Dear Editor,

Thank you for your comments and suggestions. Please find below our responses in blue.

1. The first refers to the original comments to L80-81 (#referee #1) and L78-79 (referee #2): both referees point out that work by other modellers are incompletely or wrongly explained/cited. As a consequence you remove these references completely. However, I think this is not an adequate solution of this issue. Given that your manuscript should be published in GMD (i.e., in particular addressing model developers and users), I think it is quite essential that approaches of other models must be described and cited appropriately. Therefore, I kindly ask you to re-introduce a short paragraph with an improved (still short!) review of alternative model studies and model developments (i.e. based on others than your own model).

Response: We now have improved the paragraph (Line 74-97) with a review of other model studies and included the references (e.g., Spiegl et al., 2022; Sukhodolov et al., 2017) suggested by the reviewers.

"The ability of general circulation models (GCMs, e.g., GISS ModelE, ECHAM5-HAM and EMAC) and chemical transport models (CTMs, e.g., GEOS-Chem and GMI) to capture the main characteristics in ^{7}Be and ^{10}Be transport and deposition has been demonstrated in previous studies (e.g., Brattich et al., 2021; Field et al., 2006; Heikkilä et al., 2008; Koch & Rind, 1998; Liu et al., 2016; Spiegl et al., 2022; Sukhodolov et al., 2017; Usoskin et al., 2009). For example, Usoskin et al. (2009) found that the influence of the solar proton-induced ^{7}Be production peak at the surface in early 2005 is small through the comparison of GISS ModelE simulations and surface air measurements. Heikkilä et al. (2009) showed that stratospheric ^{10}Be contribution is dominant in the global ^{10}Be deposition by tracing tropospheric and stratospheric ^{10}Be separately in the aerosol-climate model ECHAM5-HAM. Spiegl et al. (2022) used the EMAC climate model to investigate the transport and deposition process of ^{10}Be produced by the extreme solar proton event in 774/5 A.D. They suggested that the downward transport of ^{10}Be from the stratosphere is mainly controlled by the Brewer-Dobson circulation in the stratosphere and cross-tropopause transport. By comparing the measurements with GEOS-Chem simulations over January-March 2003, Brattich et al. (2021) found that increased ^{7}Be values in surface air samples in Northern Europe in early 2003 were associated with the instability of the Arctic polar vortex. They also showed that, while the model generally simulates well the month-to-month variation in surface ^{7}Be concentrations, it tends to underestimate the observations (see their Table 2) partly due to the use of the default LP67 production rate for a solar maximum year (1958) in the GEOS-Chem model (Liu et al., 2001). By using the GMI CTM driven with four different meteorological datasets, Liu et al. (2016) showed that the observational constraints for ^{7}Be and observed ^{7}Be total deposition fluxes can be used to provide a first-order assessment of cross-tropopause transport in global models. In comparison to GCMs with or without nudged winds (e.g., Golubenko et al., 2021; Heikkilä et al., 2008; Spiegl et al., 2022) which involve simulating the entire global circulation and climate, the "offline" CTMs are driven by archived meteorological data sets, either from output of GCMs or from atmospheric data assimilation systems. For example, GEOS-Chem can be driven by the GEOS assimilated

meteorology (e.g., MERRA-2 reanalysis data; Gelaro et al., 2017) or output from the GISS GCM (e.g., Murray et al., 2021)"

2. The second refers to the original comment to L327 (#referee #1): I think, this is an important information and should be added to the text. In particular you need to explain how the simulated stratospheric fraction of the 10Be deposition flux can be different from the simulated fraction of the 10Be concentration in the lowest model layer.

Response: Thank you for the comment. This was explained in the discussion of Fig. S4 (see line 364-367). We have added the reference Liu et al. (2016) to the sentence. Heikkilä et al. (2009) did not compare stratospheric fractions in total deposition fluxes vs surface concentrations and is thus not cited here. It has been cited elsewhere (see our response above).

"Since the total deposition flux reflects precipitation scavenging through the tropospheric column, it tends to be more sensitive to ^{7}Be air concentrations at higher altitudes and downward transport of ^{7}Be from the stratosphere. Indeed, model results suggest that deposition fluxes have a higher stratospheric fraction compared to surface air concentrations (Fig. S4), as previously shown by Liu et al. (2016). "

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