Reply to Reviewer #2

We would like to thank Reviewer #2 for the additional useful comments. Below follows our response point by point. The reviewer's comments are given in *italic* and our response is given in **bold** font.

1) The Reviewer notes: *"The authors did not address my main criticism. The abstract still fails to mention novel aspects. In the abstract, the authors should already make clear which results essentially stem from repeating other studies and which results are new.*"

The abstract has been restructured in order to address the reviewer's comment to highlight the key findings and novelty of this work.

2) The Reviewer notes: *"Looking at contributions of uncertainties from different regions, as far as I can see, the authors focused on 'hotspots'. I wonder how much different regions - including remote oceanic regions - contribute to model spread in ERFaci. Is the spread caused only by the hotspots? How much do remote regions contribute to the spread between models?"*

Following reviewer's comment, we added the following paragraph in Section 3.6 concluding that regions with high to medium ΔAOD over land tend to show larger inter-model variability in total ERF and total ERF_{ACI} than land regions with medium to low ΔAOD, with the lowest inter-model spread appearing over remote oceanic regions with medium to low ΔAOD:

"Analysis of the inter-model variability (one standard deviation) of ERF over a number of IPCC AR6 WGI ATLAS regions defined in Gutiérrez et al. (2021) shows that ERF_{ACI} due to all anthropogenic aerosols is the main source of uncertainty of total ERF (Table 5, Fig. S17). During EHP, the standard deviation of total ERF_{ACI} is estimated at 0.44 W m^{-2} globally, whereas the standard deviations of total ERF_{ARI} and total ERF_{ALB} are 0.14 W m^{-2} and 0.08 W m^{-2}, respectively (Table 5). EAS contributes most to the inter-model spread of both ERF_{ARI} and ERF_{ACI} with a mean value of 1.03 W m^{-2} and 3.71 W m^{-2}, respectively (Table 5), followed by SAS, which has a much smaller standard deviation (0.86 W m^{-2} and 1.76 W m^{-2}, respectively). The inter-model variability of total ERF (Fig. S17) mainly stems from the larger standard deviation of SW ERF (Fig. S18) rather than LW ERF (Fig. S19), with SW ERF_{ACI} being the main contributor. Total ERF and total ERF_{ACI} (Fig. S17) exhibit a small standard deviation during EHP over remote oceanic regions (with low ΔAOD), such as the Arctic Ocean (0.96 W m^{-2} and 0.60 W m^{-2}, respectively), the South Pacific Ocean (0.23 W m^{-2} and 0.37 W m^{-2}, respectively), the South Atlantic Ocean (0.52 W m^{-2} and 0.44 W m^{-2}, respectively), and the South Indic Ocean (0.59 W m^{-2} and 0.65 W m^{-2}, respectively). Oceanic regions in the outflow (with high to medium ΔAOD) show a larger inter-model spread in total ERF and total ERF_{ACI}, such as the North Pacific Ocean (1.55 W m^{-2} and 1.66 W m^{-2}, respectively), the North Atlantic Ocean (1.14 W m^{-2} and 1.28 W m^{-2}, respectively), the Arabian Sea (1.19 W m^{-2} and 2.04 W m^{-2}, respectively), and the Bay of Bengal (1.73 W m^{-2} and 1.72 W m^{-2}, respectively). Regions with large standard deviation in total ERF and ERF_{ACI} over land can also be found (Fig. S17), like N.W. South America (2.21 W m^{-2} and 2.17 W m^{-2}, respectively), the Tibetan Plateau (1.06 W m^{-2} and 1.57 W m^{-2}, respectively), N. South America (1.38 W m^{-2} and 1.61 W m^{-2}, respectively),

Central South America (1.79 W m^{-2} and 1.60 W m^{-2}, respectively), and East Europe (1.07 W m^{-2} and 1.36 W m^{-2}, respectively). It is interesting to note that the Arabian Peninsula shows a large inter-model variability in total ERF (1.33 W m^{-2}) during EHP (Fig. S17), which originates from a large inter-model spread in ERF_{ARI} (0.81 W m^{-2}) and ERF_{ALB} (0.79 W m^{-2}) rather than ERF_{ACI} (0.46 W m^{-2}). The land regions that exhibit the smallest standard deviation in both total ERF and total ERF_{ACI} are West Antarctica (0.19 W m^{-2} and 0.22 W m^{-2}, respectively), East Antarctica (0.36 W m^{-2} and 0.06 W m^{-2}, respectively), and the Greenland-Iceland region (0.62 W m^{-2} and 0.45 W m^{-2}, respectively). Generally, regions with high to medium ΔAOD over land (Fig. 1) tend to show larger inter-model variability in total ERF and total ERF_{ACI} (Fig. S17) than land regions with medium to low ΔAOD, with the lowest inter-model spread appearing over remote oceanic regions with medium to low ΔAOD."

We also added the following sentence in the abstract:

"Analysis of the inter-model variability of total aerosol ERF shows that SW ERF_{ACI} is the main source of uncertainty predominantly over land regions with significant changes in aerosol optical depth (AOD), with East Asia contributing mostly to the inter-model spread of both ERF_{ARI} and ERF_{ACI}."

Finally, we added the following paragraph in the conclusions section:

"Finally, the inter-model variability of ERF and its main components (ARI, ACI, and ALB) was investigated over a number of oceanic and land regions. Our analysis indicates that ERF_{ACI} is the main source of uncertainty in total ERF. More specifically, the large standard deviation of SW ERF (mainly SW ERF_{ACI}) dominates the spatial pattern of the inter-model spread of total ERF, with small contributions from LW ERF. East Asia is the greatest contributor to the inter-model variability of both ERF_{ARI} and ERF_{ACI}, while other regions, such as N.W. South America, the Arabian Sea, South Asia, and the Bay of Bengal significantly contribute to the large standard deviation of ERF_{ACI}. Oceanic regions with medium to low ΔAOD show the smallest standard deviation in both total ERF and total ERF_{ACI}, whereas land regions with high to medium ΔAOD generally exhibit larger inter-model variability."