Response to Editor

1. Comments and suggestions:

Please explain the novelty of this work in relation to your own previous work:

Zhang, K., Xiong, C., Cheng, Y., Ma, N., Mikhailov, E., Pöschl, U., et al. (2025). Assessment of hygroscopicity uncertainties associated with size and thermodynamic model: Implications for inferring chemical composition of sub‐10 nm particles. Journal of Geophysical Research: Atmospheres, 130, e2025JD043835. https://doi.org/10.1029/2025JD043835.

Responses and Revisions:

We thank the editor for the constructive suggestions and comments on our manuscript entitled "Unveiling the organic contribution to the initial particle growth in 3-10 nm size range" [egusphere-2025-4421]. The novelty of this work and its differences from our previous study are summarized as follows:

Our previous work (Zhang et al., 2025) focused on the modeling studies of exemplary substances to assess uncertainties arising from the dependence of κ on particle size and thermodynamic models. Although it discussed chemical composition inference (Section 3.4), its primary focus was on verifying the linear relationship of κ-f_{org} and assessing the associated uncertainties. More critically, that work utilized particles generated via Electrospray from solutions of ammonium sulfate and *cis*-pinonic acid. This experimental approach, particularly the use of Electrospray to generate particles from non-volatile solutes, could not directly represent the gas-phase precursor mechanisms that govern atmospheric nucleation and growth processes.

The present study, by contrast, is designed to directly probe NPF and subsequent growth by simulating atmospheric processes. Utilizing a flow tube reactor, we introduced gas-phase precursors (SO_2 and α-pinene) to study nucleation and particle growth under controlled conditions. This methodology enables us to demonstrate the role of their oxidation products in the growth process. Thus, our work provides valuable and novel physical and chemical results of nanoparticle down to 3 nm that have not been previously reported, thereby yielding critical implications for understanding atmospheric particle formation and growth.

2. Comments and suggestions:

In view of your own previous work cited above, consider rephrasing the following statements.

Line 14 in the abstract: "For the first time, the size-resolved hygroscopicity parameter *(κ) and organic mass fraction (forg) of 3-10 nm particles were measured using a custom-built scanning flow condensation particle counter (SFCPC)."*

Line 286 in the conclusion: "To the best of our knowledge, this is the first study to measure the hygroscopicity of SA and OOMs particles down to 3 nm."

Responses and Revisions:

We thank the Editor for raising this point. We acknowledge that the original phrasing could be perceived as a broad overstatement by claiming the first-ever measurements of hygroscopicity (κ) and the organic mass fraction (f_{org}) in the 3-10 nm range in general. Our intention was to highlight that, to the best of our knowledge, this work provides the first measurements of size-resolved both the κ and the f_{org} results for nanoparticles in the 3-10 nm range formed from a sulfuric acid (SA) and α-pinene-derived oxygenated organic molecules (OOMs) system. The "first time" statements specifically refer to the SA-OOMs system, which was used in this work to simulate atmospheric new particle formation and subsequent growth processes.

To accurately reflect this specific contribution, we have revised the relevant statements in the manuscript:

(1) In the Abstract: "In this study, we conducted the laboratory experiments using a flow tube reactor to investigate the nanoparticle growth processes of sulfuric acid (SA) and oxygenated organic molecules (OOMs, from α-pinene oxidation) system. Utilizing a custom-built scanning flow condensation particle counter (SFCPC), we report, for the first time, size-resolved measurements of the hygroscopicity parameter (κ) and organic mass fraction (f_{org}) for particles in the 3-10 nm size range within this atmospherically relevant system."

(2) In the Conclusion: "To the best of our knowledge, this is the first study to measure the hygroscopicity (κ) of particles composed of SA and α-pinene-derived OOMs down to 3 nm."

Refences:

Zhang, K., Xiong, C., Cheng, Y., Ma, N., Mikhailov, E., Pöschl, U., Su, H., and Wang, Z.: Assessment of Hygroscopicity Uncertainties Associated With Size and Thermodynamic Model: Implications for Inferring Chemical Composition of Sub-10 nm Particles, J. Geophys. Res.-Atmos., 130, e2025JD043835, https://doi.org/10.1029/2025JD043835, 2025.