

Interactive comment on “The climatology of dust aerosol over the arabian peninsula” by A. Shalaby et al.

Anonymous Referee #1

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General comments: The paper addresses relevant scientific questions within the scope of ACP. The authors do not clearly support to present novel concepts, ideas, tools, and data, but they analyze an area (i.e. Arabian Peninsula) which has been less studied when compared to Sahara. Improvements should be made with respect to the clear outline of the scientific methods and data used, as advised by the short and reviewer's comments. The overall presentation is not so well structured and clear. Modifications are needed according to the attached comments. In the introduction (last paragraph), the motivation/ goals/questions should be clearly shown. Although results are sufficient to support the interpretations and conclusions, they should be restructured so that they clearly analyze/answer these topics/questions.

Specific comments: The title does not incorporate the second main objective of this
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article (dust aerosol radiative forcing estimation). Could it be that it is rephrased accordingly, without being much longer? Abstract: the abstract should be rewritten after all comments are taken into account, so that it serves as a concise and complete summary of the article. line 13: the sentence is too long. It could split in two: eg obs and model findings (the latter in comparison to obs., plus clearly showing similarities and reasons for discrepancies) or which is the cycle? how the model performs and why? Introduction. In general: although I could guess that after the first two introductory paragraphs, the next two present previous studies with respect to each objective, I advise that this should be more straightforward and clear. The second paragraph, although with clear content, is not directly linked to this study, as described in the subsequent introductory paragraphs. The third paragraph, although it describes previous work on dust over the Arabian p., it does not indirectly start revealing (in conjunction to the next introductory paragraphs) the new/original contribution of the current study. Please, modify accordingly. I would suggest another thorough search in literature with respect to the appropriate references to the same/similar subject. Also, I suggest removing 'this paper focuses...' before this description. It is not specified in the introduction (last paragraph) how the model complements measurements (or vice versa) in the current study. Also, the term (or concept) climatology (long term study) is not at all referred in the introduction (either for this and/or the other studies). Sect. 2.1: I would expect the authors take in mind the two short comments posted, regarding data usage. The same for the comments of Reviewer #2 on reduce/elimination of unneeded data. An idea: it would be more helpful to provide a table for each set of obs., instead of sect. 2.1.1-2.1.4. Please, have in mind to provide all data so that the work could be reproduced by other fellow scientists. Regarding section 2.2, I would only keep the last paragraph of 2.2.1. the rest two can lie in a table in the supplement. In this table, all other schemes/model configuration information named in sect. 2.2.3 can fit, too. Again, have in mind to provide all information so that the model runs could be reproduced by other fellow scientists. Sect. 2.2.2 can be merged into 2.2. The first paragraph of now sect. 2.2.2 should be removed, only references should occur, where one can find information on

the dust uplift processes. Then, again only information related to how Regcm model incorporates already existing functions should remain. Descriptions that already exist in the source citations should be avoided. The ones found absolutely necessary to be duplicated, can be moved to an appropriate section in the supplement. Please, advice previously published supplemental material for their appropriate format/structure. All in all, subsections of 2.2 are unnecessary. After a short reference to the model, to its aerosol and dust treatment and to the table for all the incorporated processes/ modules, a short description of model period/domain and scenarios (if any) can follow and close this section. Sect. 3.1: It is not clear to the reader (in general in this article), why you use both the model and observations (although one can guess, this is not enough). You do not explain how the one complements the other. Also, reasons for their discrepancies are not given (eg different resolutions?? And /or known model discrepancies of the relevant modules, shown either from sensitivity tests or from previous regcm applications). From figs 2 and 3, it is evident that both obs and preds give the same information. . .thus, why coexist? Please explain /support your tools. Why both fig 2 and 3 are necessary? What information stems from the one that does not stem from the other? To my view, figure 3 is representative for this section. Figure 2 –if necessary– could be move to the supplement. If I am incorrect, please justify. In general, I do not get the structure in the results sections 3 and 4: you mention spatial and temporal evolution, while previously you have already talked about the annual cycle and specific regions. I would advise you to have one section as ‘Results’ and then each subsection should represent a clear concept answering to a specific question (eg model evaluation, dust climatology etc). Section 5: again, it is not clear why you use both model and obs. You mention ‘comparisons’ but what do they serve existing throughout the article? To my view, the question is ‘dust radiative forcing’ and the answer should be given with the main tool of this study. Assuming this is the model (which should be mentioned explicitly if true), then measurements only serve as evaluation tools. But, if observations can answer the same question, then why use the model? An obvious advantage of predictions vs. obs is the extended spatial distribution of the radiative

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forcing. But if I am not mistaken, it is not shown here. Shouldn't figure 11 and the respective paragraph describing it be among the first results of this study? These are the emissions that are then advected through the atmosphere. Or, in case it is only used to explain the main results, it should be placed in the supplement. There is the potential to provide substantial conclusions, although currently the respective section needs rewriting. Specific notes on parts of the paper (text, figures, tables) which should be reduced, combined, or eliminated are given here and in the attached pdf. The amount and quality of supplementary material should be modified as advised in the relevant comments The language is quite fluent and precise. Where appropriate, specific directions are given. Please do a thorough check on the correct definition and use of the symbols, abbreviations, and units.

Technical corrections: they are provided in the attached pdf

Please also note the supplement to this comment:

<http://www.atmos-chem-phys-discuss.net/15/C563/2015/acpd-15-C563-2015-supplement.pdf>

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