Atmos. Chem. Phys. Discuss.,
https://doi.org/10.5194/acp-2019-364-RC2, 2019

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Seasonal characteristics of organic aerosol chemical composition and volatility in Stuttgart, Germany" *by* Wei Huang et al.

Anonymous Referee #2

Received and published: 11 June 2019

Huang et al. present a study investigating ambient organic aerosol in a German city with high air pollution for European standards. The combined information from two mass spectroscopy methods, AMS and FIGAERO-CIMS, gives insights into organic aerosol mass loadings, molecular composition, and apparent particle volatility. The study is well designed and enhances the current understanding of seasonal variability in the investigated organic aerosol properties. However, a few issues need to be addressed and discussed in the manuscript.

1.) The description of the filter collection suggests that the filters were collected inside the measurement container at ∼298K. This would be ∼25 °C warmer than the aver-

age ambient temperature in winter leading to a substantial evaporation of semi volatile compounds during sample collection even with the shortest collection times. The opposite could happen on hot summer days when the outside temperature is higher than in the container. Gas phase compounds would condense on the particles and filter increasing the observed volatile fraction. This needs to be discussed.

2.) It should be clearly stated in the text that the C* values from the elemental composition parameterization are calculated at a reference temperature. The "acting" C* values at the ambient temperature in summer and winter are different and with this the classification of compounds into EL/L/S/IVOC. It is possible to calculate the shift in C* values due to the different temperatures similar to Stolzenburg et al. 2018 and present them at least in the SI material.

3.) Generally, a little bit more information about the C* parameterization should be added. Especially a note that this assumes that each detected elemental composition is indeed only one isomer with one C* value and that no thermal decomposition occurred. The ion thermograms shown in Figure S10 indicate that this assumption is not universally valid, and you do discuss this later in the text. But in my opinion, this needs to be pointed out already when introducing the parameterization as it impacts the interpretation of the calculated C* values.

4.) The specific borders for the volatility categories vary between publications. But more resent ones (Donahue et al 2009) defines SVOC as -0.5 to 2.5 log10C* and IVOC from 2.5 to 6.5 log10C*. Is there a reason for your different choice of categories?

5.) The dominant wind direction changes with the seasons from east to south-west coming over the inner city of Stuttgart including busy roads and the main train station with a big construction site. However, when discussing the seasonal changes in OOA sources this is not mentioned at all. Are the emissions so well mixed in that region that no influence on the SOA is expected?

Minor comments:

+ What were the mass loadings on the collected filters? Also, summer and winter samples had ∼20% different amounts of BC which is “invisible” to FIGAERO. Was the collected aerosol mass corrected for that?

+ In Figure S10, distinct changes in the ion thermograms are visible. However, due to the multitude of lines and the limited number of colours it is impossible to identify if e.g. any of the 3 dominant green lines in panel (a) are the same ion as the bimodal green line in panel (b). Adding the ion compositions as labels to a few ion thermograms may make reading this figure easier and may reveal some interesting details.

+ 1808 out of 2138 ions were of type CHOX. What were the other ones?

Technical comments:

page 2 line 63 “suggested” should be “suggesting”

page 4 line 127 “298 K” authors use Kelvin here and everywhere else temperature is given in Celsius. Should be changed to Celsius.

page 4 line 148 “filters were deposited” Particles are deposited on the filters, but the filters are not deposited in the filter holders.

page 5 line175 “m-3” is broken over lines

page 5 line189 “%” is broken in next line

page 10 line 360 “Potential possible reason” use either potential or possible.

References

Donahue et al., Atmos. Environ., 43(1), 94–106, doi:10.1016/j.atmosenv.2008.09.055, 2009.

Stolzenburg et al., Proc. Natl. Acad. Sci., 115(37), 9122–9127, doi:10.1073/pnas.1807604115, 2018.

Interactive comment on Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2019-364, 2019.