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Interactive comment on "A new balance formula to estimate new particle formation rate: reevaluating the effect of coagulation scavenging" *by* Runlong Cai and Jingkun Jiang

Anonymous Referee #2

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Review of A new balance formula to estimate new particle formation rate: reevaluating the effect of coagulation scavenging

A new method to estimate particle formation rates has been proposed by the authors which is an improvement to existing ones with respect to taking coagulation into account. This seems to be an important improvement whan analysing new particle formation events in polluted conditions, such as Beijing, where the method is applied. Also, a nice comparison with some previous approaches is presented. The topic fits well to ACP and deserves publication, but some major modifications are first necessary. In addition, the manuscript suffers from several grammatical errors as well as unclear writing (some of the points I have commented below but many not). A thor-

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ough language-check is thus essential.

Comments: 1. Eq. 1 and Appendix A: I believe that eq. 1 is a direct consequence of the GDE and does not require the rather complicated derivation of Appendix A. If one starts with the continuous GDE, integrates it from d_k to d_u, and finally writes the coagulation terms in discrete form with the bins - then equation 1 is self-evident (or can be derived in 3 lines)?

2. Eq. 1: The writing under the summation symbol is very small font and almost unreadable. It has to be made more clear. Also, does the validity of the equation require a bin structure such that (d_i)^3 + (d_j+1)^3 = (d_g)^3 ?

3. Page 3, line 84: What does "not included" mean here?

4. Page 4, lines 112-113: Why is information about size distribution below d_k needed, when applying equation 4?

5. Page 4, discussion after eq. 4 and Page 7, lines 195-196: The main problem in eq. 9 is that GR and n are not estimated at 1.5 nm in an optimal way but above it, isn't it. If, instead of using the range 1.5 - 2.5, one would use 1 - 2, the result would be much better?

6. Page 5, lines 137-139: Why "varying upper size bound"? And why 28,000 cm-3? Furthermore, I don't understand the sentence "d_u is equal to 25 nm rather that d_b when calculating dN/dt..."???

7. How do you determine GR?

8. Appendix B, page 15, line 393: I am not sure that the statement "Equation B2 is a mathematical truth" is correct, especially if (k-1) refers to a (wide) bin? The physical process of condensation is by monomer additions.

9. Much of Appendix B is repetition of the main text. Can it be shortened and combined with the main text so that any Appendix would not be necessary?

10. It is really interesting to see the performance of the different approaches when applied to experimental data. The paper would, however, become even better if validation of the new method would be demonstrated with synthetic data, for which the answer is known. I am not saying that this is a necessity for this paper, but something for the authors to consider.

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