here. It would be interesting to quantitatively show the amount of aerosol mass transported by the Mistral and how that enhances the background aerosols?

2) They mentioned this paper is motivated by the aerosol radiative effects. However, the authors didn't conduct any analysis of aerosol radiative effects in the paper, and seemly have no future plan to do so (their last sentence in the conclusion part says: future work will be dedicated to assesses the representativity of this case study). Hence, the paper lacks the scientific importance needed for publication in ACP. Here are some questions that should be addressed in this paper

a) What are the aerosol radiative effects on surface temperature and atmospheric lapse rate? Are they important to explain the discrepancies between model and measurements in Figure 3, Figure 4, and Figure 6?

b) Why the model-simulated AOD is only about 50% of satellite-retrieved AOD? Which one should reader trust? If the model error is quite large, then further analysis of model results lack the credibility.

c) Table 1. The difference of simulated and measured sulfates and nitrates is quite large, and in some cases, the difference is a factor of 3-4. The authors attributed these differences to the distance between the observation site and the location of simulated sulfate plume in the model. I don't think this explanation has any scientific value. What are the possibly physical reasons for this difference? Is it related to any non-ideality in the emission strength, boundary layer scheme, or other causes? If there is a 50km difference, can authors show the two model values, one in the pollution plume and another just over the station? Without a detailed analysis to explain the large difference, I doubt the fidelity of their other analysis.

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d) More quantitative analysis is needed. What the correlation is between modeled and satellite AOD? What is their correlation with AERONET AOD? What are the correlation between modeled and measured sulfate and nitrate? A time-series of modeled and measured aerosol mass will be helpful as well.

Interactive comment on Atmos. Chem. Phys. Discuss., 6, 11913, 2006.

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