Anonymous Referee #2

The authors have addressed my comments at an adequate level. I particularly appreciate the overall thorough approach, and the care with which questions related to supersaturation correlation with updraft/downdraft, particle wall losses, and definition of activation diameter were treated. Connection to the atmospheric context has been strengthened.
The paper is close to acceptable from my perspective, after the following corrections:

Response: We thank the referee for the careful review and encouraging assessment of our revised manuscript. We have addressed the remaining requested corrections point by point below.

- I still find the supersaturation oscillations at top/bottom boundaries to be highly concerning. The author response makes sense, from a numerical perspective, but it's clear from the new Figure 15 c,d that under polluted conditions much of the activation seems to coincide with the region displaying the largest positive-supersaturation oscillation. In my opinion, the authors should include a direct statement pointing this out and acknowledging that strong supersaturation oscillations near boundaries need to be addressed in future work. I considered recommending rejection of the manuscript in the first round due to this strong artifact, and although it's still a concern, I believe the authors have demonstrated that the key results (e.g., correlations with w) are not strongly influenced by it. But I don't think it's viable for this kind of artifact to exist in future studies, so I will reject any paper I'm asked to review unless I am convinced the artifact has been resolved. It is certainly possible to resolve it, because plenty of other numerical studies of convection-cloud chambers do not show such oscillations of this key microphysical variable.

- Regarding the LES wall modeling, it would strengthen the paper to include a reference to existing work, such as:
Wang, A., Yang, X.I. and Ovchinnikov, M., 2024. An investigation of LES wall modeling for Rayleigh–Bénard convection via interpretable and physics-aware feedforward neural networks with DNS. Journal of the Atmospheric Sciences, 81, 435-458.

Response: We thank the referee for this important comment. We have added a direct statement in the Results section, immediately following the discussion of Fig. 15, noting that in the polluted case much of the activation occurs within the near-bottom region where the positive supersaturation oscillation is the strongest. We also now explicitly state that this near-boundary oscillation is a limitation of the present simulations, that it may affect the quantitative magnitude of activation in the boundary-adjacent layer, and that reducing this artifact is an important priority for future chamber simulations. We have also added the recommended reference to Wang et al. (2024) (Lines 127-132, 507-516):

“Recent LES wall-modeling work for dry Rayleigh-Bénard convection, a wall-bounded buoyancy-driven flow relevant to chamber-like configurations, has shown that conventional MOST-based wall treatments can produce substantial errors and that near-surface vertical velocity can be an important control on wall fluxes (Wang et al., 2024b). This highlights that near-wall treatment in a convection cloud chamber is itself a nontrivial modeling problem, so the present specified-state and free-slip configuration should be viewed as an idealized chamber representation rather than a fully resolved wall-flux formulation."

"As discussed in Sect. 3.2, the present simulations exhibit supersaturation oscillations near the lower and upper rigid boundaries, and in Fig. 15c,d much of the polluted-case activation occurs within the near-bottom layer where the positive supersaturation oscillation is the strongest. This indicates that activation in polluted conditions is indeed concentrated in a shallow near-bottom region in the chamber, although the local magnitude of activation in this boundary-adjacent layer may be enhanced by the numerical oscillation. We therefore interpret Fig. 15 primarily as evidence for the vertical confinement of activation under polluted conditions, rather than as a precise quantitative measure of the absolute activation magnitude near the boundary. Importantly, the main conclusions of this study do not rely on this near-wall feature alone, because the weakening of the dependence of droplet growth and activation on vertical motion is also supported by the interior W-S diagnostics and the trajectory-based statistics shown in Figs. 7, 12, and 14. Reducing these near-boundary supersaturation oscillations is an important priority for future chamber simulations."

- The reference to a paper currently in review (Grabowski et al. 2026) is not acceptable for ACP, so the authors should replace it with another reference (ACP guidelines state "Works cited in a published manuscript should be published already, accepted for publication, or available as a preprint with a DOI.")

Response: We thank the referee for pointing this out. Since the original submission, Grabowski et al. (2026) has recently been accepted and posted as an Early Online Release article with a DOI. We have therefore retained this reference and updated it accordingly in the revised manuscript.

Updated reference:

Grabowski, W. W., Chandrakar, K. K., and Morrison, H.: Broadening of adiabatic droplet spectra through eddy hopping: Polluted versus pristine environments, J. Atmos. Sci., https://doi.org/10.1175/JAS-D-25-0148.1, 2026.

Wang, A., Yang, X. I., and Ovchinnikov, M.: An investigation of LES wall modeling for Rayleigh–Bénard convection via interpretable and physics-aware feedforward neural networks with DNS, J. Atmos. Sci., 81, 435–458, 2024b.