Geoscientific
Model Development
Discussions

Interactive comment on "libcloudph++ 0.2: single-moment bulk, double-moment bulk, and particle-based warm-rain microphysics library in C++" *by* S. Arabas et al.

Anonymous Referee #1

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1   General Comments

The authors provide a thorough overview of a novel library-based platform for simulating cloud microphysical processes. The layout of the paper is well though out, providing a natural progression from more simplistic representations of cloud microphysics to a state-of-the-art particle-based scheme. The included example figures clearly demonstrate reasonable cloud properties, especially for the idealized two-dimensional kinematic framework used in this study. I do have two major concerns with the work in its current form. (1) While the main points put forth in this work are fairly clear, there are numerous grammatical errors that need to be addressed. (2) It is unclear how the

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C++-based library performs relative to standard Fortran codes that are typically used in atmospheric modeling. Based on these concerns, I recommend that the paper be accepted with minor revisions.

2   Major Comments

1. **Grammatical Errors and Consistency:** As mentioned above, the main points are conveyed to the reader. However, there are many grammatical errors in the text that need to be corrected before publication. I counted more than 125 errors related to article usage alone. There are also issues with punctuation, primarily the use of commas, semi-colons, and colons. The use of hyphens in compound adjectives is not correct in many instances. I suggest that you have the paper reviewed/edited by a native English-speaking scientist to ensure that the text is free from grammatical errors before resubmitting. I would typically note such errors on a line-by-line basis; however, given the large number of corrections needed, I believe that the paper will be better served by being reviewed/edited by a native English-speaking scientist.

   There are also issues using inconsistent terms in the text. For example, the use of "setup" versus "set-up". Moreover, the library name is not consistent throughout the paper. The formatting of vertical lists is also not consistent. The intended meaning of some terms is not clear; for example, "dump" on line 16 of page 8283 is unclear. Furthermore, please also make sure that all acronyms are defined in the text and are consistently used (e.g., "rhs" or "r.h.s").

2. **Performance Relative to Traditional Fortran-based Codes:** Traditionally, Fortran is used in the atmospheric science community for numerical simulations. The reasons for using C++ are clearly represented in the text. However, it is unclear how easy it will be for someone who typically uses Fortran-based models

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to use the new library. Moreover, it is not clear how the performance (in terms of execution time) compares with traditional modeling frameworks and codes. Is it possible to run the kinematic model with the single-moment scheme in the original Fortran code? I believe that this is an important point for model users. If the spinup time for the user is large and the gain in efficiency and usability is small, it is unlikely that people will latch onto this novel concept. However, if the spinup time is short and the gain in efficiency is large, people are much more likely to migrate to this framework. Quantifying these aspects may be difficult and not within the scope of the current work; however, at least a qualitative discussion is warranted in my opinion.

3 Major Comments

1. Page 8315, Lines 1-2: Can you provide additional justification for the statement "Arguably, this is because of the numerical diffusion of the Eulerian double-moment scheme"? Perhaps just a reference or two would be sufficient.

2. Page 8315, Lines 5-16: While I do not doubt that the results presented in this paragraph are true, it might be nice to include a figure that shows, e.g., the scavenging rate of aerosol particles.

3. Page 8319, Lines 3-4: Can you elaborate more on how you expect to reduce the execution times of the code? I am thinking something along the lines of some areas of the code that you feel can be improved or made more efficient (I understand that you likely do not want to publish a list of things that you plan to do so that you do not get scooped).

4. Page 8320, Line 6: Can you be more specific? Are you referring to different flows or different model dimensions?

5. Page 8320, Lines 11-13: I was a bit perplexed when I read this statement. Perhaps an introduction to the need for Python bindings earlier in the text would help the reader understand the last statement of the paper? Otherwise, I would omit the statement referring to the Python bindings because this is the first that they are introduced.

6. In general, please consider using "because" instead of "as" in the text; the use of "as" is confusing in many cases.

Interactive comment on Geosci. Model Dev. Discuss., 7, 8275, 2014.