Bayley et al. provides a description of the parameterizations implemented in their super-droplet method model CLEO. As a model description paper, the manuscript provides valuable information in terms of the implementation such that one could examine the choices of the CLEO model and determine that they are correctly implemented. Additionally, such details are essential for understanding how CLEO could be used within other models and/or compared against other models. This manuscript presents a valuable addition as it presents a novel approach for microphysics, discusses the implementation details of said microphysics and particle motion due to mean flow. Such a framework is important for addressing the shortcomings of simplified cloud microphysics representation. Therefore, I recommend this manuscript should be suitable for publication pending revisions. I request that authors address comments and consider possible suggestions that may clarify and strengthen the manuscript further.

1 Major comments

- The general use of term Eulerian feels potentially confusing as a reader given the paper discusses Eulerian in both the sense of space and also in the sense of sectional microphysics. The presented model relies on a Eulerian model for solving wind field (and water vapor) but is Lagrangian in both particle position and in terms of microphysics.
- The authors could briefly discuss how CLEO can interface with other models, especially since it is presented here in a simplified 2D setup. Even if the companion paper covers this in detail, a short explanation would help readers understand its applicability, particularly regarding particle motion (see Section 4).
- In general, it is not really clear to me what CLEO is and is not. It is not 100% clear how it relates to the original SDM or PySDM, if it is merely an extension of a model or brand new model.
- Section 4 does not include any stochastic component for turbulence. While this is an intentional choice, if may be unclear to readers why this decision was made, whether or not there are justifications to this or if this is a possibly a typical assumption in these types of models.
- Beyond the noted parameterizations and particle motion, were there other significant assumptions in the model process design? Listing these briefly would help potential users or those comparing CLEO with their own models understand it's key assumptions.
- Section 5 is entitled "Validations" while it appears to contain, at least mostly, model verification. The authors should clarify whether or not certain aspects are for model verification or model validation. Dividing up this section of four tests into subsections may also be of benefit, such as one section for three individual proceses and another section that puts everything together.
- I suggest that the authors find a way to possibly present the convergence of the particle field of Figure 9 in a more meaningful way rather than relying on visual inspection.

- This paper has been submitted as a Model description paper. I would suggest that the following is considered:
    - The scope and limitations of the approach adopted for CLEO could be expanded as the authors deem applicable. The manuscript may benefit from a paragraph or brief subsection regarding a discussion of scope of applicability and limitations. This is helpful for people to evaluate the applicability of CLEO and be aware of its weaknesses or aspects that are currently omitted. Example of which, how effects of sub-grid scale turbulence were noted to be neglected in Section 4.

2 Minor comments

- I believe that the title, per journal guidelines, should include information regarding the version number. This number appears to be v0.52.0 in the code availability section of this manuscript. However, this may be complicated by the fact that the companion paper regarding performance appears to have used a different version of CLEO.
- I believe Equations 12 and 13 should use S_S and S_L rather than R_S and R_L, since the latter are not defined in the text. Please verify or correct accordingly. Also check the consistency of the defintion of S_c since it uses R_S and R_L, and it isn't clear why it would not just use R_j and R_k.
- Line 334: "...and a log standard deviation of 1.4" appears to be incorrect. I believe this should be standard deviation and not the log of the standard deviation. Please verify and correct if necessary.

3 Technical errors

- Line 176: should σ actually be σ_l?
- Figure 8 introduces N as number of superdroplets when n_s was introduced earlier.
- In the reference section, many of the DOIs appear to be mangled with repeated doi.org.