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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The Influence of Simulated Surface Dust Lofting Erodible Fraction on Radiative Forcing" *by* Stephen M. Saleeby et al.

Anonymous Referee #2

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The manuscript analyses the numerical simulations of dust lofting using erodible dust fraction as input and its impact on radiation during daytime hours and nighttime hours. The dust erodible fraction is taken from dataset from three methods, namely, the "Idealized", "Ginoux", and "Walker". The numerical simulations are done with WRF and RAMS over the Arabian peninsula. Overall, the manuscript is well written, logically presented, and is interesting to read. I recommend the publication of this manuscript after considering the following suggestions:

1. I could not find any quantitative validation exercise between MODIS and Model AOD. Please clarify. Can the MODIS AOD be extracted at some of the stations and compared with Model data? It has also been inferred in previous studies that MODIS data overpredicts AOD for regions predominant with dust (see Remer et al., 2005).

Please take this into account while validation of the model. Remer LA, Kaufman YJ, Tanré D, Matto S, Chu DA, Martins JV, Li RR, Ichoku C, Levy RC, Kleidman RG, Eck TF, Vermote E, Holben BN (2005) The MODIS aerosol algorithm, products, and validation. J Atmos Sci 62:947–973. https://doi.org/10.1175/JAS3385.1 2. A large underestimation is seen between model and AERONET AOD. What could be the reason for this? It will be nice if the authors could provide a quantitative validation, including bias and normalised mean error. How much is the uncertainty in AERONET AOD for regions predominant with dust? I suggest strengthening this Section by providing information from any available literature study as well. One of such studies, I recently found is by Kokkalis et al., (2018). Long-Term Ground-Based Measurements of Aerosol Optical Depth over Kuwait City. Remote Sensing, 10, 1807; DOI:10.3390/rs1011180710. 3. Also, why "Ginoux"' is larger than the "Walker" (refer to Figure 7c)? Please include some discussion on this. 4. How much is the difference between the simulated dust concentration from NAAPS and that from RAMS and WRF? I suggest the authors discuss this as they provide NAAPS dust concentration. 5. How much is the expected uncertainty in your model values for radiative impacts? 6. I suggest to compare the radiative implications, such as radiative cooling/heating during daytime and nighttime with observational data 7. Refer to Figure 10f: Is this for Total LW fluxes? Or for total radiative fluxes (SW+LW)? Please check.

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