Response to Editor

We thank the Editor for their constructive suggestion. Below we provide our response.

However, please include a section on the limitations of this study, before the "Conclusion" section, as there are several uncertainties associated with the measurements, simulations, and the methods used for analysis. Please compute the uncertainty, wherever is applicable.

We have re-organised Section 4 of the main text to include a paragraph discussing limitations and uncertainties of our study.

"Despite the robustness of the diagnosed response, several sources of uncertainty remain. First, our findings are based on a single climate model, and the magnitude of the response may therefore be sensitive to model-specific representations of aerosol–cloud–radiation and circulation interactions, as well as to the strength of the simulated aerosol effective radiative forcing, which is known to be relatively strong in CESM1 compared to other climate models (Zelinka et al., 2014; 2023). Second, although ensemble-mean signals are statistically distinguishable from internal variability, especially for the European aerosol contribution, the experiments comprise eight members each. While this is consistent with the minimum number typically recommended for detecting forced multi-decadal signals (e.g., Deser et al., 2012), the influence of internal climate variability cannot be fully excluded, especially at regional scales, including potential contributions from Atlantic slow-frequency variability linked to the ISM multi-decadal mode (e.g., Rajesh and Goswami, 2020). Third, uncertainties in early-twentieth-century aerosol emissions and their spatial distribution, together with limitations in observational datasets arising from sparse and non-uniform measurement networks, introduce additional ambiguity in both the applied forcing and the evaluation of the simulated response. Fourth, some discrepancies exist between the CESM1 simulated rainfall pattern and the observed trends, particularly at sub-regional scales. Nevertheless, the model captures the key large-scale features of the observed changes, including enhanced summer rainfall over central/northern India and South China, and drying over southern India and the southern Indochina Peninsula. It should also be noted that our analysis isolates the anthropogenically-forced response, whereas observed changes reflect a combination of external forcing and internal climate variability, and therefore exhibit a wider range of magnitudes and more pronounced spatial variability than an ensemble of coarse-resolution climate model simulations. Finally, the interpretation assumes approximate linear additivity of responses to different forcing agents and source regions (e.g., North American aerosols), whereas nonlinear interactions among aerosols and greenhouse gases, particularly via circulation adjustments, may modulate the overall monsoon response. Addressing these uncertainties will require coordinated multi-model, single-forcing large-ensemble experiments (e.g., Smith et al., 2022; Simpson et al., 2023) and improved constraints on historical aerosol emissions, which together would help assess the robustness and

generality of the dynamical pathway identified here."