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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Atmospheric dust modeling from meso to global scales with the online NMMB/BSC-Dust model – Part 2: Experimental campaigns in Northern Africa" *by* K. Haustein et al.

Anonymous Referee #1

Received and published: 20 December 2011

This study investigates the ability of the new NMMB/BSC-Dust model to simulate two episodes during the field campaigns SAMUM-1 and BoDEx. This is an important evaluation of the new model that goes beyond the evaluation in the companion paper by Perez et al. 2011.

After the following revisions are considered, I recommend this manuscript for publication in ACP.

General comments

A major question is on the consequences of this study for the operational setup of the model. The authors mention the article of Zender et al. (2003a) who describe the problems of NCEP soil moisture for dust models. Only for the BoDEx period the soil conditions are initialized with GLDAS data which results in a better reproduction of different variables. Also experiments with changed vertical to horizontal flux ratio or a reduced threshold friction velocity, that "improved the skills of the model", are only presented for BoDEx. It should be discussed how these changes (soil conditions, flux ratio, threshold velocity) influence the simulations during SAMUM-1 and if they are suitable for the operational setup of the model.

Specific comments

Abstract

Page 30275, line 2: Please mention in Sect. 2.1 what "online" means in this context.

Page 30275, line 15: Insert "horizontal" between "operational" and "resolution".

Page 30275, line 15: Insert "dust" between "vertical" and "distribution".

Page 30275, line 21: "...may be attributed to poor soil initial conditions." This is a vague statement that is only mentioned in the abstract and the conclusions but not discussed in Sect. 4.1.3. Did the authors perform a simulation with the GLDAS soil initial conditions for SAMUM-1 as well? Such an experiment could strengthen this statement.

2.1

Page 30279, line 26: Please provide some more information and/or references for the STATSGO-FAO data.

Page 30280, line 26: Please provide some more information and/or references for the NESDIS climatology.

2.2

Page 30280, lines 24-26: The question arises why the simulations with GLDAS initial conditions are only performed for BoDEx, not for SAMUM-1.

Page 30281, line 6: Where does the density of 2.6 g cm-3 for dust particles come from?

3.1

Page 30281, line 18: Please provide also the elevation of Ouarzazate.

4.1.1

Page 30286, lines 1-2: Satellite images are only shown in Fig. 2 b,c,f,g, not in a-g.

Page 30286, line 9: The strongest signal in the MSG image is placed over the north-eastern part of Sudan which should be discussed. OMI shows it as well. Does the model miss, underestimate or misplace this?

Page 30286, lines 9-12: It is not clear which dust is meant in the sentence "In the course of the day, the dust was advected..." because the previous sentence closes with "Western Sudan". It should be mentioned that "the course of the day" can not be comprehended from the one Figure for 16 May.

Page 30286, line 12-14: Do the authors trust MODIS DB more than OMI? The SeaW-IFS image shows also a dust plume off the coast of Western Sahara and Mauritania. This seems to be missed by the model which should be mentioned.

Page 30286, lines 17-18: Because the SeaWIFS image does only show half of the Iberian peninsula and due to the gaps in the satellite overflights, I think you can not conclude about this region from this image. I disagree with the statement that modeled AOD and the MSG image qualitatively match over the Iberian peninsula.

Page 30286, lines 20-21: The signal in the OMI image lies over eastern, not over western Libya.

Page 30286, lines 26-27: There is one small scale spot over the northern part of the Adriatic Sea in MODIS compared to a much larger signal over the region around Corsica. In my opinion it is not possible to draw any conclusions about the dust plume from the available images.

Page 30287, line 6: Do the authors mean the border region Niger/Chad instead of "Eastern Chad"? Otherwise I disagree with this sentence.

Page 30287, line 9: Clouds obscure the region of interest to a large extent in the SeaWIFS image which should not be considered for this region at this time.

Page 30287, line 16: Delete "(Fig. 5)". Figure 5 does not show the "late afternoon hours".

Page 30287, line 26: Is the modeled 10m wind speed "rather smoothly distributed" all the time from 19-20 May or does this statement bear on Figure 6e? As this is the only point where the 10m wind speed is discussed, the authors could think about deleting the 10m wind speed panels from all the Figures 2-7. In turn, they could enlarge the other panels for better readability.

Page 30288, lines 8-9: In my opinion it is more accurate to write "The model slightly overestimates the MODIS..." instead of "...matches also...".

4.1.2

Page 30288, lines 15-16: Please clarify why values higher 0.6 indicate anthropogenic aerosols.

Page 30288, lines 24-26: What is the reason for the overestimation at Banizoumbou? Is it due to overestimated emissions in the source regions or maybe due to wrong transport ways of the dust?

4.1.3

Page 30291, line 15: Please leave out "moderately". The model overestimates the dust

by a factor of 3.

4.2

Page 30293, lines 23-25: Is this description based on the sun photometer measurements in Fig. 15a or on other data that are not shown? If it is only based on the shown data, you can say nothing about 10 March because there are no measurements shown for this day.

4.2.1

Page 30295, line 9: The statement "... NCEP-GLDAS does a good job ..." is vague.

Page 30297, line 7: I think it should read "Western Sudan". But how do you know that this dust is "freshly emitted".

4.2.2

Only the simulation with the GLDAS soil conditions is discussed here. How does the model perform with the NCEP-FNL conditions?

5 Conclusions

Page 30300, lines 17-19: The possible explanations for the "insufficient mixing" are too vague.

Technical corrections:

Throughout Paper: Replace "Bodele depression" by "Bodele Depression".

Throughout Paper: Replace "Tibesti mountains" by "Tibesti Mountains".

Page 30280, line 19: Fig. 1 shows 0°-60°N, 20°W-60°E, while you say 0°-65°N, 25°W-55°E in the text. Which of these coordinates define the model domain?

Page 30280, line 21: Leave out "in the vertical".

Page 30290, lines 18-19: This sentence should be rephrased. Not the comparison but

the profiles are similar. The comparison of profiles in Figs. 10 and 11 with the ones in Fig. 12 is pretty complicated. I recommend "meters above surface" for the vertical axis in Figs. 10 and 11 as in Fig. 12.

Page 30297, line 20: Should read "zone" not "zones".

Page 30297, line 22: Should read "These..." not "This...".

Figs. 8, 9: Note in the caption that Angström exponents are shown as black circles.

Figs. 10, 11: Please correct the labels of the stations in the caption: Fig. 10: Quarzazate (e), Fig. 11: Athens (b,d), Naples (e), Thessaloniki (a,c)

Fig. 14 j,k: In the title it should read "30.33N".

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 30273, 2011.