

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

R. Morales Betancourt and A. Nenes

nenes@eas.gatech.edu

Received and published: 2 September 2014

*We thank both reviewers for their positive, thoughtful feedback and constructive comments. Specific points raised are in bold while responses are in italics.*

**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.

*This is a good point. This issue was addressed by adding a brief description of the “population splitting” concept in the abstract.*

**There should be some results from the evaluation of the parameterization here.**

*A brief account of the parameterization performance when compared to parcel model*

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*and previous versions is now included in the abstract.*

**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:**

*Section 3 is now re-written. It now includes a detailed description of the parcel model simulations, and the aerosol fields used in the evaluation.*

**– 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.**

*This point is well taken. We now explicitly mention this in section 3.*

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

*A detailed description of the CAM fields we used as input is now included in the revised manuscript (section 3.1 aerosol and vertical velocity fields). The description includes the chemical compounds allowed in each mode, which then determine the hygroscopicity parameter for each lognormal mode. The range of the different parameters considered in the evaluation is included in Table 1.*

**– 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.**

*To address this issue we included a new section “3.2 Cloud Parcel Model Configuration” in the manuscript.*

**Specific Comments:**

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**Page 2910, Line 24: Typo “of of”**

*The typo is now corrected.*

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

*Thank you for the comment. The new manuscript now includes more subsections in section 3.*

**Page 2917, Line 25: It is very ambiguous what “both quantities” means.**

*The typo was corrected.*

**Page 2918, Line 11: Typo “avearge”**

*The typo was corrected.*

**Page 2918, Line 27: na,  $\kappa a$ , and dg have not been explained in the text.**

*This is now corrected. Since a description of the aerosol fields was included, the symbols are now defined earlier in the text.*

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

*Thanks for noticing this typo. It is now corrected.*

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

*A brief description of the sensitivity of  $N_d$  to both  $d_{gi}$  and  $\kappa_{ai}$  is now included in the manuscript.*

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Interactive comment on Geosci. Model Dev. Discuss., 7, 2903, 2014.

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