

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

Anonymous Referee #2

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Morales Betancourt and Nenes describe in their paper an improvement of the scheme by Barahona et al. (2010) for the simulation of droplet activation in updrafts. The paper is mostly clearly written and the essence of the improvement is easy to comprehend. The paper fits into the scope of the journal and should be published after a minor revision.

1) Although it is never stated, I think that the "population splitting concept", i.e. all that is described in Section 2.1 has to be applied "bin-wise" where the bins are bins in critical supersaturation. On first reading it was not clear to me which of a spectrum of critical supersaturations are meant, for instance in eq. 6. It should be stated clearly whether the concept has to be understood bin-wise, or if not, how I should interpret an integral like in eq. 6.

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- 2) The discussion of Figure 1 and eq. 10, is a bit hard to follow, because you use at least three different types of terminology: The D_p scale, the s scale, the Δ (discriminant) scale, and the Populations I-III. It might be good to have a table where all the conditions and Population numbers are presented together.
- 3) Last line of page 2911: "has no real solutions" is better.
- 4) The description in the 2nd paragraph of Section 2.1.1 is a bit unclear. Do you mean that Barahona et al. had replaced $D_p = D_p^{(2)}$ by $D_p = D_p^{(2)} / \sqrt{3}$? Please rewrite the section.
- 5) Page 2914, line 25: "As s_{max} approaches ξ_c from above" is better.
- 6) Last sentence of 1st par. in Sect. 3.1 is incomplete.
- 7) Description of Figure 2 in Sect. 3.1 (panel letters) is inconsistent with the figure.
- 8) Description of Figure 3 in Sect. 3.1: please mention that you describe the results of your own parameterisation now.
- 9) Page 2918, line 16: "similar improvement". Similar to what? (You may refer to table 2).
- 10) Caption of Figure 4: Please correct.

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