Atmospheric Chemistry and Physics Discussions

Atmos. Chem. Phys. Discuss., referee comment RC1
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Comment on acp-2021-313

Anonymous Referee #1

Referee comment on "Technical note: AQMEII4 Activity 1: evaluation of wet and dry deposition schemes as an integral part of regional-scale air quality models" by Stefano Galmarini et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2021-313-RC1, 2021

General Comments

This technical note describes the research protocol for Activity 1 of AQMEII-4. AQMEII-4 has been set up to examine the deposition processes in regional air quality models with the aim of assessing differences in the models' deposition parameterizations and how these differences impact atmospheric composition predictions. The technical note reports the models that will participate in AQMEII4 and defines a standard reporting framework for dry deposition parameters. Importantly, this technical note defines the 'Effective Conductance' and 'Effective Flux' parameter(s) and how they should be calculated so that dry deposition can be meaningfully compared across modelling systems.

This Technical Note is well written and provides a clear overview of Activity 1 as well as detailed descriptions of the calculations that will be used to compare dry deposition across the model ensemble. The Technical Note will provide a useful reference for Activity 1, bringing the technical information together in a single 'point of reference'.

I recommend that this Technical Note is published once the following comments and technical corrections have been addressed.

Specific Comments and technical corrections

L203: It would be useful to have a figure to illustrate the European and North American domains.

L229-231: I do not understand what the authors mean by 'hourly speciated files'. Please clarify.

L320-330: Suggested text modification from (units s cm-1) to (units = s cm-1)

Figure 3:

- The resolution of this figure is generally poor and in particular the text for the x-axes tick labels is difficult to read (in fact unintelligible for 3a and 3d). This should be improved before final publication.
- Can the authors explain why there is a smaller effective conductance for soil (and possibly lcan and cut, although it is difficult to tell from the figure) at 06:00?

Table 5: The format of this table should be improved. It might be better in landscape as all the columns could do with being a bit wider.

Tables 5 and 6: For ease of comparison, would it possible to situate Fig 2a in closer proximity to Table 5?

L524-526: *'In this example, note that the branch containing the rdc term has been designated as the lower canopy pathway, due to the presence of the canopy buoyant convection term rdc (i.e., closest analogy to Wesely's setup is to have the pathway involving deposition to "soil" pathway is designated as a "lower canopy" pathway).*'

=> Consider re-wording this sentence from '*the branch containing the rdc term'* to *'the branch representing deposition to soil'* or similar to avoid confusion about the two slightly different usages of rdc in this sentence.

Table A1: Should the units for the water vapour column be changed from cm3 cm-2 to cm3 cm-2? Units for RHO (Air density of lowest model layer)?

Table A2: Change 'Number concentration of PM2.5at ground, cm-3' to 'Number concentration of PM2.5 at ground, cm-3'. Units of eq ha -1?

Table A2: Could the authors please provide a description of the units eq ha -1**.**

Appendix tables B1 – B7: I think the formatting could be improved across these tables and importantly, made consistent. E.g. Font formatting, equation layout (for preference, the equations should be as in Table B6, represented as fractions rather than as (xxxx)-1, but consistency is the main thing). In some cases the tables may be better displayed in landscape so that equations can be presented on one line. Table B6 is nicely laid out, although the text in column one is too small to read easily.

Table B2 and B3: Should RES – SURF be RES-SURF?

Figure B3 and B4: Shold these be the same?

Appendix C, Equations 8 and 9: These are hard to decipher, please consider improving their layout

L958: Fix reference formatting for Yi (2008) and Bash et al., (2010)