Atmos. Chem. Phys. Discuss., 12, C7994–C7996, 2012
www.atmos-chem-phys-discuss.net/12/C7994/2012/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Density currents as a desert dust mobilization mechanism" *by* S. Solomos et al.

S. Solomos et al.

kallos@mg.uoa.gr

Received and published: 11 October 2012

Response to anonymous referee #4

The paper focuses on a specific type of density currents in Western Sahara that are associated with intensive generation of dust and initialization of meso-scale dust storms. These phenomena are of relatively small scale and are not resolved in up-to-date GCM, CTM, and even most of RCM studies. Therefore it is very important to quantify their effect and eventually parameterize it in large-scale simulations. The authors have chosen for their case-study a series of convective storms over Atlas Mountains on May 31, 2006. The authors also reported the sensitivity of the simulated dust generation to the model resolution. The paper is well written and can be published after minor revision.

[REPLY] We thank the reviewer for the comments. A response to the raised issues is following.

General Comments 1. Paper considers dust as a trasor and does not discuss a radiative effect of dust 2.This kind of hampers comparison simulated dust with observations

[REPLY] The interactive dust module in RRTM was enabled for all runs. The reviewer is correct that this was not explicitly stated and a relevant sentence has been added in page 21585, line 4.

2. The considered density flow develops after the rain. It would useful to discuss how this could effect dust generation efficiency

[REPLY] The increase in ground wetness due to rainfall is explicitly treated in the model. Reduction of dust production due to increased soil moisture is addressed with the parameterization of Fecan et al. (1999). The relevant section (page 21584, lines 9-11) has been included in the manuscript for clarity. After the thunderstorm, the generated density current continued propagating over dry areas and was not accompanied by precipitation.

Specific comments

L. 124: Remove “phase”

[REPLY]Done

L. 140-145: I doubt the parent domain uses two-way boundary conditions. If yes, please clarify

[REPLY] The reviewer is correct. The parent grid is one-way nested towards the boundary conditions and the corresponding section has been rephrased in the text.

L. 213: Remove “.”

[REPLY] Done

ACPD

12, C7994–C7996, 2012

L. 222: Change “formatted” to “formed”

[REPLY] Corrected.

L. 264: Change “extend” to “extent”

[REPLY] Corrected.

L. 266-270: Units for flux are incorrect

[REPLY] Dust production is computed as the net (production-deposition) flux per model timestep. The units have been corrected in the revised article.

L. 370: 20% of CCN is of course exaggeration but it is strange it did not have an effect

[REPLY] As stated in the text there are differences in the precipitation patterns; however, the effects on temporal and spatial properties of the haboob are limited. This could be an interesting topic for a microphysically oriented type of study.

L. 372: For the shallow convection in subtropics ice nucleation is not applicable

[REPLY] Yes, we agree.

Please also note the supplement to this comment:
http://www.atmos-chem-phys-discuss.net/12/C7994/2012/acpd-12-C7994-2012-supplement.pdf

---

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 21579, 2012.