

Interactive comment on “WRF-Chem model simulations of a dust outbreak over the Central Mediterranean and comparison with multi-sensor desert dust observations” by Umberto Rizza et al.

Anonymous Referee #2

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General Comments

This study evaluated the WRF-Chem simulation for a dust event over the Central Mediterranean in May 2014. The evaluation used multiple observations including satellite and ground data. Understanding the dust emissions over Sahara and how those dust particles can be transported towards the Mediterranean is an important topic. However, the evaluation and analysis presented in this study are in poor quality. Among the comparisons between the model and observations, I can only see the good comparison with AERONET AOD. All other comparisons are not good. However, the authors did not spend efforts to improve the simulation or conduct any sensitivity experiment to provide any suggestions to improve the model against observations in

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future. This makes the study less significant. More specific comments listed below.

Specific Comments

1. In the model setup session, please describe how long does the simulation last? What's the initial date and chemical initial and boundary condition?
2. Figure 2 shows geopotential distribution from the AIRX3STD not from a reanalysis. However, later on, many discussion about the wind fields. Then, why not just using a reanalysis dataset for both geopotential and winds? Please explain.
3. Line 5-9 of page 10, the authors evaluated water vapor mixing ratio and claimed that water vapor is important for chemistry. However, do we expect significant impact from chemistry in this study? If yes, is GOCART-simple scheme too simple for complex chemistry involving dust? Don't see the reason for evaluating water mixing ratio for this study.
4. Figure 3 and 4, when comparing model results and measurements, they need to be shown in the same map projection and domain. The current format is very confusing. The label showed below each figure indicates "GRADS" and "date" needs to be removed.
5. Figure 5 is too busy. Suggest separating AOD and emission. Emission color contour with 10-m winds, and AOD color contour with 700 hPa winds.
6. Again, Figure 6 and 7 need to be on the same map project and domain for direct comparison. The current format is too confusing. The two figures are also with different color tables. It seems to me that there is significant difference between MODIS and model. Is it due to the different map projections and color tables? What is the spatial correlation coefficient between the measurements and simulations?
7. Figure 8, comparing with AERONET, please show the mean bias and temporal correlation coefficient for each site.

8. Quality of Figure 9 needs to be improved.

9. Figure 10, I didn't see that the model reproduces vertical structures. Please show the vertical correlation coefficient for each profile.

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