Geoscientific
Model Development
Discussions

Interactive comment on "Droplet activation parameterization: the population splitting concept revisited" *by* R. Morales Betancourt and A. Nenes

Anonymous Referee #1

Received and published: 19 June 2014

This manuscript "Droplet activation parameterization: the population splitting concept revisited" by Morales Betancourt and Nenes presents a modification to cloud activation parameterizations. Their technique is based on using different approaches for calculating droplet size when air parcel reaches its maximum supersaturation during cloud activation. According to the comparison between a detailed cloud parcel model and different "generation" parameterizations, the error of the modified parameterization is smaller than for the earlier parameterization. The manuscript is certainly within the scope of Geoscientific Model Development and I recommend its publication after the following points have been addressed:

- Abstract: Most readers are not familiar with the "population splitting" concept. It would be useful for the reader if it was explained in the abstract in one sentence.

- Abstract: There should be some results from the evaluation of the parameterization here.

- The manuscript contains mostly of material already presented in earlier articles while the new concepts and results are explained fairly shortly. Especially, Section 3 is fairly ambiguous and should be written in more detail:

  - It is not explicitly said that the parameterization results in Section 3 have been calculated with modifications implemented to Barahona et al., 2010 parameterization (instead of e.g. Barahona and Nenes, 2007 parameterization). This should be clarified in the revised manuscript.

  - Please elaborate how CAM5.1 aerosol fields were used. E.g. what parameters (composition, updraft velocity, temperature) were used?

  - Although details of the parcel model simulations can be found in previous articles, it would be useful to shortly summarize the parcel model configuration (200 size sections, equilibration at 95%?) and how the number of activated droplets is defined in the parcel model simulations.

- Page 2910, Line 24: Typo "of of"

- Subsection 3.1 is not needed since there is only one subsection.

- Page 2917, Line 25: It is very ambiguous what "both quantities" means.

- Page 2918, Line 11: Typo "avearge"

- Page 2918, Line 27: n_a, κ_a, and d_g have not been explained in the text.

- Figure 4: Wrong abbreviation for Barahona et al., 2010 parameterization.

- There should be some discussion on the sensitivity of N_d to mode diameter and hygroscopicity parameter. What can we see from these sensitivities?

- Figure 4, caption: Change "(b) sensitivity to aerosol number" to "(b) sensitivity to the hygroscopicity parameter" and "(c) sensitivity to aerosol number" to "(c) sensitivity to the geometric mean diameter"