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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Understanding sources of organic aerosol during CalNex-2010 using the CMAQ-VBS" *by* M. C. Woody et al.

Anonymous Referee #3

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Woody et al. present a comparison and analysis of OA model predictions for Southern California during CalNEX using the CMAQ model with two different treatments of OA. SOA and POA are modeled using a more traditional approach ("AE6"), in which POA is considered non-volatile and volatile organic compounds (VOCs) are oxidized to form SOA; and the VBS approach based on Koo et al., in which POA is considered semi-volatile and VOCs, I(intermediate)VOCs and S(semi)VOCs are oxidized to form SOA. Model to model comparisons, as well as measurement to model comparisons, are used to assess whether model underpredictions are due to emissions/dispersion, photochemical processing, or OA treatment. The manuscript represents a considerable amount of effort, and a large amount of information is presented (9 figures in the body, and 23 in the supplement not all of which are called in the text). In both the

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abstract and the conclusion, the large body of results is summarized; however, overall, there is a lack of synthesis, conclusions and implications. The significant contributions of this work may be masked by the large amount of information and the rather poor way that it is presented. The research is scientifically sound and likely has the potential to contribute to the field, both from the perspective of understanding atmospheric OA formation, as well as improving model representation. It is recommended that the manuscript be considered for publication in ACP, but with editorial revisions to highlight and support major conclusions and scientific contributions.

Comments:

The abstract is generally a good representation of the paper, from the perspective of the presentation of a lot of results with limited synthesis and interpretation. The abstract is quite long, and it is suggested that some of the details be omitted. In addition, it is suggested that a synthesis of the results and their implications be included to highlight significance of the work.

p. 26749, line 17-18: The focus on the degree to which processes and/or sources characterized by CMAQ are at play in the ambient atmosphere is not particularly well connected to the focus on sources of OA as written.

The first three paragraphs of the introduction present many prior studies that are relevant to the research from the perspective of reporting previous OA measurement/modeling results in California, including during CalNEX. However, the information is poorly organized and it does little to build the motivation and need for the specific work presented. It is suggested that the authors consider reorganization of the introduction to better support their efforts in analyzing process/source contributions to measured and modeled OA.

p. 26749, line 9: “indicates” should be “indicated” or “indicate”

p. 26750, line 1-2: In the abstract and throughout the results, CMAQ-AE6 is differ-

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entiated from CMAQ-VBS; here however, they are described as the single approach to simulate aerosols (aerosols 6 module with the VBS approach). This needs to be reconciled.

It is suggested that the authors consider restructuring the methodology such that the paragraph starting on p. 26752, line 15, continues the discussion of SVOCs and POA from the paragraph starting on p. 26752, line 6; and then is followed by discussion of the emissions inventory and then modeling domain.

p. 26750, lines 10-20: The purpose of the additional references following Murphy and Pandis is unclear. In some cases, it seems as if the authors would like to reference the original data source, however, that is not made clear. What is the Koo et al. reference for? And Carlton et al. 2010? These are confusing given that the authors note that yields are based on Murphy and Pandis 2009.

p26750-2751: The authors need to make it clearer that the order of magnitude reduction in volatility (e.g., line 25, p26750) occurs at each step.

p. 26755, line 25: It is suggested that the authors remove the imprecise language such as “were in reasonably good agreement”, given that quantitative metrics follow.

p. 26758, line 22: It is not clear whether “estimated” here means calculated or concluded based on simulations. Please clarify.

p. 26762, line p. 26763, line 6: Can the authors clarify what is meant by production efficiency? I was not expecting missing/mischaracterized IVOCs to be linked to production efficiency as is written.

p. 26763, line 25: Can the authors expand on what is meant by obtaining agreement for the wrong reasons? Can they give examples of what else would lead to the same conclusions?

p. 26767, line 11: Replace “biogenic” with “biogenics”, or add “species”/”compounds”/etc.

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p. 26768: It is not clear what is added by the application and discussion of the SIMPLE parameterization.

Largely absent from the results and conclusions is the role of oligomers (e.g., see review by Ziemann and Atkinson, 2012) and their lack of representation in models.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 26745, 2015.