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Interactive comment

Interactive comment on "The impact of fluctuations and correlations in droplet growth by collision-coalescence revisited. Part I: Numerical calculation of post-gel droplet size distribution" *by* Lester Alfonso and Graciela B. Raga

Anonymous Referee #2

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In this paper, stochastic effects in the collisional growth of cloud droplets are studied in a small volume. Solutions of master equation are shown for a system of up to 40 droplets. The results differ from the deterministic Smoluchowski equation, particularly after the sol-gel transition. This effect was studied by other authors for simplified coalescence kernels (Bayewitz et al 1974, Lushnikov 2004 from manuscript's references list).

The main novelty of this paper is in comparing the deterministic and stochastic approaches for a realistic coalescence kernel. It is surprising, that it is not clearly stated

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Discussion paper

if, for a realistic kernel, the deterministic equation breaks down (i.e. does not conserve mass) after the critical time, as is in the case of product kernel. Table 2 should contain results of the deterministic approach, like Tab. 1 does.

From the cloud physics perspective, it is interesting to see, that for a realistic coalescence kernel, the critical time is more than 20 minutes. It is unlikely that such a small volume within a cloud would remain unmixed for that long, e.g. because of sedimentation. Therefore, using larger simulation cells and the Smoluchowski equation seems to be vindicated. On contrary, authors suggest that the Smoluchowski equation cannot explain spectral broadening. Some additional comments on that matter would be welcome.

The presented results are valuable as a reference for other researchers, since they are obtained by solving the exact equation for coalescence.

Finally, I would like to suggest some changes that would increase readability of the paper:

1. Section 2. presents the numerical method used, which was already described in a previous paper. It could be removed from this manuscript, together with Figs. 1 and 2.

2. "Standard deviation of the mass of the largest droplet" defined by Eq. (11) is in fact standard deviation of mass divided by mean mass. It should rather be called the relative standard deviation.

3. Boxes with text in Fig. 3 and their respective "arrows" only blur the image. The same information is given in the caption.

4. From my understanding, Figs. 4, 5, 8 and 9 present histograms of mass concentration of droplets within given size range (bin). Presenting them with continuous lines makes them seem like density distributions.

5. Label on horizontal axes on Figs. 4 and 5 is "bin number", while on Figs. 8 and 9 it is "droplet radius". Is it the same thing?

6. Legend in Fig. 4(b) is titled "Master Equation", while one on Fig. 4(a) has no title. Do both figures present solutions of the master equation?

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