Response to the Editor:

General remarks:

We would like to thank our editor A. Schmidt for her quick response to our inquiry and her personal efforts in revising our manuscript. We thank her for making very useful suggestions to further improve the paper. Our point-by-point responses to the Editors' comments and corresponding changes are detailed below in blue text, and the changes are shown in the version of the manuscript with tracked changes (together with other minor corrections).

• Lines 55-56: The factor of -25 is not stated in Sellitto et al. (2022). I agree a factor of -25 is appropriate but you must provide the correct reasoning and provide an appropriate reference, thus please revise the sentence in question. Note, sulfate particles also absorb outgoing terrestrial radiation and near-infrared solar radiation, causing stratospheric heating.

-> Response: The sentence was rephrased and a reference was added.

"Friberg et al. (2018) included the entire time series of CALIOP (Cloud-Aerosol Lidar with Orthogonal Polarization) data from 2006 to 2015 and derived stratospheric AOD using reanalysis data for the tropopause, but only mention medium size eruptions explicitly. Radiative forcing is estimated in this case by multiplying AOD with a factor of -25 (Hansen et al., 2005) rather than using a radiative transfer model, an approximation valid in the absence of major forest fires (see e.g. Sellitto et al. (2022))."

• Lines 264ff: The description of the correction factor that has been applied is still hard to follow even with the text you added in the Appendix. Please revise the text to fully address the reviewer's initial comments on this part of the manuscript. The justification reads okay but technical details are still missing so that readers can follow as to what has been done.

-> Response: More details are added to the text:

"..., f an empirical factor which equals 1 for sufficient data coverage (examples and more details see Appendix B)."

"If data gaps cause a shift of the time period away from the maximum perturbation or a low bias in the zonal average due to the zero values in the gaps at some longitude bin or in a period, a correction factor f > 1 based on comparison of total injected SO_2 mass with the one taken from other satellite data is applied in Equation 1. ... An extreme case is the eruption of Calbuco, with a correction factor of 3 for removal processes, because of a shift..."

We have also expanded the corresponding part on MIPAS in the second paragraph of the same section:

"For MIPAS sometimes corrections in the order of up to 30% were necessary because of gaps (containing zero values) to be consistent with the total injected SO_2 mass derived from MLS (Microwave Limb Sounder) or OMI (Ozone Monitoring Instrument). Here the corrected values serve as reference for SO_2 derived from the instruments measuring extinction."

Furthermore, a remark on related uncertainties is added in the conclusions in the second paragraph: "In our approach the largest uncertainties are due to the handling of gaps in the satellite data."

In "data availability" we added: "A detailed documentation on the used data for MIPAS, SAGE, OSIRIS and GOMOS for the individual events is available from the authors on request."

• Throughout the manuscript make sure to clearly state that you are calculating an instantaneous radiative forcing whereas Schmidt et al. (2018) for example calculated an effective radiative forcing. You must clearly indicate what forcings are compared with each other. This applies to relevant Figures such as Figure 11 and the main text.

-> Response: Throughout the manuscript where it refers to our simulations, we have added the term "instantaneous" radiative forcing to the text. In Section 6.3 and Figure 11, we have added "effective" radiative forcing (ari) for reference with Schmidt et al. (2018). For details see the manuscript with tracked changes.

• Please do not use red and green colours at the same time in Figures (in particular in line plots) as readers with colour vision deficiencies will not be able to correctly interpret your figures. See ACP guidance: https://www.atmospheric-chemistry-and-physics.net/submission.html#figurestables

-> Response: Thank you for drawing our attention to graphics with color vision deficiencies. For our color maps we have now chosen the cmocean perceptually-uniform colormap "cmocean_thermal".
https://ferret.pmel.noaa.gov/Ferret/faq/ferret-color-palettes
For line plots, we have substituted green colors.