I am pleased with many of the authors' replies to my concerns regarding the methods used in this paper, as well as their incorporation of suggestions regarding references, notation and language. Unfortunately, some of the justification present in the authors' response was not incorporated in the manuscript. I also have further concerns regarding remaining issues in the grammar and language throughout the work.

Specific comments revisited:
2. *Notations and E0 and Ees*: Thank you for updating the notation. The approach that you are following (Andronache) should be cited in the paper where you are defining the coalescence efficiency.

3. *Instantaneous charging assumption*: I appreciate the thorough response justifying this assumption, but would like to see it explicitly and clearly stated in the paper as a limitation and your justification. It would likewise be nice to see the authors' expectation of what impact this assumption may have on the results discussed in the work.

4. *DNS vs LES:* Please also state in the text that this is a two-dimensional LES. (I realize it is already stated in the abstract)

Additional general comments:

- Can you justify or comment on the use of such complex equations for the particle charge (e.g. Eq 14, versus Eq 13) and whether this additional complexity (a) adds considerable computational burden; (b) whether it is justified in terms of the difference in results produced.
- It would also be nice to see a brief discussion of any new insights that have arisen from this study in comparison to Khain04.
- In general there are also several grammar mistakes that remain in this manuscript. I will address a few examples below, but I hope that the authors will undergo thorough proofreading.
- Section 2.5 is likely unnecessary to include, as the reader could easily look at references for the compressible nonhydrostatic equations. I would recommend instead pointing to a citation for the implementation used in SCALE.

Other comments (based on the track-changes document line numbers)

- Abstract: Consider adding an introductory sentence at the start to introduce what electro-coalescence is or its impacts, something like line 520-521 in the discussion section.
- L17: "… particle-based microphysics method: **the** super-droplet method…"
- L20: "…dynamic process. **W**e assume…"
- L39: "**rain** formation" (was not corrected from first review)
- L58-59: This sentence doesn't make sense, especially the added phrase.

- L74: What would it mean to “eliminate” the Greenfield Gap? Do you mean that there would no longer be fewer particles in this size range?
- L291-292: Can you comment on this range (0.1-10um) and its correspondence to the Greenfield Gap?
- L361-362 and L367-368 seem redundant
- L375 seems like an odd place for this statement. It would be better to put it in the data availability section and remove the url here.
- L450-451 is redundant with the figure caption.

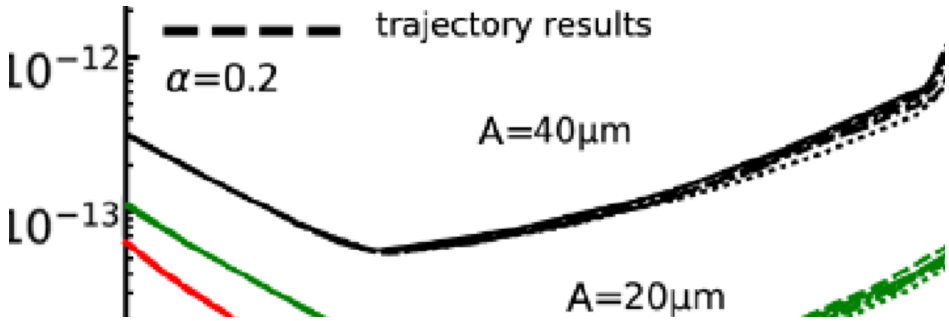
comments to revised manuscript egusphere-2023-2507 submitted to Geosci. Model. Dev.
June 2024

Overall, the manuscript is improved compared to the original submission, however neither all of the key points raised in the first round of review, nor the readability issues were addressed in a fully satisfactory manner.

The manuscript still contains numerous technical flaws in punctuation, grammar, symbol and physical units mismatches. My first earlier comment was that "*the choice of the particle-resolved method is not explained - what are the benefits, tradeoffs, limitations as compared to other modelling techniques, in the very context of modelling charged-particle interactions*". The introduced change vaguely states that "*particle-based microphysics method, which calculates the electro collision-coalescence kernel in real time, offers more detailed insights into droplet behavior influenced by electrostatic forces, surpassing the bin method that relies on lookup tables (Khain et al., 2004), while also demanding less computational resources*". Computational demands are not explored in the present paper at all. Lookup tables are an implementation detail and can be used with both bin- and particle-resolved methods for speeding up evaluation of multi-dimensional formulae. On the other hand, particle-resolved models surpass bin-resolved models in the tractability of aerosol-cloud interactions, what is partly leveraged in the present study (while Khain et al. 2004 resorted to prescribed initial droplet size distributions). Similarly, the fidelity of representation of particle collisions is argued in literature (by the paper co-author!) to be superior in particle-resolved models (e.g., section 4.4. in Liu et al. 2023, https://doi.org/10.1007/s00376-022-2077-3). It would be worth to elaborate on it both in the Introduction as well as in the last paragraph of the Discussion section. As of now, sections Discussion and Conclusion do not refer to the particle-resolved methodology at all. It seems as all the discussion and conclusions apply equally well to bin methods - if so, worth highlighting.

Despite introducing changes to the model code and providing new source archive at Zenodo, the title and text still refers to the version number from the original submission - a change in version number is needed.

Despite authors' statement on provision of vector graphics in figures, provided pdf evidently contains raster graphics, here is how the Fig. 1 looks like if zoomed:



Detailed comments:

- l. 16: remove size-resolved (it is unclear what size refers to)
- l. 17: add "probabilistic" before "particle-based"
- l. 17-20: split into multiple sentences, suggest adding information on the processes represented in the microphysics model
- l. 27: rephrase "droplet charge is lower charge limit"
- l. 38: do these references support "and even cloud chemistry"?
- l. 39: missing space in "Chapter15"

- l. 42: is the non-chronological order of references intentional?
- l. 55: why is the μm unit typeset in different font?
- l. 57: rephrase "opposite sign charged affect by"
- l. 65: rephrase "series of trajectory simulation work by"
- l. 65: is the non-chronological reference order intentional?
- l. 71: "micrometer" used here, but "micron" elsewhere
- l. 85: "5% of maximum charge amounts of natural droplets" seems unclear, also perhaps better not to start a sentence with a digit
- l. 90: avoid using surnames as person indications, these should be used only as reference labels (also, plural "simulations"?)
- l. 92: what "real-time" refers to? is it different than in other cited studies? (it is elaborated on in l. 101, but still unclear why so central - super-particle method could also use a lookup table, it is just a way of speeding up evaluation of a multi-argument function...)
- l. 95-97 the "will be addressed in future work" statement seems awkward for an introductory section
- l. 103: super-droplet method was already mentioned, but the acronym is only defined here - move the definition to first occurrence
- l. 104: -droplets vs. -droplet, also since SDM was just defined, why not start using the acronym?
- l. 109: multiplicity was never mentioned before
- l. 113: specifying particular chemical composition seems misleading at the level of method description - there is nothing in the method that constraints it to ammonium sulphate!
- l. 126: remove "and"
- l. 135: non-chronological order of references; also: should be Rogers & Yau instead of Yau & Rogers
- l. 147: worth mentioning here that charge effects on the equilibrium saturation vapour pressure are neglected (see, e.g., Weon & Je 2010, https://doi.org/10.1063/1.3430007) - then at least this section would be somewhat justified in the paper
- l. 178: "viscosity rate" $\rightsquigarrow$ "dynamic viscosity"
- l. 187: is this what is meant: "droplet accepts less than 1 elemental charge"?
- l. 194: is μ_a the same as μ defined in line 177?
- l. 204: r_{nt} is defined as dimensionless ratio in (12) but eq. (13) suggests it should have length dimensionality
- l. 209: ditto - r_{nt}^2 is added to dimensional r^2
- l. 210: period at line beginning, unopened parenthesis...
- l. 233: ϵ_0 was already defined in l. 205
- l. 233-235: two consecutive sentences begin with almost the same phrase

- l. 237: grammar: "we following Andronache (2004)"
- l. 281: R symbol mismatch - previously used for particle radius
- l. 295: "and the time derivatives for condensation/evaporation" - predicate missing?
- l. 313-314: "size distribution were adjusted to 3, 6 or 9 times" sounds as if size parameters were adjusted
- l. 321: shouldn't this section go before 2.6?
- l. 324: "code is not accessible through this site" should better go into the preceding parenthesis
- l. 343: "common" $\rightsquigarrow$ "coupling"?
- l. 341: worth rephrasing "processes for aerosol/cloud/precipitation particles are integrated separately" as it seems misleading - aerosol, cloud and precipitation particles are not treated separately
- l. 350 (again): please elaborate what are "Lagging processes" and "overall system dynamics"
- l. 350: "prioritized in computational priorities" - pleonasm
- l. 398: rephrase "The results of the domain and ..." (domain- and ensemble-averaged?)
- l. 401: "cloud" $\rightsquigarrow$ "clouds" (or otherwise "produces")
- l. 454: suggest removing "will be evaluated in our next paper"
- l. 459: "103" $\rightsquigarrow$ "on the order of 100" ?
- l. 468: rephrase "two factors larger"
- l. 472: what "the cloud model" refers to?
- l. 489: "the effective radius" was never introduced, in general this sentence appears quite abruptly here (perhaps introduce subsections in section 4?)
- l. 505: acknowledge that alpha was arbitrarily prescribed here
- l. 506: remove "we leave them for the future work"
- l. 508: please elaborate on how it can be done and how this works brings us closer?
- l. 550: Davis 1964a - is it different from Davis 1964b, if so, add needed information
- l. 552: Davis 1964b - add DOI: https://doi.org/10.1093/qjmam/17.4.499
- l. 601: add permanent URL: https://www.jstor.org/stable/113853
- l. 608: "eulerian" $\rightsquigarrow$ "Eulerian"; "lagrangian" $\rightsquigarrow$ "Lagrangian"
- l. 657: it is Rogers & Yau, not Yau & Rogers (already pointed out in the first round of review)