The response to Editor:

We sincerely appreciate the editor's time, consideration, and valuable suggestions in reviewing our manuscript. Below, we provide specific responses to each comment, with our revisions highlighted in blue.

1. Thank you for your careful responses to the constructive reviews. I am now willing to forward your provocative manuscript for publication in ACP. However, I have two minor requests. First is that the abbreviation ERFaci be reintroduced in the Conclusions.

Thank you for your comment. We have now reintroduced the abbreviation ERFaci in the Conclusions, specifically in L184: "Our study offers critical insights into the quantification of the effective radiative forcing from aerosol-cloud interactions (ERFaci)…".

2. The second is that the results for the sensitivity shown in Figure 1 be summarized numerically in the abstract, body, conclusions. Non-linearity is central to the paper's arguments, and this can be quantified for example by a global mean oceanic value to give the reader a sense of the magnitude of the difference. It looks to be roughly 0.5.

Thank you for this insightful comment. We have now incorporated numerical summaries of the global mean activation rate throughout the manuscript. To ensure consistency with the ERFaci estimation, we followed the methodology outlined in Appendix A6 and included the associated uncertainties based on Appendix A8. Below are the specific revisions:

Abstract (L14): "Our analysis estimates a global mean activation rate of 0.35 ± 0.17 (90% confidence)…".

Section 2.1 (L65): "On a global scale, the mean activation rate is 0.35, indicating that sulfate aerosol activation is less efficient than a one-to-one conversion.".

Section 2.1 (L71): "with a global mean of 0.21 (Fig. S1).".

Conclusion (L187): "…estimated globally at 0.35 ± 0.17 for SO_4^{2-} and 0.21 ± 0.23 for AI (90% confidence)…".

Appendix A6 (L451): "We also apply this scalar multiplier to extrapolate the global mean activation rate, as variations in N_d in single-forcing (aerosol-only) experiments primarily result

from changes in aerosol concentrations. This extrapolation remains consistent with the ratio of global mean ERFaci_obs calculated with and without accounting for activation rate, suggesting a global mean activation rate of 0.37 for SO_4^{2-} and 0.21 for AI.".

Appendix A8 (L522): "The uncertainty in the activation rate is calculated in a similar manner, but it arises from the regression coefficient of $\partial \ln(N_d)/\partial \ln(X)$ and the extrapolation of the global activation rate. The term δ is computed following Eq. (A9) but excluding $[\Delta \ln(X)]$ and using $\ln(N_d)'$ in place of CRE_lcld'. To estimate the uncertainty in spatially averaged regression coefficients for the activation rate, we employ Eq. (A11). Consequently, the overall 90% CI for the global activation rate is given by

$$\text{Activation rate, global} \pm \sqrt{([\gamma]\Delta_{obs})^2 + \Delta_\gamma^2}. \tag{A14}$$ ".