Response to the editor

We are grateful for your comments on our manuscript. Based on these comments and suggestions, we have made careful modifications as listed below. The comments are copied in black text, and the responses are in regular blue font. All changes made to the text are in *italic text*.

EC1. Shorten the abstract so it adheres to the journal guidelines.

Response: We have shortened the abstract to less than 250 words (248 words now) according to the journal guidelines.

Abstract: "Aerosol particles play critical roles in climate and human health. However, aerosol composition and evolution, particularly secondary organic aerosol (SOA), and its interaction with clouds in high-altitude background areas in China remain less understood. Here we conducted real-time measurements of submicron aerosols (PM_1) using aerosol mass spectrometers at a forested mountain site (1128 m a.s.l.) in southeastern China in November 2022. The average ($\pm 1\sigma$) PM_1 mass concentration was $4.3 \pm 4.8 \ \mu g \ m^{-3}$, which was ubiquitously lower than those at other mountain sites in China. Organic aerosol (OA) constituted the largest fraction of PM_1 (42.9 %) and was dominantly secondary as indicated by the high oxygen-to-carbon (O/C) ratio (0.85–0.96) and carbon oxidation state (0.21–0.49). Notably, the remarkably enhanced PM_1 concentrations observed during daytime on cloudless days were identified to be likely produced from cloud evaporation. While more oxidized oxygenated OA was scavenged efficiently during cloud events, cloud evaporation was found to release a significant amount of less oxidized oxygenated OA from air mass transported from polluted regions. The distinct decrease of OA/ΔCO with the increase of O/C during the cloud evaporative period further demonstrates that OA remained in cloud droplets are generally in a moderate oxidation state. Moreover, organic nitrates were also estimated and showed a higher contribution to the total nitrate during the cloudy period (27 %) than the evaporative period (3 %). Overall, our results demonstrate the importance of SOA and the influences of cloud processes in regional mountain areas in southeastern China."

EC2. l. 58: 'mainly' seems redundant (most of these studies…mainly)

Response: Deleted as suggested.

EC3. l. 70 (Caption Figure 1): 'at' is missing (at Mt. Tai)

Response: Added.

EC4. l. 105: ASCM should be ACSM

Response: Revised.

EC5. l. 113: Replace 'of ACSM' by 'by ACSM'

Response: Replaced.

EC6. l. 175: "The highest two frequences of PM1 concentrations were distributed within 0–3 μg m-3 and 5–8 μg m-3 (29.0 % and 29.8 %, respectively)."

I don't understand this sentence. 1) I am not sure that 'frequence' (should be 'frequencies' anyway) is the right word here. 2) Do you mean that 'PM1 concentrations were either between 0 and 3 ug/m3 or between 5 and 8 ug/m3'? Is the reader supposed to this in Fig S3?

Response: We apologize for our confusing statements. The editor is correct that 'frequences' should be 'frequencies' here, and the original meaning of this sentence is that PM_1 concentrations were either between 0–3 μg m^{-3} and 5–8 μg m^{-3} (as indicated by the white lines in Fig. S3). However, we realize this sentence is redundant given the discussion in Section 3.1 mainly regarding the roles of organics and nitrate in PM_1 elevation. Therefore, we have deleted this sentence in the revised manuscript.

EC7. l. 213/4: 'nitrate wind polar plot' sounds like lab jargon. Please use the terminology as in the corresponding figure caption 'Wind (NWR) regression polar plot for nitrate'

Response: We have changed it to "Non-Parametric Wind (NWR) regression polar plot for nitrate".

EC8. l. 245: "These particles were then removed by new cloud formation and strong

wind (WS > 4 m s^{-1}).” This new text sounds as if there had been precipitating clouds. I am sure that this is not the intended meaning. To me, these are two different effects 1) Particles were scavenged by clouds (but still present in the air mass), 2) there were strong winds that moved everything in the air mass.

Please clarify what you want to say here.

Response: Thank the editor for pointing this out. Since there were no PM cutoffs before the sampling inlet, the reduced particles were more likely to be removed by strong winds that moved everything in the air mass. We have clarified this in the revised manuscript.

Line 241: *“These particles were then removed by the strong winds (WS > 4 m s^{-1}) that dispersed the entire air mass.”*

EC9. l. 255: “However, there were several observations and questions raised that cannot be conclusively confirmed with the current data we have.”

Reword this sentence as subjects and verbs do not match – observations cannot be raised; questions cannot be confirmed…

Response: This sentence has been rephrased in the updated manuscript.

Line 250: *“However, we also observed several phenomena during the sampling period that cannot be conclusively explained by the current data.”*

EC10. l. 261: replace ‘severe’ by ‘thick’

Response: Replaced.

EC11. l. 372: Use consistent wording. A few lines above, you call the correlation between MO-OOA and BC ‘moderate’ which seems more appropriate here

Response: We have changed ‘considerably’ to ‘moderately’ here.

EC12: l. 374: replace ‘coated on’ by ‘coating’

Response: Replaced.

EC13: l. 400: replace ‘variations’ by ‘trends’

Response: Replaced.

EC14: l. 410: 'reintroduced into the atmosphere' seems odd. Also clouds are part of the atmosphere. Please reword.

Response: The term 'reintroduce into the atmosphere through cloud evaporation' has now been revised to 'released through cloud evaporation'.

EC15: Figure S3: Add a legend to explain the colors

Response: Added.
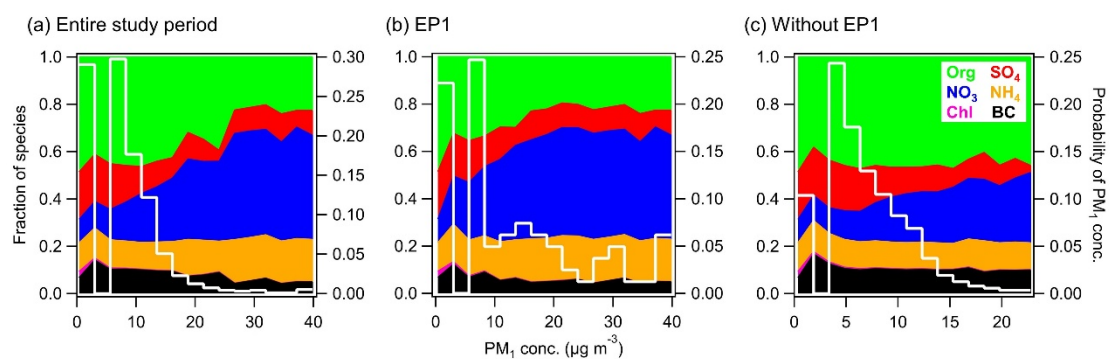
Figure S3. Variations of aerosol composition as a function of PM$_1$ mass concentration and the probability density of PM$_1$ during (a) the entire campaign, (b) EP1, and (c) the campaign without EP1.