

## ***Interactive comment on “Simulating secondary organic aerosol in a regional air quality model using the statistical oxidation model – Part 2: Assessing the influence of vapor wall losses” by C. D. Cappa et al.***

**Anonymous Referee #2**

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The manuscript “Simulating secondary organic aerosol in a regional air quality model using the statistical oxidation model – Part 2: Assessing the influence of vapor wall losses” by Cappa et al presents a study of how wall-losses of secondary organic aerosol (SOA) in chamber measurements affect the modeled atmospheric SOA concentrations. There have been several studies on wall losses in chamber measurements. However, to my knowledge this is the first study that has comprehensively taken chamber wall losses into account in a large scale atmospheric model. The manuscript fits well in the scope of Atmospheric Chemistry and Physics and very well written. I can

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recommend it to be published after the following minor issues have been addressed:

- Abstract, Page 30083, Line 28, “Similar improvements...”: This sentence is difficult to understand without reading the whole manuscript. In addition, in Section 2.3.2 it is said that with more volatility bins, “wall-less” fits could be determined. Although the results of this study strongly indicate that wall-losses have to be taken into account in order to reproduce observed SOA properties, I would recommend excluding this sentence from the Abstract.
- Page 30089, Line 25-: Doesn't the accommodation coefficient have any effect on the amount of SOA or is the effect insignificant?
- Page 30091, Line 11: This inconsistent behaviour should be explained. Now it is only shown in Fig S2 and not really explained anywhere.
- Page 30093, Line 29: How is SOA formation from isoprene a notable exception?
- Page 30095, Line 26: Should this be along the lines of “ $R_{\text{wall}}$  increases with decreasing SOA concentration”?
- Page 30096, Lines 4-7: Is this true for both relative and absolute differences? I would expect that the absolute differences in concentrations between the wall-loss and no-wall-loss simulations are higher in high-source regions.
- Page 30102, Line 1: It is unclear to me, what is the “fossil fraction of SOA”.
- Page 30105: Since the diurnal variation of NO<sub>x</sub> concentrations haven't been taken into account in these simulations, would you expect the model to reproduce diurnal profiles well?