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***Interactive comment on* “Chemical composition, microstructure, and hygroscopic properties of aerosol particles at the Zotino Tall Tower Observatory (ZOTTO), Siberia, during a summer campaign” by E. F. Mikhailov et al.**

Anonymous Referee #1

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General: Mikhailov et al. present an extensive study of chemical composition and hygroscopic properties for a “tall tower” Siberian background site. These measurements are an important contribution to the literature, and the methods employed are world-class. It is a bit unclear the motivation for developing the mass-based kappa interaction model as opposed to the traditional parameterization – perhaps the authors can provide some brief motivation here. More detailed comments follow below. Detailed: Abstract, Line 11: The authors should indicate what forms of sulfate actually can be detected. Specifically, does the present study have the capability to determine organic sulfates? Figure

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2 and p. 7846, Lines 1-6: It is not clear what is being done here. How were the “initial volume distributions” measured? Judging by the discontinuity around 500 nm it is most likely a combination of APS and SMPS. The caption for figure refers to a “Boltzmann sigmoidal algorithm” but no mention is made of this in the experimental section. p. 7846: What does “series multiplying” mean? p. 7847: How was the range of the STXM measurement determined? p. 7848: In the experimental section, no mention is made of where the Al and Fe data was obtained. The authors should note this. p. 7848: There is a reference to a commercial brochure. This is not an appropriate reference. The company name and model of the microscope will suffice. Reference to any peer reviewed literature documenting this microscope would also be pertinent. p. 7856, line 6: a distribution of analyzed particles would better illustrate the sizes of particles subjected to STXM measurement. p. 7856: The authors have $/OM^{-1}$. This appears to be denoting normalization by total OM. The addition of a / symbol makes it seem as if you are dividing by the inverse – was this really intended? Figure 1: The fires (red dots) need to be indicated somewhere in the figure or the caption. Figure 3: What are the limits of the A-B axis? How can mixed phase II exist if 100% A is present? Can the authors perhaps use an actual system here using actual data? Also, (a, b) should be capitalized (A, B) in the figure caption.

Figure 5: The size scale needs units.

Figure 8: While the logarithmic axis may be necessary to capture the true range in G, the goodness of fit near the deliquescence RH is difficult to evaluate.

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