Atmospheric Chemistry and Physics Discussions

Interactive Comment

Interactive comment on "Aerosols' influence on the interplay between condensation, evaporation and rain in warm cumulus cloud" *by* O. Altaratz et al.

Anonymous Referee #1

Received and published: 19 October 2007

The manuscript presents modelling study about the effect of aerosol particle concentration on cloud droplet and precipitation formation, as well as cloud lifetime of warm cumulus cloud. The results presented are interesting and closely related to other recent studies, and give some new information about the complex interactions between aerosols, clouds and precipitation. Conclusions are well argued and clear. Overall, the manuscript is well written with clear structure, but slightly too concise at some points.

I have few comments that need to be addressed before the possible publication in ACP.

1) The description of the model used is very concise. Adding more information about

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things like aerosol description in the model would not increase the length of manuscript considerably, but it would make it easier to read.

2) Pollution aerosol was placed in the single bin in the aerosol size distribution. Is this realistic? Is it possible that using the wider distribution also for pollution aerosol, the drizzle and precipitation formation might be affected? This is an important question as one of the main findings of the manuscript is the larger raindrops with increased aerosol loading.

3) The grid used in the model is quite coarse although the simulation area is not very large. This raises a question about the possible changes in results, especially at the cloud boundaries if a better resolution would be used. It might be difficult to run simulation with higher accuracy, but some discussion should be added about the choice of the resolution.

4) The maximum number of cloud droplets formed in polluted cases is actually enhanced more than the number of CCN added. I think this issue needs to be explained. Also giving some number value for the clean aerosol size distribution used would make reading of the manuscript easier.

5) There is some discussion about the horizontal wind speeds and the effect of aerosols on that. Could the figure describing wind fields as well as liquid water content be useful in this context as the strength of updrafts are not presented or given in the manuscript for different cases? Updraft velocity also affects incloud residence time of air parcels and thus precipitation formation. I leave this matter for authors to decide.

6) I agree with Referee #2 that the difference in cloud height can not be addressed in the way it is done. As the vertical grid spacing is 100m, it is misleading to say that difference in cloud top height is 100m between clean and polluted cases, as it can be something less or more as only the maximum value of liquid water mass mixing ratio at certain grid-level is used to define the cloud top.

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7) As some sensitivity tests are done, like said in conclusions, could it also be said if the differences between polluted and clean cases are similar on average as in the simulations presented.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 12687, 2007.

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