Response to the Executive Editor:

We sincerely appreciate the Executive Editor's time, consideration, and insightful comments in reviewing our manuscript. Below, we provide a detailed response to the comment, with the corresponding revision highlighted in blue.

1. I am reviewing your paper for the first time in order to decide whether it qualifies as a Letter. Before accepting it as a Letter rather than a regular article I would like to see some appreciation that the approach you have taken to estimating ERFaci is only one of several others. Satellite estimates of dNd/dSO4 is one metric, but several other studies have applied multiple constraints simultaneously and reached different conclusions. Reliance on one or a small number of constraints can lead to over-constraint, which I am concerned may be the reason for the overly tight constraint that you present. For example, just from my own group's work (see eg https://acp.copernicus.org/articles/23/8749/2023/ and references), we use dozens of constraints in a statistically rigorous approach that accounts for potential model structural biases and conflicting observations. Ignoring conflicting constraints can lead to over-constraint, which is a well-understood problem with the emergent constraint approach for example.

To be acceptable as a Letter I would like to see some recognition of this issue. In particular, it's important to make clear that the tightness of your constraint is inconsistent with other approaches in which a larger number of constraining observation types are used. In addition to citing some of the other studies using different approaches, it is important to point out that your tight constraint applies to the _particular_ approach that you have used. It therefore is a major revision to studies that have used this same particular approach (you cite 4 such studies), but not those that have used alternative approaches. Based on those alternative approaches, a larger uncertainty range remains plausible. It should be made clear that this discrepancy in the tightness of constraint remains to be resolved.

My assessment above draws comparisons with my own group's studies, but there are others, and you should not see my comments as an attempt to seek citations, but rather to make the novelty of your study a bit clearer.

We thank the Executive Editor for the thoughtful and constructive feedback. We agree that our approach represents one of several existing methods for estimating ERFaci, and we acknowledge that our reliance on selective satellite observations, reanalysis data, and model outputs may inherently constrain the estimated uncertainty range. However, we emphasize that while each individual estimate exhibits relatively tight bounds, the combined use of two aerosol proxies (SO_4^{2-} and AI) and three N_d filtering methods yields a comprehensive range of ERFaci estimates (-0.74 to -0.02 W m^{-2}), which captures much of the spread reported in the literature.

In response, we have revised the manuscript to clearly state that the tightness of our constraints may not fully reflect the broader uncertainties present in climate assessments. We now explicitly acknowledge that different methodologies can yield wider uncertainty ranges. Nevertheless, our

findings are consistent with those reported in the literature and complement—rather than contradict—estimates obtained through different methodologies. The following revised text has been added at L192:

"However, we recognize that the error bars on our constraints may not fully capture the broader uncertainties present in climate assessments. Different methodologies employing multiple observational constraints (Regayre et al., 2023) and energy balance constraints (Albright et al., 2021) suggest a wider ERFaci uncertainty range, from -0.9 to -0.1 W m^{-2} and -0.9 to -0.2 W m^{-2}, respectively (90% confidence). Our reliance on selective satellite observations, reanalysis data, and model outputs may inherently limit our uncertainty range. Despite employing the optimal N_d filtering method in our analysis, which aligns well with aircraft in-situ observations (Appendix A1.3), there remain uncertainties in N_d derived from cloud optical depth and effective radius retrievals from MODIS satellite observations. Thus, we estimate ERFaci using two additional cloud droplet filtering methods introduced in Gryspeerdt et al. (2022), and the estimates remain qualitatively consistent (Fig. S4). Even considering the most negative ERFaci estimate among the three filtering methods, its value (-0.46 ± 0.28 W m^{-2} for SO_4^{2-} and -0.30 ± 0.19 W m^{-2} for AI, 90% confidence) still lies at the higher bound (less negative) of both IPCC and WCRP estimates. Overall, our range of ERFaci estimates, from -0.74 to -0.02 W m^{-2}, aligns with those obtained using alternative methodologies, while also highlighting the robustness of our findings across different data selections—a potentially smaller influence of aerosol-cloud interactions on climate forcing than previously assessed."

We believe this clarification strengthens the manuscript by placing our results within the broader context of ERFaci assessments, while also highlighting the robustness and consistency of our observational approach across different data selections.