Interactive comment on "Measurement Report: Distinct size dependence and diurnal variation of OA hygroscopicity, volatility, and CCN activity at a rural site in the Pearl River Delta (PRD) region, China" by Mingfu Cai et al.

Summary:

This work demonstrates the hygroscopicity, volatility and CCN activity of OA particles at a rural environment of PRD. The manuscript fits well to the scope of ACP. However, I think more evidences or discussions should be included if possible. This paper is worth to be published, but not in its current form. Thus I recommend it to be accepted after the following comments listed below have been adequately addressed.

Comments:

1. Section 2.2.2: Please give more information of reference data used in the Köhler theory when performing the CCNC calibration with ammonium sulfate particles. This is very important because different parameterizations will retrieve different critical supersaturations (Rose et al., 2008).
2. Line 340, I understand the decomposition of particles is hard to quantify. Could you roughly estimate the uncertainty?
3. Lines 409-413: I agree that the surfactant effect is crucial to explain the discrepancy in hygroscopicity closure study. Could you provide any chemistry evidence about that? Maybe from the AMS data or filter sample if this had been done in the campaign. Also, the difference between κ_{CCN} and κ_{htdma} may also due to the parameterizations used in the CCNC and HTDMA calibration. See Wang et al., (2017). Please consider it and give more information as suggested in comment 1.

   Many studies (Petters et al., 2009;Wex et al., 2009;Hersey et al., 2013;Wu et al., 2013;Hong et al., 2014;Hansen et al., 2015;Mikhailov et al., 2015;Pajunoja et al., 2015;Zhao et al., 2016) have reported the different hygroscopic properties from CCNC and HTDMA measurements. I would suggest more discussions should be added.
4. As shown in Fig. S10, the depression of surface tension is more obvious for larger particles (low SS). Is this more related to the ELVOCs? I would suggest to provide more case study, such as comparing the hygroscopicity (three methods) with different pollution condition (or OA content). For SS=0.7%, I do not suggest to adjust the

surface tension, it seems more reasonable to use the sigma of water.

5. Line 491: If there is a paper about the hygroscopicity of OA in the same study, please clarify the similarities and differences

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Zhao, D. F., et al.: Cloud condensation nuclei activity, droplet growth kinetics, and hygroscopicity of biogenic and anthropogenic secondary organic aerosol (SOA), Atmos Chem Phys, 16, 1105-1121, 10.5194/acp-16-1105-2016, 2016.