

Response to Reviewer #1

General comments:

This study used an advanced aerosol-fog sampling system to directly investigate the impacts of aerosol hygroscopic growth and activation processes on physical and chemical properties of submicron aerosols which is rarely done before. Presented results revealed significant shifts in aerosol size distributions and composition under both subsaturated and supersaturated high RH conditions, with more than 70% submicron aerosol migrated to supermicron ranges in foggy conditions, and over 25% of aerosol mass with dry diameters below 1 μm resided in supermicron ranges under subsaturated high RH (> 90%), shedding new insights into aerosol sampling and aerosol physical properties in foggy/cloudy and high RH conditions. Moreover, simultaneous measurements of aerosol chemical compositions shedding new insights into hygroscopic and activation properties of different aerosols types, which is important implications in both aerosol/cloud aqueous chemistry and cloud microphysics. In general, I think this manuscript is well organized and presented direct measurements of aerosol hygroscopic and activation processes with the view of aerosol size and chemistry which is very useful for aerosol and fog/cloud community, therefore suggest acceptance after minor revisions.

[We thank the reviewer's positive comments.](#)

Minor comments:

Emphasize the broader implications of the research findings for aerosol/cloud science and atmospheric chemistry in the abstract

[Corrected.](#)

[Following the reviewer's comments, we added](#)

[“Overall, our study highlights remarkably different cloud and fog processing behaviors between primary and secondary aerosols, which would benefit a better understanding of aerosol-cloud interactions under distinct atmospheric conditions.”](#)

Explicitly state the research objectives or questions towards the end of the introduction to guide readers on what to expect from the study. This helps to focus the reader's attention and provides a roadmap for the rest of the manuscript. Current version discussed too much on aerosol chemical compositions, however, discussions about current understandings of how aerosol hygroscopic growth and activation impacts on aerosol submicron aerosol compositions is relatively few.

[We thank the reviewer's comments. Indeed, we have expanded our discussion in the introduction to further explore how RH impacts aerosol chemical compositions, as only a limited number of studies have directly investigated the effects of aerosol hygroscopic growth and activation on aerosol size or chemical compositions.](#)

To better clarify this point, the following sentences are added in the first paragraph:
“Most current studies primarily focus on the impact of RH on aerosol chemical compositions, with only a limited number of studies directly quantifying how aerosol hygroscopic growth and activation affect size and/or chemical compositions of aerosol”