Atmospheric Chemistry and Physics Discussions

Atmos. Chem. Phys. Discuss., referee comment RC2
https://doi.org/10.5194/acp-2021-313-RC2, 2021
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Comment on acp-2021-313

Anonymous Referee #2

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-RC2, 2021

The Air Quality Model Evaluation International Initiative (AQMEII) aims to evaluate regional-scale air quality models used for research and regulatory applications. The fourth phase (AQMEII4) focuses on wet and dry deposition processes and their effects on model predictions and performance. A primary activity of the fourth phase is to conduct a diagnostic comparison of air quality model predictions of deposition fields and to evaluate model concentrations and wet deposition fluxes against surface observations in North America and Europe. The purpose of this technical note is to provide background information about the dry deposition schemes from the modeling systems included in the study and the protocols that will be used for their intercomparison. The technical note describes the harmonization of the spatial domains, emissions, chemical boundary conditions, and output across the modeling efforts. It provides detailed representations of the dry deposition scheme for each air quality model included in the study. It describes the use of effective conductance and effective flux as a basis for cross-comparisons of dry deposition pathways between models, as well as land use/land cover and other diagnostics reported for each model. The technical note is well written and will be an important resource of background material for future publications of AQMEII results. I highly recommend publication with consideration of the following:

- Versions and references for the modeling systems should be identified in Table 1.
- Maps of the European, North American, and combined domains should be added.
- Please explain what is meant in lines 194-196 on page 7 regarding “past use in policy-relevant emissions scenario simulation, with changes in emissions policies that may affect the deposition”.
- It would be helpful to know which emissions models were used, not only the source of the data, i.e., 2011v6.3 and 2016 beta, in the unified approach for forest fire emissions in North America and Canada.
- In lines 338-346 on page 13, consider summarizing and briefly explaining some of the key motivating factors that have led to the development of different resistance frameworks. For example, is it the evolution of measurement systems, availability of

observational data, inclusion of missing deposition pathways, etc.

- Please describe the characteristics that are used to guide the mapping to each generic land use/land cover category. For example, what are the definitions of mixed forest or herbaceous cover?
- Check the references as well as the definitions of variables in Appendix B (which should be at the first instance) for completeness.