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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Organic aerosol volatility and viscosity in North China Plain: Contrast between summer and winter" *by* Weiqi Xu et al.

Anonymous Referee #1

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General Comments: The manuscript by Xu et al. investigated aerosol volatility and viscosity in North China Plain (NCP) using thermodenuder coupled with high resolution aerosol mass spectrometer. Generally, volatility distributions and glass transition temperature were compared in detail during two different seasons (summer and winter) at two different locations (urban site (Beijing) and rural site (Gucheng)). The compositional differences between volatile and non-volatile species were also elucidated. They found that OA in winter in NCP is more volatile than that in summer. In addition, OA occurred mainly as solid in winter in Beijing, while it dominantly existed in semi-solid phase in Beijing in summer and Gucheng in winter. The topic fits well within the scope of ACP. This manuscript is generally well written. Before its publication, the following comments need to be addressed.

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Discussion paper

Specific Comments: 1. The predicted viscosity was partly influenced by the low RH (overall lower than $\sim$40% throughout the day in winter in Beijing). Can you also provide the predicted viscosity under high RH in winter in Beijing? For example, I noticed you have the high RH data in Fig.5. 2. Page 9, line 15: The high contribution of low volatility organic nitrates in summer is the reason of higher concentrations of non-volatile nitrates in summer, rather than the comparable non-volatile sulfate and nitrate. Please elaborate. 3. MFR (an extensive parameter explicitly depending on mass concentration) is not equivalent to volatility since volatility is an intensive parameter, which only depends on chemical nature of compounds in a mixture. However, MFR was used as a basis for volatility comparison in Page 10, line 17. In addition, are those differences in thermograms between LO-OOA during different RH levels and that of MO-OOA caused by concentration? 4. How did you measure PAH? Please describe in the measurement or data analysis section. In addition, are there any specific reasons that you used C* =10 -5 μgm$-$3 to fit the measured thermograms? 5. The mass fractions of PM and OA species in Figs. 1-2 : It looks like the scale of the x-axis is wrong. The ambient temperature is obviously not 25 âĎČ in winter. 6. I suggest putting mass concentrations of composition of total, volatile, non-volatile PM and OA in a table so that the readers can see them clearly.

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