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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Cloud and aerosol radiative effects as key players for anthropogenic changes in atmospheric dynamics over southernWest Africa" *by* Konrad Deetz et al.

Anonymous Referee #2

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The authors focus on South West Africa, a region which is in a developing phase with an expected massive population growth and urbanisation. Therefore, an increase in anthropogenic aerosol concentration is expected. The authors assess the implication of aerosols and their possible changes on clouds and atmospheric dynamics. They present a process study with the regional model COSMO-ART. In particular, they discuss the impacts of aerosols on the propagation of the Atlantic Inflow frontal location and the Stratus to Cumulus Transition. In general, the paper is well written and the topic is of general interest. Deetz et al. conducted a detailed analysis of the performed simulations to understand the processes how aerosols influence prominent South West African dynamical features. Their main conclusions are based on three different simu-

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lations, the reference, the polluted and the clean case.

I miss the discussion about the realistic representation of the current aerosol distribution in the model. Since an extensive measurement campaign took place during July 2016 it should be possible to evaluate the simulated distribution of aerosols against more measurements (here only a comparison with measures liquid cloud properties are shown).

Since the direct aerosol effect depends mainly on the radiative properties of the aerosols it is of interest to show the aerosol composition in the region during the 2nd -3rd of July. And again, it would be helpful if the simulated aerosol radiative properties or the simulated radiative fluxes could be evaluated against observations.

To understand the full meaning of polluted and clean case it is necessary to know about the aerosol content and composition in the reference case. Without that knowledge, a fractional increase or decrease is not meaningful. Do the authors change the aerosol concentration of the different types equally? This should be clarified in the revised manuscript.

Another clarification is needed in terms of the general model setup. How are aerosols treated at the outer boundaries? Are they prescribed by output of global model simulations? The meteorological state is initialized every day at 0 UTC. Are the wind and temperature fields pulled back to the ICON forecast every day at 0 UTC? If yes, how is it possible to analyse the impact of the direct and indirect aerosol effect on the dynamics? I also wonder about the choice of the inner model domain (figure 1, indicated by red box). The western as well as the eastern and part of the northern boundary are located in a mountainous region. Could that cause problems due to resolution effects?

Minor comments:

Page 1 line 22: The population is expected to growth.

Page 2 line 19: Please replace “react” with “are”.

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Page 10 line 25: Please rewrite that sentence

Table 1: I recommend to rename the simulations (the names are unnecessary long), ADE and AIE are scaled by the same factor, the simulations could be named as AE0.1, AE0.25. . . (AE = aerosol effect)

General remark: Maybe it is not necessary to present results of all 6 simulations. It underlines somehow the results but for the discussion it seems not to be important to present them. I recommend that the authors rethink the demand to present the AE0.1, AE0.5, AE2 simulations in the paper.

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