We would like to thank the reviewers for taking time to review this paper and providing constructive comments to improve the paper. All questions and comments raised by the reviewers have been answered in our responses below and the manuscript has been revised accordingly. The comments are shown below in black with our reply in blue.

RC1:

Overall comments: This manuscript addresses how aerosol composition, specifically organic fraction, can influence CCN closure results. The authors obtain aerosol composition and CCNC measurements from aircraft observations in different field campaigns, ACE-ENA and HI-SCALE. The sites differ in their environments, resulting in differing composition and changes in CCNC observations and closure. The results highlight the importance of understanding regional aerosol sources in order to reduce the gap between observed CCNC results and model results. The paper can be a great asset for future studies bridging the gap between modeled and observational CCN. I do have a few questions/a comment:

1. Page 5, Lines 121 – 125: I would suggest putting the supersaturation levels and kappa values used here; it was confusing to have this mentioned and then not find the values until later

RESPONSE: Thank you for the suggestion. We agree that explicitly defining these key parameters when the methodology is first introduced significantly improves the clarity of the manuscript. In the revised Section 2.2 (Data Preprocessing), we have incorporated the specific supersaturation (SS) levels employed during the ACE-ENA and HI-SCALE campaigns. We have also explicitly stated the κ values and densities assigned to each chemical component. The revised text is shown below:

"CCN data was measured by a Continuous-Flow Streamwise Thermal Gradient CCN Counter (CCN-200, Droplet Measurement Technologies) at prescribed supersaturation levels, for the ACE-ENA campaign, SS was set to 0.14% (channel A) and 0.32%/0.37% (channel B); for HI-SCALE, the levels were 0.24% (channel A) and 0.46% (channel B). The supersaturations were determined at 600 mbar for two distinct temperature settings, with each temperature setting corresponding to one column. To ensure reliable and consistent measurements, the instruments were calibrated before and after each deployment, and twice during the field campaign. Throughout the flights, the CCN instrument was operated with a constant-pressure inlet carefully maintained at 600 mbar. The measurements were then converted to ambient temperature and pressure conditions. Aerosol chemical composition was measured by a High-Resolution Time-of-Flight Aerosol Mass Spectrometer (AMS), quantifying major non-refractory submicron components. To estimate aerosol hygroscopicity, we adopt values from the 3-mode version of Modal Aerosol Module (MAM3, Liu et al., 2012): $\kappa_{org} = 0.1$ and $\kappa_{inorg} = 0.507$ (applied to sulfate, nitrate, ammonium, and chloride), assuming an internal mixing state to link results to GCM biases. Fixed densities were assigned at 1.0 g cm^{-3} for organics, 1.77 g cm^{-3} for inorganic salts, and 2.2 g cm^{-3} for chloride.

2. Page 7, Line 159-160: I understand the kappa values were pulled from Liu et al., but why not prescribe kappa values for each species as opposed to lumping non organics under a singular

value? For example, Kulkarni et al assigned a range of kappa values of soluble organic, and kappa of 0.7 for nitrates and sulfates. These values are higher than the assigned kappa inorg of 0.507– would this not affect the closure results? Does the kappa inorg value also include elemental carbon (kappa of 0) by chance?
Citation: Kulkarni, G., Mei, F., Shilling, J. E., Wang, J., Reveggino, R. P., Flynn, C., Zelenyuk, A., & Fast, J. (2023). Cloud Condensation Nuclei Closure Study Using Airborne Measurements Over the Southern Great Plains. Journal of Geophysical Research: Atmospheres, 128(5), e2022JD037964. https://doi.org/https://doi.org/10.1029/2022JD037964

RESPONSE: Thank you for raising this question. The values of κ_{org}=0.1 and κ_{inorg}=0.507 were specifically chosen to maintain consistency with the MAM3 aerosol module, for the objective to evaluate the performance of parameterization schemes commonly used in GCMs within the context of a closure experiment. We emphasize this goal in the Introduction:

"Therefore, one can use observations to conduct CCN closure analysis, which compares measured and calculated CCN number concentration, to inform whether the aerosol parameters and mixing assumptions in GCMs are realistic"

According to the results in this paper, using higher κ values (e.g., 0.7 for pure inorganics) as in Kulkarni et al. (2023) would increase the overestimation of CCN Closure Ratio. We added discussions of the different kappa values in the paper:

"To quantify the potential influence of model parameter assumptions—such as density and hygroscopicity—on the closure results, sensitivity tests were conducted based on typical ranges reported in literature. The density of organic aerosol typically varies from 1.0 to 1.5 g/cm³ (Broekhuizen, 2006; Cerully et al., 2015; Medina et al., 2007; Meng et al., 2014; Padró et al., 2012), while the organic hygroscopicity parameter (κ_{org}) ranges from 0.01 (nearly insoluble) (Bougiatioti et al., 2009; Medina et al., 2007) to 0.2 (Cerully et al., 2015). Additionally, the maximum assumed κ_{inorg} for inorganic species can reach 0.7(Kulkarni et al., 2023). The dashed lines in Figures 9b and 10b represent the range of closure ratios (CR) under the combination of these assumptions. A prominent common feature observed at both ACE-ENA and HI-SCALE is that the uncertainty range of CR expands significantly as MForg increases. At low MForg, the variations in assumed parameters result in minimal CR differences due to the dominance of inorganic particles. Conversely, at high MForg, the uncertainty regarding the physicochemical properties of organic aerosols becomes the primary source of error in CCN estimations. This underscores the necessity of obtaining accurate, size-resolved organic composition and property data, particularly in organic-rich environments."

On black carbon (BC): Since the AMS only measures non-refractory submicron components, the calculated κ_{AMS} from Equation (2) does not include BC. we explicitly discussed this limitation in the manuscript:

"A notable limitation in this approach is the exclusion of black carbon (BC). Since the AMS exclusively measures non-refractory submicron components, the volume fraction of

hydrophobic BC ($\kappa \approx 0$) is omitted from the volume-weighted average in Eq. (2). This omission artificially inflates the bulk hygroscopicity of the particles, rendering the modeled internal mixture more hygroscopic than the actual ambient population. Such an effect is particularly relevant in environments influenced by combustion or long-range transport of continental pollution, further contributing to the systematic overestimation of CCN activation. (Ren et al., 2023; Saliba et al., 2023; Soloff et al., 2025).”

3. Figure 3(d): How are the error bars for CCN number determined?

RESPONSE: We thank the reviewer for this careful observation. In the revised manuscript, we have updated and standardized the statistical representation for all box plots, including Figure 3d. In the previous version, the whiskers extended to the maximum and minimum values within the Q3 + 1.5 times IQR and Q1 - 1.5 times IQR ranges, respectively. To provide a more direct representation of the data variability and to better capture the distribution of extreme values, we have modified the whiskers to represent the 5th and 95th percentiles of the dataset. This definition has been explicitly clarified in the revised figure caption:

“In the box plots, the center line represents the median, the box boundaries denote the 25th and 75th percentiles, and the whiskers extend to the 5th and 95th percentiles of the data.”

4. Page 13, Line 292: With internal mixing contributing to gaps in the CCN closure, would you consider other kappa hygroscopicity frameworks or incorporating other models? For example, using PartMC (Riemer et al 2009) to assume external, internal mixing, and phase separated morphology? What about calculating kappa using frameworks that assume phase separation (Malek et al 2023)? The future work Citations:
Riemer, N., West, M., Zaveri, R. A., and Easter, R. C. (2009). Simulating the Evolution of Soot Mixing State with a Particle-Resolved Aerosol Model. J. Geophy. Res., 114:D09202. DOI:10.1029/2008JD011073.
Malek, K., Gohil, K., Olonimoyo, E. A., Ferdousi-Rokib, N., Huang, Q., Pitta, K. R., Nandy, L., Voss, K. A., Raymond, T. M., Dutcher, D. D., Freedman, M. A., & Asa-Awuku, A. (2023). Liquid–Liquid Phase Separation Can Drive Aerosol Droplet Growth in Supersaturated Regimes. ACS Environmental Au, 3(6), 348–360. https://doi.org/10.1021/acsenvironau.3c00015

RESPONSE: We appreciate the reviewer's insightful suggestion. In the present study, we deliberately retain the internal mixing assumption for two key reasons. First, this assumption is consistent with how aerosol activation is parameterized in mainstream global climate models (e.g., MAM3), and our goal is to evaluate the inherent biases that arise from this widely used simplification under varying organic aerosol conditions. Second, we are constrained by the available observational methodology: the HR-ToF-AMS provides size-resolved bulk chemical composition for submicron aerosols but lacks the single-particle resolution necessary to robustly constrain particle-resolved models or phase-separation frameworks. That said, we recognize this as an essential frontier for improving CCN prediction. To address the reviewer's concern, we have added a dedicated discussion in the revised manuscript:
“While the internal mixing assumption serves as a practical baseline consistent with current

global climate models, it inherently simplifies the complexity of atmospheric aerosols. To overcome these limitations, future studies could employ particle-resolved models, such as PartMC (Riemer et al., 2009), to explicitly track the dynamic evolution of diverse mixing states. Furthermore, the assumption of homogeneous mixing neglects complex particle morphologies. Recent evidence demonstrates that liquid-liquid phase separation (LLPS) within organic-inorganic mixtures can actively drive aerosol droplet growth in supersaturated regimes, significantly altering effective hygroscopicity (Malek et al., 2023). Although integrating such advanced frameworks is currently constrained by the bulk nature of AMS measurements, combining these modelling approaches with single-particle observational techniques remains a critical frontier for refining aerosol activation parameterizations."

RC2:

In this study, the authors investigate how variations in aerosol composition affect CCN prediction accuracy, demonstrating that the dependence of CCN closure with organic mass fraction differs between midlatitude marine and continental environments. This paper advances understanding of aerosol activation and emphasizes the need to incorporate size-resolved chemical composition and mixing state information into global climate models to improve CCN prediction. The authors thoroughly discuss all data and the conclusions are well supported. The paper is well written with a few minor corrections. I have a few questions and comments:

1. Line 120, "CCN data was measured by a Continuous-Flow Streamwise Thermal Gradient CCN Counter (CCN-200, Droplet Measurement Technologies) at prescribed supersaturation levels during flight operations;" How was the instrument supersaturation calibrated and how often was this calibration performed?

   RESPONSE: The supersaturations were determined at 600 mbar for two distinct temperature settings, with each temperature setting corresponding to one column. To ensure reliable and consistent measurements, the instruments were calibrated before and after each deployment, and twice during the field campaign. Throughout the flights, the CCN instrument was operated with a constant-pressure inlet carefully maintained at 600 mbar. We have added the information in the section of data introduction:

   "CCN data was measured by a Continuous-Flow Streamwise Thermal Gradient CCN Counter (CCN-200, Droplet Measurement Technologies) at prescribed supersaturation levels, for the ACE-ENA campaign, SS was set to 0.14% (channel A) and 0.32%/0.37% (channel B); for HI-SCALE, the levels were 0.24% (channel A) and 0.46% (channel B). The supersaturations were determined at 600 mbar for two distinct temperature settings, with each temperature setting corresponding to one column. To ensure reliable and consistent measurements, the instruments were calibrated before and after each deployment, and twice during the field campaign. Throughout the flights, the CCN instrument was operated with a constant-pressure inlet carefully maintained at 600 mbar. The measurements were then converted to ambient temperature and pressure conditions."

2. Can the authors comment on why they chose to assume complete internal mixing? The authors have a thorough discussion of why this assumption tends to overestimate CCN concentrations, but no discussion of why they did not investigate any other mixing state assumptions.

   RESPONSE: We thank the reviewer for this comment. The choice of the complete internal mixing assumption was motivated by two primary considerations. First, a key objective of this study was to evaluate the performance of the bulk hygroscopicity frameworks commonly employed in current Global Climate Models across diverse environments; thus, using the internal mixing assumption therefore provides a consistent baseline to directly quantify the potential biases inherent in these widespread model assumptions. Second, the AMS measurements used in this study provide only bulk aerosol composition rather than single-particle-resolved information. Introducing alternative mixing-state assumptions without

observational constraints on particle-level composition and morphology would require additional empirical parameterizations and could introduce further unconstrained uncertainties into the closure analysis. To maintain a rigorous and well-defined framework, we therefore adopted the complete internal mixing assumption in this study. We have added the following explanation to the manuscript:

'The assumption of complete internal mixing was adopted primarily to maintain consistency with the parameterization schemes utilized in mainstream global climate models, such as MAM3 (Liu et al., 2012). An external mixing assumption has also been discussed in many previous studies (Broekhuizen, 2006; Kulkarni et al., 2023; Lathem et al., 2013; Moore et al., 2011; Schulze et al., 2020; Wang et al., 2010), in which aerosol species are treated as compositionally distinct particle populations rather than internally mixed particles. Compared with the internal mixing assumption, external mixing generally reduces the effective hygroscopicity and CCN activation efficiency, resulting in lower predicted CCN concentrations. However, accurately representing external mixing states requires detailed particle-resolved compositional information that is not available from the AMS measurements used in this study. Therefore, evaluating alternative mixing-state representations is beyond the scope of this study and warrants further investigation using single-particle observational constraints."

3. Line 129, "Each instrument contributes its most reliable size range and overlapping regions harmonized to yield a continuous distribution spanning from a few nanometers to several micrometers (Mei et al., 2024)." Can the authors specify what the "most reliable size range" for each instrument is?

   RESPONSE: As suggested by the reviewer, we have added the specific size ranges for each instrument integrated into the BEASD product.

   "Aerosol number size distributions were derived from the Best Estimate Aerosol Size Distribution (BEASD) product, which harmonizes observations from multiple complementary sensors. Each instrument contributed data within its "most reliable size range," with overlapping regions carefully reconciled to yield a continuous distribution spanning from a few nanometers to several micrometers. Specifically, for the ACE-ENA campaign, the FIMS covered 10–600 nm and the PCASP spanned 0.095–2.9 μm, while the super-micron range was supplemented by the CAS (0.55–12.73 μm) and FCDP (0.75–13.49 μm). During the HI-SCALE campaign, the FIMS provided coverage from 10 to 400 nm, the PCASP from 0.095 (or 0.125) to 2.9 μm, and the CAS and FCDP extended the distribution up to approximately 11–12 μm. Furthermore, aerosol chemical composition measured by the HR-ToF-AMS was utilized to estimate the refractive index (RI). This allowed for the correction of equivalent optical sizes into geometric sizes, ensuring physical consistency across the integrated spectrum of different sensors. (Mei et al., 2024)."

4. Line 140, "We perform leg-mean values and percentiles (5, 10, 25, 50, 75, 90, 95) for measurements obtained in each flight leg, and use leg-mean values in most part of this study. The results are robust if median values (50th percentile) are used (not shown)." Can the authors

clarify what they mean by “in most part”? Are the median values preferred for being deemed “robust”?

RESPONSE: We thank the reviewer for this keen observation. We realize that the phrase "in most part" in the original manuscript was imprecise and potentially misleading. To clarify, all calculations, statistical analyses, and figures presented in this study were consistently performed using leg-mean values. We have corrected this statement in the revised manuscript to reflect that leg-mean values were used throughout the study. We also reiterate that while median values were checked for sensitivity, they yield consistent conclusions and do not alter the primary findings of our work.

“We perform leg-mean values and percentiles (5, 10, 25, 50, 75, 90, 95) for measurements obtained in each flight leg, and use leg-mean values throughout of this study. The results are robust if median values (50 percentile) are used (not shown).”

5. For the MAM3 model parameters, how do these values, specifically density of organics and kappa of organics, contribute to overestimation of predicted CCN concentrations? What are the typical range of values assigned to ρ_{org} and κ_{org} in continental and mid-latitude marine environments?

RESPONSE: Thank you for the suggestion. Higher assumed hygroscopicity for organic and inorganic species reduces the critical diameter, which in turn increases the calculated CCN number. From the equations:

$$V_i = \frac{C_i}{\rho_i} \ , \tag{1}$$

$$\kappa = \frac{V_{org}}{V_{total}} \cdot 0.1 + \frac{V_{inorg}}{V_{total}} \cdot 0.507 \ , \tag{2}$$

a larger assumed organic density reduces the organic volume fraction, increasing the bulk κ and thus increasing the calculated CCN number, and vice versa.

In previous midlatitude CCN closure studies, the density of organic aerosol typically ranges from 1.0 to 1.5 g cm^{-3} (Broekhuizen, 2006; Cerully et al., 2015; Medina et al., 2007; Meng et al., 2014; Padró et al., 2012). Hygroscopicity is generally assumed from insoluble ($\kappa \approx 0$) (Bougiatioti et al., 2009; Medina et al., 2007) up to $\kappa = 0.2$ (Cerully et al., 2015). For inorganic particles, they are often assumed to be a single ammonium sulfate component (e.g., Bougiatioti et al., 2009; Broekhuizen, 2006) or a mixture of ammonium sulfate and ammonium nitrate (Bhattu and Tripathi, 2015; Jurányi et al., 2010). The density is generally assumed to be a uniform value of 1.77 g cm^{-3}, with a relatively small range of variation. The maximum assumed hygroscopicity value is 0.7 (Kulkarni et al., 2023).

To investigate to what extent different assumptions for density and hygroscopicity affect the final closure results, we conducted sensitivity tests based on previous studies, adopting the assumptions that yield the maximum CR and minimum CR, respectively. The minimum CR is obtained by assuming: organic density = 1.0 g cm^{-3} and nearly insoluble ($\kappa = 0.01$), inorganic

density = 1.77 g cm^{-3}, and inorganic hygroscopicity = 0.507. The maximum CR is obtained by assuming: organic density = 1.5 g cm^{-3}, inorganic density = 1.77 g cm^{-3}, organic hygroscopicity = 0.2, and inorganic hygroscopicity = 0.7. The results are shown in the figure below.

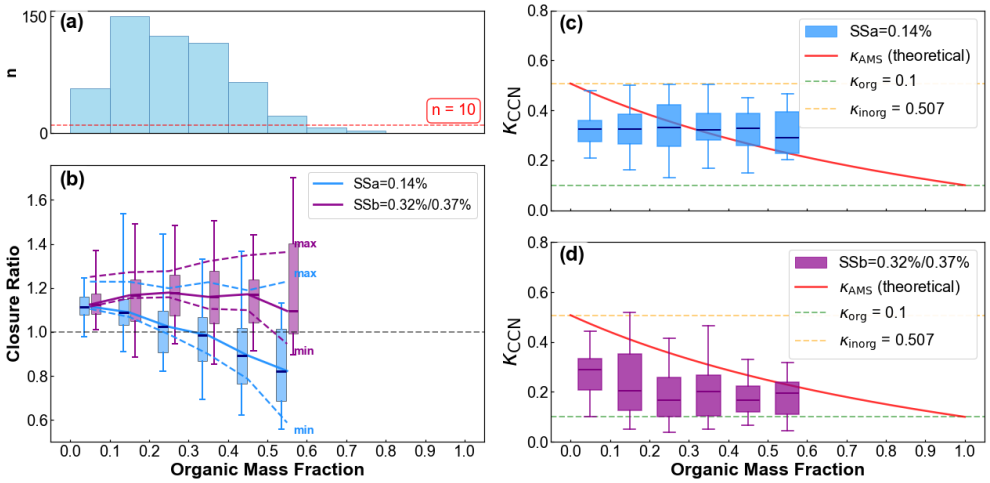

Figure 9. Relationship between CR and observed hygroscopicity (κ_{ccn}) with MForg for ACE-ENA. (a) number of flight legs in each MForg bins. (b) box plots of CR as a function of MForg at two supersaturations (SSa = 0.14%, SSb = 0.32/0.37%). Dashed lines represent the sensitivity results of maximum and minimum values of median CR derived from the extreme range of density and hygroscopicity parameters reported in literature. (c–d) Comparison between κ derived from aerosol and CCN number concentration (κ_{ccn}, box plots) and from AMS-measured chemical composition (κ_{AMS}, red line), c for SSa and d for SSb. The pre-defined hygroscopicity for organics and inorganics (κ_{inorg} = 0.507, κ_{org} = 0.1) are also plotted in dash. In all box plots, the horizontal line indicates the median, the box boundaries represent the 25th and 75th percentiles, and the whiskers extend to the 5th and 95th percentiles. Only data sample number > 10 was plotted in (b), (c) and (d).

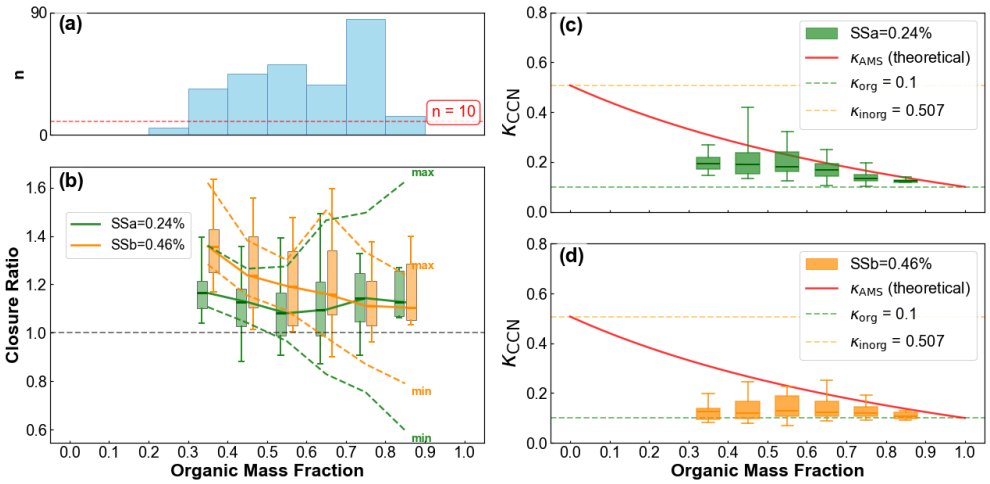

Figure 10. Same as Figure 9 but for HI-SCALE.

A clear common feature is observed for both ACE-ENA and HI-SCALE: the difference in CR among different assumptions is significantly smaller at low MForg than at high MForg. This indicates that the uncertainty in CCN closure studies mainly arises from different assumptions

regarding organic aerosol particles. The relevant discussion has been added to the revised manuscript:

"To quantify the potential influence of model parameter assumptions—such as density and hygroscopicity—on the closure results, sensitivity tests were conducted based on typical ranges reported in literature. The density of organic aerosol typically varies from 1.0 to 1.5 g/cm³ (Broekhuizen, 2006; Cerully et al., 2015; Medina et al., 2007; Meng et al., 2014; Padró et al., 2012), while the organic hygroscopicity parameter (κ_{org}) ranges from 0.01 (nearly insoluble) (Bougiatioti et al., 2009; Medina et al., 2007) to 0.2 (Cerully et al., 2015). Additionally, the maximum assumed κ_{inorg} for inorganic species can reach 0.7(Kulkarni et al., 2023). The dashed lines in Figures 9b and 10b represent the range of closure ratios (CR) under the combination of these assumptions. A prominent common feature observed at both ACE-ENA and HI-SCALE is that the uncertainty range of CR expands significantly as MForg increases. At low MForg, the variations in assumed parameters result in minimal CR differences due to the dominance of inorganic particles. Conversely, at high MForg, the uncertainty regarding the physicochemical properties of organic aerosols becomes the primary source of error in CCN estimations. This underscores the necessity of obtaining accurate, size-resolved organic composition and property data, particularly in organic-rich environments."

6. Line 331 "It is surprising that the relationships with MF_{org} are dramatically different at the two sites." Can the authors comment on the potential influence of the two campaigns occurring during different seasons on the dependence of CCN closure ratio on MF_{org}? Does this possibly contribute to the large difference between the two sites?

RESPONSE: We appreciate the reviewer's suggestion. We agree that seasonal factors may influence the results. However, we contend that the pronounced differences in the dependence on MForg between the two sites primarily stem from the fundamental disparities in their environmental backgrounds and aerosol sources. SGP site is situated in a terrestrial environment dominated by biogenic and agricultural emissions, leading to an exceptionally high organic fraction; conversely, ENA represents a typical clean marine environment influenced by oceanic biogenic emissions and long-range transport. These substantial differences in aerosol mass loading, primary chemical composition, and particle size distribution patterns are the dominant factors driving the divergent relationships between MForg and CR. We have expanded the discussion in Section 4 to acknowledge the potential role of seasonality while underscoring the primary importance of the broader environmental context:

"It should be noted that as the ACE-ENA and HI-SCALE campaigns were conducted in different seasons, seasonal variability might potentially influence the observed results. However, given that the aerosol mass loading differs by nearly an order of magnitude between the two sites, and the chemical characteristics exhibit a fundamental contrast between terrestrial organic dominance at SGP and marine sulfate dominance at ENA, the environmental regime plays a more central role in determining CCN activation properties and their sensitivity to composition. Seasonality, by comparison, acts as a secondary modulation within the established framework of each site."

7. Line 363, “Thus, a higher MF_{org} likely indicates conditions dominated by primary organic aerosol loading, often accompanied by suppressed NPF activity, leading to more larger particles and fewer small particles (Fig. 8b). While these compensating changes may leave the total aerosol number concentration nearly unchanged, they reduce the fraction of particles that can be activated as CCN, resulting in a lower CCN activation fraction at higher MF_{org} during the HI-SCALE campaign.” It makes sense that a greater organic fraction would lead to a lower activation fraction due to reduced bulk hygroscopicity, however the discussion of these particles being larger preceding this statement is slightly confusing. An increase in the number of larger particles would seemingly lead to an increase in the CCN activation fraction as larger particles are more likely to exceed the critical diameter and activate.

   RESPONSE: We thank the reviewer for pointing out this issue. The original interpretation contained logical weaknesses and that some statements were too strong given the evidence presented. Therefore, we revised the paragraph to make the interpretation more cautious and to better distinguish the effects of organic mass fraction, particle size distribution, and CCN activation behavior:
   “Organic aerosols at SGP may be influenced by multiple sources and processes, including local emissions and secondary production associated with NPF. Therefore, the relationship between MForg, particle size distribution, and CCN activity is not expected to be controlled by organic fraction alone. Figure 8b suggests that changes in aerosol size distribution provide an important explanation for the non-monotonic variation in CCN activation ratio. In particular, the MForg = 0.6-0.7 bin is characterized by enhanced Aitken-mode particles and relatively fewer accumulation-mode particles. These small particles can substantially increase the total aerosol number concentration but are less likely to activate as CCN under the measured supersaturation conditions. As a result, the CCN activation ratio decreases abruptly (Fig. 7f). At higher MForg, the increased abundance of larger, CCN-relevant particles likely contributes to the recovery of the activation ratio. These results indicate that the dependence of CCN activity on MForg is strongly modulated by particle size distribution and should not be interpreted as a purely compositional effect.”

8. Line 27, “Atmospheric aerosols, as tiny solid or liquid particles suspended in the atmosphere, exert substantial influence on Earth’s climate system (Intergovernmental Panel on Climate Change (IPCC), 2023).” This sentence is missing the word “defined” after aerosols.

   RESPONSE: Thank you for the suggestion. The word "defined" has been added as requested.

9. Line 228, “This is also consistent with Fig. 3b, that showing the accumulation-mode aerosols were much more numerous in summer than in winter while the Aitken-mode aerosols were similar or even slightly less for particles of ~ 20 nm in diameter.” This sentence should read “This is also consistent with Fig. 3b, showing that the …”

   RESPONSE: Thank you for the suggestion. We have corrected the sentence as suggested.

10. For Figures 3c and 4c is it possible to show the median lines in black? The red is hard to see.

RESPONSE: We agree that the red lines were difficult to distinguish. Following the suggestion, we have changed the median lines in Figures 3c and 4c to black for better visibility.

11. Line 384, "It shows that the median κ_{ccn} is rarely dependent on MF_{org}, which is inconsistency with the assumption of internal mixing and fixed hygroscopicity for each AMS-measured composition." Inconsistency should be replaced with "inconsistent".

RESPONSE: Thank you for the suggestion. The word has been corrected from "inconsistency" to "inconsistent".

12. Line 424, "At lower supersaturations, the critical diameter is larger with only larger particles (accumulation mode) can be activated" With should be replaced with "and" so that the sentence reads: "At lower supersaturations, the critical diameter is larger and only larger particles (accumulation mode) can be activated"

RESPONSE: Thank you for the suggestion. We have replaced "with" with "and" as suggested, improving the sentence flow.

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