

Interactive comment on “Organic aerosol in the summertime Southeastern United States: Components and their link to volatility distribution, oxidation state and hygroscopicity” by Evangelia Kostenidou et al.

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(1) Organic aerosol (OA) is an important aerosol component in the atmosphere. One key to fully understanding OA is to constrain the volatility and hygroscopicity of OA. This manuscript used the measurements by a thermodenuder coupled with a HR-AMS to analyze OA source, volatility distribution, oxidation state and hygroscopicity. This study gives the OA community some insights on OA volatility and hygroscopicity, and pointed out the caveat of deriving the volatility of OA only from its mass fraction remaining (MFR). These findings are worth publishing for sure.

We do appreciate the positive assessment of our work. The responses to each comment of the reviewer and the corresponding changes in the manuscript can be found below.

(2) I don't have many comments but hope the authors can explain why they only used 3-bin C distribution (rather than 5 bins, 10 bins, for example) to fit the measured thermograms. 3 bins cannot cover the whole range of real OA volatilities. Also, can the authors describe more on the approach of Karnezi et al. (2014) that was used to calculate the best fit of MFR and the uncertainties of OA volatility distributions? I find it hard to understand this method based on the current form.*

The number of bins that can be used in the analysis of thermodenuder data is in general determined by the ambient OA concentration (the bin range can extend up to an order of magnitude higher than the measured values), the number of temperature steps used in the analysis (the number of bins cannot be much higher than the number of data points available for fitting), and the maximum fraction of the OA evaporated during the analysis. Our selection of only 3 bins was determined by the availability of measurements at 25, 60, 80 and 100 C. The concentration of the OA was of the order of $5 \mu\text{g m}^{-3}$, so there is a little information about compounds with saturation concentration of $100 \mu\text{g m}^{-3}$ or more in the corresponding thermograms. These two constraints resulted in the choice of the 0.1, 1 and $10 \mu\text{g m}^{-3}$ bins. Please note that the $0.1 \mu\text{g m}^{-3}$ bin also includes material with even lower volatility that did not evaporate at the highest temperature used. These important points have been added to revised paper.

The Karnezi et al. (2014) approach searches the full parameter space for solutions that are consistent (within a predetermined error consistent with the experimental uncertainty) with the measured thermograms. It usually finds a number of such solutions. It then calculates a weighted average (the closer a solution is to the data the higher its weight) and a weighted standard deviation using all these “acceptable” solutions. This brief explanation is now included in the paper.

(3) *Line 63. Please give the full name of PMF.*

It has been added.

(4) *Line 87 and 88. The sentence reads odd.*

We have rephrased the sentence.

(5) *Line 130. Can the authors briefly describe these two papers?*

We have added a short description of these two papers. Xu et al. (2015a) estimated the contribution of different sources to the measured OA while Cerully et al. (2015) quantified the OA hygroscopicity. These two papers use the same AMS dataset with the present study.

(6) *Line 265. Why no measurements above 100 Celsius?*

The experimental set-up used was rather complex because there were four lines (ambient bypass, ambient TD, PILS bypass, and PILS TD) used in an effort to characterize both the volatility and hygroscopicity of the OA. Because of the multiple objectives of the measurements, the number of temperature steps that could be used in the TD was limited and an upper temperature of 100 C was selected in the design phase of campaign. In retrospect, an even higher temperature would have provided very useful information. We have added a sentence in the Conclusions recommending the use of higher temperatures in additional steps in future studies in that area.

(7) *Line 367 and 368. This sentence reads odd too.*

We have rephrased the sentence.

(8) *Line 380. “Evaporation coefficient”, do you mean “accommodation coefficient”?*

We have rephrased this to “accommodation (evaporation) coefficient” to avoid confusion.

(9) *Line 399. It should be Figure S6, rather than S7.*

Corrected.

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Discussion paper

