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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 #1

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

The paper presents another just as good simulation of the March 2006 dust storm over West Africa. The case was already studied by Tulet et al. (2008), Mallet et al. (2009) and Cavazos et al. (2009), which all show a change in the atmospheric stability due to the radiative impact of dust. Following the aforementioned studies, the present paper describes the radiative impact of dust on temperature and reaches similar conclusions. It however differs from the previous studies by running their model over a shorter period (until 00 UTC 10 March versus 11 or 13 March) while the dust outbreak severely

affected Djougou, Benin on 10 March (AOD around 2.5, see Figure 5 of Tulet et al.) and Ilorin, Nigeria on 11 March (A0D around 4). The rationale for this shorter period was not given. Another drawback is a short and incomplete discussion of another case in June 2007 (see the specific comment below). A new aspect offered by the study is on the dust feedback on dust emission. However the discussion on that part was neglected. My suggestion is to expand it in a revised version of the paper.

Major comments

The case of June 2007 is not sufficiently described compared to the other case. So it would more simple just to skip it. One of the interests of the June case in the present paper is the vertical change in temperature with respect to the height of the dust layer (Figure 10). You correctly pointed out that "the location and the vertical extension of the dust plume determine the effect on 2 m temperature" (p 7574, lines 19-20). However a similar figure was shown for the 2006 case on 10 March by Tulet et al. (2008). These authors show dust at 2-km altitude with mass concentration around 2000 ug/m3 (Figure 9c) associated with an increase in temperature up to 4 K (and a decrease in temperature below the dust layer; Figure 9f). Your case of June 2007 presents similar figures in dust concentration and temperature effect. But why not showing a similar figure from your simulation of the March case? This would make the paper much more comprehensive.

AOD retrievals from OMI, MISR, and/or MODIS should be preferred to RGB products shown in Figure 3 (p 7592) for allowing a quantitative comparison of AOD. Attached you will find a figure that completed your Figure 3 with AOD retrieved from MODIS deep blue AOD retrievals (available on http://daac.gsfc.nasa.gov/giovanni/). You wrote (p 7565, l 5) that "the position of the simulated dust storm is in good agreement with the observed one given by the dust product". This contradicts the comparison with MODIS observations, which shows a delay in the simulated dust front (in agreement with your conclusion on the comparison with sun photometer data). Also the simulation overestimated the local AOD maximum with respect to satellite data. This result contrasts with

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the AOD underestimation found with your selection of AERONET stations (Figure 4). In conclusion, your simulation is just as good.

Specific comments

p 7555, First paragraph is very academic and far from the focus of the study. It should be shorten. In particular, the sentences on the aerosol-cloud interaction should be skip out as the study discuss on the radiative impact of dust only.

p 7556, second line, the works of Tompkins et al. (2005) and Chaboureau et al. (2007) should be mentioned as they both show that a change in the dust representation over West Africa resulted in a modification of the monsoon activity.

p 7564 (l 25) and p 7565 (l 7 and 19). According to the caption, Figure 3 shows the simulated AOD, not the simulated emission fluxes.

p 7566 (l 20) Which station do you refer to?

p 7572 (l 6), Figure 7 does not show any correlation, but the relationship between Delta F and the AOD.

References

Chaboureau, J.-P., P. Tulet, and C. Mari: Diurnal cycle of dust and cirrus over West Africa as seen from Meteosat Second Generation satellite and a regional forecast model, Geophys. Res. Lett., 34, L02822, doi:10.1029/2006GL027771, 2007

Tompkins, A. M., C. Cardinali, J.-J. Morcrette, and M. Rodwell: Influence of aerosol climatology on forecasts of the African Easterly Jet, Geophys. Res. Lett., 32, L10801, doi:10.1029/2004GL022189, 2005

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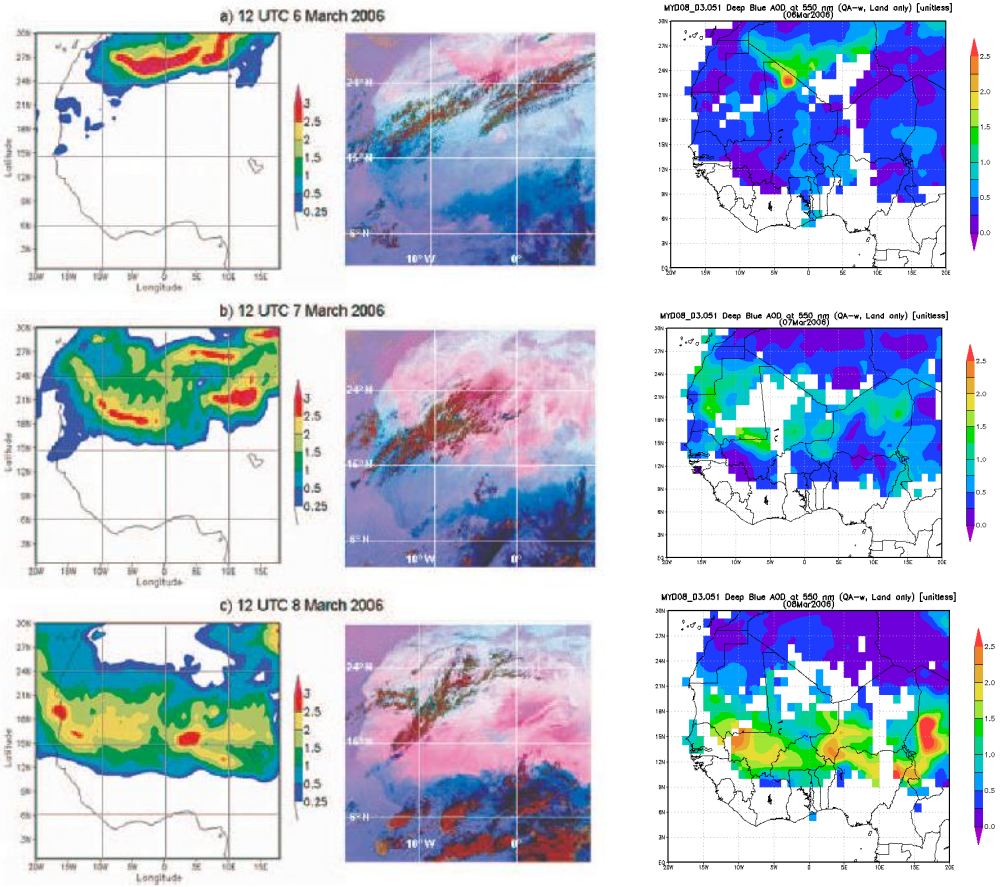

Fig. 1. AOD on 8, 9, and 10 March 2006

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