Response to referee Mindjin Tang

The referee's comments are in italics, our responses in plain font.

*Mikhailov et al. used several methods to investigate composition, hygroscopic properties and CCN activities of three types of subpollen aerosol particles. This work is very robust and comprehensive, and thus deserves publication by ACP. 1) In general I feel that this manuscript is very long, and the authors may considering moving some non-critical parts to Appendix or Supporting Information.*

We thank Mindjin Tang for the constructive criticism and suggestions for improvement that were taken into account upon manuscript revision. Responses to individual comments are given below.

1. *Section 2.5 (including Figures 1-2 and Table 1) can be substantially shorten, as HHTDMA has been described in a previous paper; some mathematical equations (and related discussion) presented in Sections 2.6 and 2.8 can be moved to Appendix or Supporting Information.*

Figures 1-2 and Table 1 went to Supporting information. Sections 2.6 and 2.8 were substantially shorten. Some equations and accompanying material sent to the Supplement.

2. *p35, line 1-18: I am not sure whether information provided by this long parapraph is an important finding of this work.*

This paragraph has been removed.

3. *p27, line 14-15: could you please explain why the measured kappa values decrease with water activity in the range of 0.65-0.95 before LLPS occurs?*

Kappa value decreases with $a_w$ increasing due to solute-solute and solute-water interaction in the concentrated solution droplet. It particularly follows from relation for intrinsic hygroscopicity: $\kappa_{intr} \approx \nu_s \Phi_s \frac{\rho_s M_w}{\rho_w \mathrm{M}_s}$, where $\nu_s \Phi_s$ is the product of the stoichiometric dissociation number and the molal osmotic coefficient of the solute. For concentrated solutions $\Phi_s > 1$, in dilute solution it approaches to 1. There are different thermodynamic models (like UNIFAC) used to describe the concentration effect of organic on $\Phi_s$ . Nonideality of concentration solution also considers in term of the excess of Gibbs energy and water activity coefficient, $\gamma_w$ (Petters et al., Atmos. Chem. Phys., 9, 3999–4009, 2009. Concentration-dependent of $\kappa$ for single compounds in term of van't Hoff factor ($i_s$) $\kappa_{intr} = i_s \frac{\rho_s M_w}{\rho_w \mathrm{M}_s}$, analysed in Mikhailov et al. (Atmos. Chem. Phys., 9, 9491–9522, 2009) Mikhailov et al. (Atmos. Chem. Phys., 13, 717–740, 2013) also suggested a mass-based κ interaction model that describes concentration-dependent water uptake by multicomponent aerosols.

4. *p 25, line 2: please change "16" to "0.16".*
   Done.