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Atmospheric Chemistry and Physics Discussions

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 #1

Received and published: 12 September 2016

In this paper, the WRF-Chem was used to simulate an intense Saharan dust outbreak event that took place over the Mediterranean in May 2014.Results have shown that a cyclone near the Atlantic coasts of Spain is responsible for strong westerly Atlantic winds (about 20 m s-1) reaching the northern Sahara and leading to the lifting of mineral dust. The northward transport is made possible by a ridge over the central Mediterranean associated with the omega-like pressure configuration. Compared with optical properties from satellite and ground-based sun-photometers and lidars, plus in situ PM10 data, the WRF-Chem data showed a good agreement with them in different aspects.

In general, the comparison between WRF-Chem and other multi-sensor desert dust

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observations maybe a good point. However, the manuscript needs to be extensively improved in some details. I strongly advice the authors to take into consideration of the following minor remarks so as to improve the quality this manuscript.

Comments

1. The abstract is too long and need to be simplified so that the readers can catch the major points and results.

2. This paper doesn't have key words, please add them.

3. I would suggest authors include more recent paper in this field to strengthen the introduction section. The following paper is for reference only:

(1) Shao, Y., et al., 2011: Dust cycle: An emerging core theme in Earth system science. Aeolian Research, 2.4 (2011): 181-204.

(2) Huang, J., T. Wang, W. Wang, Z. Li, and H. Yan, 2014: Climate effects of dust aerosols over East Asian arid and semiarid regions, Journal of Geophysical Research: Atmospheres, 119, 11398–11416, doi: 10.1002/2014JD021796.

(3) Wang, W. et al., 2010: Dusty cloud properties and radiative forcing over dust source and downwind regions derived from A-Train data during the Pacific Dust Experiment, Journal of Geophysical Research, 115, D00H35, doi:10.1029/2010JD014109.

(4) Chen, S., et al., 2013: Modeling the transport and radiative forcing of Taklimakan dust over the Tibetan Plateau: A case study in the summer of 2006, Journal of Geophysical Research: Atmospheres, 118 , doi:10.1002/jgrd.50122.

(5) Bi, J.et al., 2011: Toward characterization of the aerosol optical properties over Loess Plateau of Northwestern China, Journal of Quantitative Spectroscopy Radiative Transfer, 112 (2), 346-360.,doi:10.1029/2009JD013372.

4. Page 10 As we known, many factors such as Wind speed, Atmospheric stability, and so on play an important role in dust emission, why are the two factors more important?

Why do you show the Fig.4 in the paper?

5. Page10, Line 32 Is the threshold calculated in this paper or obtain from other literatures? This paper did not tell us explicitly.

6. Page11 “the total dust flux (white contours for the selected dates of May 18, 20, 21 and 24 (panels a, b, c, and d respectively). The AOD is obtained from WRF-Chem simulations vertically integrating (from the ground to the top of domain, i.e. 20 km) the aerosol extinction coefficient at 550 nm. The same figures also show: i) the wind field at 10 m (black arrows), that is directly connected with the dust emission, and 5 ii)” Please check the brackets whether match or not.

7. Page11, Line32 What’s a system of ephemeral salt lakes effect on the four dust sources?

8. Page15, Line16-17 What’s the reasons that the model overestimated the dust peak (PM2.5 and PM10)?

9. Fig. 1: The fonts in the map are too small that they are difficult to read.

10. Fig.2: You can use the same color bar in Fig.2.

11. Fig.3 and Fig.4: You should use the same domain, map projection, and color bar.

12. Fig. 11: The figure seems to be very busy. Could you modify it?

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