

Interactive comment on “Positive feedback of dust aerosol via its impact on atmospheric stability during dust storms in the Eastern Mediterranean” by S. Remy et al.

Anonymous Referee #1

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The manuscript entitled: “Positive feedback of dust aerosol via its impact on atmospheric stability during dust storms in the Eastern Mediterranean” attempts to describe the influence of dust aerosols on a prediction both in an assimilation and non-assimilation mode. This topic has been little addressed in the past and deserves attention as the results presented show but I have two reservations with this paper: First, the authors are not aware of the literature about dust on this topic and miss out on (at least) two very substantial previous studies, I am thinking of the work of : Pérez et al. (2006) and Miller et al. (2014). The authors would greatly benefit from reading these 2 papers and contrasting their results with the ones included in these 2 papers.

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Second, the choice of experiments precludes assessing the full effect of dust aerosols in the simulations since all experiments have either a dust climatology or have aerosols that are calculated prognostically. It would have been wiser to also have an experiment without any dust, hence allowing to assess the full effect of having dust on SW and LW radiation as well as on the physical parameters studied (T2m, pressure, temperature and boundary layer dynamics). I propose that the authors put their paper in the context of what others have done before which should enhance its impact and help the authors study the mechanisms by which a positive feedback is created here.

Minor points :

Title and throughout the paper : ‘dust’ and ‘aerosol’ are redundant terms. Dust is an aerosol, I propose that the authors use either dust, either mineral aerosol throughout the text.

Some parts of the paper are very well written some other have been written hastily and deserve more work. This is the case with the second paragraph of section 5 that needs to be improved. (lines 7 to 24, page 28164).

In the following sentence p 28153: “The Baseline Surface Radiation Network (BSRN) (Heimo et al., 1993) maintains two stations in the area of interest: Tamanrasset (Mimouni, 2013 in Southern Algeria and Sede Boqer in Israel, Lyubansky, 2012).”, you need to fix the parenthesis as follows : “The Baseline Surface Radiation Network (BSRN) (Heimo et al., 1993) maintains two stations in the area of interest: Tamanrasset (Mimouni, 2013) in Southern Algeria and Sede Boqer in Israel, (Lyubansky, 2012).”

Figure 3 caption : The VIS image from MODIS/Aqua is said to be at the bottom of the Figure whereas it is at the top, please correct it.

Page 28161, please explain the mechanisms as to why you observe the following: ‘While the incoming solar radiation was affected by the SW experiment only when the AOD was highest, i.e. on 18 April, long-wave radiation in the LW experiment is more

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sensitive to lower values of AOD.'

In terms of describing all the simulations that you made in the text of the manuscript it would be more efficient and easier for the reader to present a Table with these simulations.

Page 28161, line 18: change 'systemically' to 'systematically'

Concerning Figure 6, do you have an explanation as to why the effect on the LW can be seen for much longer periods and is much larger than the effect of the SW. You give some hints in the text and you could have a small paragraph that focuses on this finding.

Caption of Figure 9: You indicate AOD or REF minus LW for the top of the Figure. I believe you do not show any AOD on Fig. 9. Please correct the caption.

Page 28171, line 13: change "It is highly probably..." to "It is highly probable..."

Title of Tables 2 & 3: take out 'left' and 'right' from these titles.

Pérez C, Nickovic S, Pejanovic G, Baldasano JM, Özsoy E (2006) Interactive dust-radiation modeling: a step to improve weather forecasts. *J Geophys Res* 111:D16206. doi:10.1029/2005JD006717
Miller, R.L., P. Knippertz, C. Pérez García-Pando, J.P. Perlwitz, and I. Tegen, (2014) Impact of dust radiative forcing upon climate. In *Mineral Dust: A Key Player in the Earth System*. P. Knippertz, and J.-B.W. Stuut, Eds. Springer, 327-357, doi:10.1007/978-94-017-8978-3_13

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