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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The effect of dry and wet deposition of condensable vapors on secondary organic aerosols concentrations over the continental US" *by* C. Knote et al.

Anonymous Referee #2

Received and published: 14 July 2014

This is a well written, appropriately titled manuscript describing modeling efforts to quantify the effect that deposition of gas-phase semi-volatile organic compounds has on predictions of secondary organic aerosol. While it now appears from the literature that deposition/uptake of such compounds in smog chambers affects the ability of associated experiments to predict yields, only little effort has been aimed at quantifying this effect in the ambient atmosphere. Therefore, this is an appropriate topic for ACP. What work has been done previously is cited and provides the basis for this work, which provides a quantitative conclusion. The paper uses appropriate methodology and cites previous work liberally; methodologies (with the exceptions noted below) ap-

pear sound. The abstract is complete and accurate. That being said, there are a few issues that need to be addressed prior to my being able to recommend publication.

Significant comments: Much of this work is predicated on the work of Hodzic et al. (2014a), which was not made available for review. Not enough information about this work is given to allow for an evaluation of whether this approach should be carried into WRF-Chem/VBS. Please provide more information.

Given that all biogenic and all anthropogenic species are lumped together, how accurate is the unweighted average that is used for their characteristics? For example, the compounds that result from isoprene or terpene or sesquiterpene oxidation that might be in the same bin of volatility are going to be very different structurally – how does this impact their water solubility/H*? How widely do the individual H* vary? This needs to be explained more systematically in this manuscript. This would also then impact the deposition velocities, of course.

In the LOWVOL case (page 13739, line 4), what is the basis for using the C* = 1 bin? I recognize that it is "shielding" but why C*= 1? Why not C* = 10? Or C* = 0.1?

Page 13742, line 10. By considering only "traditional" SOA pathways, I believe that the authors may have missed a good opportunity. Yes, their point was to emphasize that deposition of SVOCs should be included in models – and they state that including other SOA pathways would simply shift things around (that is, that the end effect will be similar). However, I would argue that models for the non-traditional pathways also exist – so when you include both traditional and non-traditional pathways AND the deposition pathways, it would be the best evaluation yet of how well we can model SOA – and it would tell us how far off we are and potentially give insight into what really is missing.

Minor edits: Page 13734, line 14 – please define VBS here as this is the first use

Page 13741, line 13, I do not believe that the deposition cases has removed the local maximum. I believe it is still observed in Figure 4, left hand side.

Page 13742, line 8. Strongly overestimating in summer? Strongly is probably too emphatic.

Page 13744, line 6, add “to” between “relative” and “simulations”; next line use “employ” rather than “employs”

Page 13746, line 11 – change “and neither in the effect on” to “or in”

Page 13747, line 1 – study should be studies

Table 3, it could be my printed version, but it is difficult to see anything in bold?

Figure 2, update caption as there are no “left” and “right”

Figure 3, small size makes it difficult to assess measurements versus model output in right hand side

Figure 4, please use color in left hand side as the different lines are currently difficult to distinguish

Figure 5, same comment as Figure 3 for the top.

Figure 6, dark font inside dark green pie slice is difficult to read.

Should the figures associated with the Appendix be numbered differently?

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 13731, 2014.