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Atmospheric Chemistry and Physics Discussions

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.

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The objective of this study is to assess the impact of the dust direct effect on the forecasted meteorological parameters for selected dust storms. Not many studies are already addressed to this issue. The study aims to assess how much the dust-radiation impact, if introduced in numerical weather prediction systems improved weather predictions. The authors present results of several sensitivity experiments performed: impacts of AOD satellite data assimilation, radiative forcing with dust climatology vs. online predicted dust, the model forcing with different radiation components affected by dust etc. Conceptually, the study is well designed, providing a reader detailed insight

to the results.

However, it could be useful the authors indicate how close is the MACCII system (other systems if the authors are aware), to operationally implement the dust-radiation impacts (I guess together with other aerosol types) in order to further improve accuracy of weather forecasts.

Since similar studies were already reported, the authors should mention an early work, probably the first of that kind, on introduced interactive dust radiation effects in order to improve atmospheric model forecasts (Perez et al JGR 2006 and predeceasing work cited there). Also I suggest the modelling study of Spyrou et al 2013 ACP to be referred. I suggest the authors comment how results of the current study in general compare with the work in the mentioned or similar references.

After considering the comments above and those listed as specific, below, I propose the study to be published.

Specific comments Pg 28148, line 3. '. . .we report on a new mechanism. . .' The statement is not quite adequate; the mechanism is not new but studied in details.

Pg 28148, lines 18-19 'Overall, the impact by the long-wave radiative forcing was more important than the short-wave contribution' Comment please how much the result compares with similar studies.

28149 lines 10-11 '. . .the aerosol-clouds interaction or aerosol semi direct and indirect effect, by influencing the concentration, size and chemical composition of the cloud condensation nuclei (CCN). . .' Report on recent observation and modelling studies on dust important role in ice nucleation, e.g. Hoose, C. and Möhler, 2012, ACP; Niemand et al, 2012 ACP

Pg 28150 lines 18-20 ". . .Dust aerosol events over the Eastern Atlantic may also impact hurricane activity over the Atlantic and Caribbean areas (Kamal et al., 2012 and S. H. Chen, personal communication, 2014)'... I suggest the statement to be mitigated. The

subject is still under research and yet no firm conclusions can be stated.

Pg 28152lines 18-20 "...Dust sources are then parameterized, following Ginoux (2001), as a function of the cubic power of 10m wind speed... The sentence is not precise. The emission, not sources is a cubic function of wind.

I suggest 'forward model' is replaced by 'online model'

Pg 28157, lines 3-4 '...the aerosol fields were initialized from the MACC re-analysis on the 10 April 2012...'; The start of the cycled forecasts start just one day before the first dust storm event happened. It might be too short time for the model to spin-up the dust cycle. Please comment.

Pg 28157, lines 7-8 '...In The main advantage of this configuration comes from comparing the model outputs with and without radiatively interactive aerosols....' Also beginning of Pg 28158; Then Pg 28156 '...The objective of this study is to assess the impact of the aerosol direct effect...' Also many other parts of the text refer aerosol in general, not specifically dust These are just a few of many examples where this is not obvious if dust is separately treated from other aerosol components in the model or not. I suggest that dust is clearly terminologically distinguished from the other aerosol components in the model.

3 Methodology I suggest the authors introduce a table with brief description of experiment types reported.

Pg 28171: '...In the absence of daytime radio-sonde data in Egypt...' Is there a nighttime radio-sonde data in Cairo? If yes, I suggest this data to be used to compare results of different simulations, especially for temperature profiles.

Fig. 14,16 I propose to show parameters differences rather than sided values. Pg 28175 '...However, this (short-wave) feedback was much smaller than the interaction of aerosols with the meteorology brought by the radiative impacts of aerosols in the long-wave spectrum...' Compare this with similar studies if existing.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 28147, 2014.