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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Feedback between dust particles and atmospheric processes over West Africa in March 2006 and June 2007" *by* T. Stanelle et al.

Anonymous Referee #2

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Review of the manuscript "Feedback between dust particles and atmospheric processes over West Africa in March 2006 and June 2007" by Stanelle et al.

This manuscript shows experiments based on coupling of an atmospheric model with a dust model component. The study is based on two major Saharan dust storms. The authors developed a method that introduce on-line interaction between the atmospheric radiation and dust concentration, and thus provides sensitivity analysis of results with and without dust-radiation feedbacks.

The chosen research subject of the study is of particular importance for treating the dust-radiation interactions in the future chemical weather forecasting systems, since

some observation studies indicate possible improvement of the weather forecasts when dust concentration is considered as a controlling factor of the atmospheric thermodynamics. Having this in mind, I welcome very much the selected subject of the presented work.

However, in my major comment listed bellow I express a concern with respect to the authors' conclusions about the sign of the surface temperature response and corresponding sign of the feedback mechanism. I therefore ask the authors to reconsider the results by performing additional tests.

MAJOR COMMENT The major result of the study is an increase of the surface temperature and connected positive feedback in the regions of the largest concentration over Sahara. This result contradicts to decrease of temperature and negative feedback effect obtained by all (according to my knowledge) published similar studies; most of them the authors reference in the manuscript. At least one of the previously published experiments is based on use of the same atmospheric driver implemented in the current study. A common feature of the current study and several other similar works are that all are based on selected dust storm cases. So, lack of longer-term model experiments in all current studies could explain the existence of divergent conclusions from different studies.

Taking into account the importance of the subject of this study and necessity to clarify the way how dust affects the radiation balance, I strongly propose to authors to perform additional model experiment performed over a selected 3-month season, and to evaluate the model results with respect to the surface temperatures for available SYNOP stations over northern Africa. Although indirectly, the proposed sensitivity experiment can indicate the features of the dust direct effects on the radiation balance.

1. Does the paper address relevant scientific questions within the scope of ACP? Yes.
2. Does the paper present novel concepts, ideas, tools, or data? The paper presents a concept of experiments studying sensitivity of the dust-radiation model on direct effects

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of dust on radiation. Although not new as a concept, I consider the study important to complement results of similar studies with new results that authors obtained. (See MAJOR COMMENT above) 3. Are substantial conclusions reached? See MAJOR COMMENT above 4. Are the scientific methods and assumptions valid and clearly outlined? See MAJOR COMMENT above; the validity of the scientific methods and assumptions could be confirmed by the requested additional proposed test. 5. Are the results sufficient to support the interpretations and conclusions? Yes, but only partly. (See MAJOR COMMENT above) 6. Is the description of experiments and calculations sufficiently complete and precise to allow their reproduction by fellow scientists (traceability of results)? Difficult to judge before the required additional test is performed (See MAJOR COMMENT above) 7. Do the authors give proper credit to related work and clearly indicate their own new/original contribution? Yes 8. Does the title clearly reflect the contents of the paper? Yes 9. Does the abstract provide a concise and complete summary? Yes 10. Is the overall presentation well structured and clear? Yes 11. Is the language fluent and precise? Yes 12. Are mathematical formulae, symbols, abbreviations, and units correctly defined and used? Yes 13. Should any parts of the paper (text, formulae, figures, tables) be clarified, reduced, combined, or eliminated? Yes 14. Are the number and quality of references appropriate? Yes 15. Is the amount and quality of supplementary material appropriate? N/A

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 7553, 2010.