Reviewer #2：

(1) L41 –The recommended forcing for PMIP4 is Toohey and Sigl (2017). Have these previous reconstructions been used in any CMIP6 simulations?

Response*: The Toohey and Sigl (2017) forcing reconstruction was based on Sigl et al. (2015). To be consistent with the PMIP4 references, we modify the text as copied below::*

"the conversion factors have been utilized in the ice-core-based last millennium volcanic forcing reconstruction of Gao et al. (2008) and Toohey and Sigl (2017), which has been widely used in the CMIP5 and CMIP6 model simulations, respectively."

(2) L50 –It would be useful to list what these 6 eruptions and the three methods are?

***Response:** The information about the 9 Antarctic cores and the three methods have been added as copied below:*

"Due to the limited number (0 in Greenland and 9 in Antarctic, including Law Dome, DML-B32, ITASE015, ITASE005, ITASE004, ITASE013, ITASE001, ITASE991, and SP2001c1) of ice core sulfate observations for the late 20th century, the conversion factor for Pinatubo is derived combining three methods (i.e., radioactive deposition from nuclear bomb tests, observation of Pinatubo sulfate deposition in eight Antarctic ice cores, and GISS Model E simulation of volcanic sulfate transport and deposition following the 1783 Laki, 1815 Tambora, 1912 Katmai, and 1991 Pinatubo eruptions, Gao et al. (2007))"

(3) L125 –How different are these numbers compared to previous averages used to estimate the loadings?

***Response:** The previous values of average deposition have been added and the revised text is copied below:*

"The composites, after correcting for area-difference, show slightly smaller sulfate deposition in both Greenland (57 kg km^{-2} in this study w.r.t. 59 kg km^{-2} in Gao et al. (2007)) and Antarctic (47 kg km^{-2} vs. 51 kg km^{-2})."

(4) L155 - How realistic is it that the Monte Carlo characterization is the same for all low latitude eruptions?

Response: *The Monte Carlo characterization of the conversion factor for individual eruption depends on the number of available ice core observations and their recordings of the volcanic aerosols. We choose SH-LTD$_T$ and use its characterization to expand SH-LTD$_P$ and others, because it is obtained based on the largest collection of ice core records and the signals appeared to converge better than the other events. In another word, the possible range of SH-LTD$_P$ could be wider using Monte Carlo characterization of other events.*

How realistic is the assumption can partially be evaluated by the general closeness between the volcanic sulfate aerosol distribution pattern and the precipitation pattern in both icecaps (Gao et al., 2007). It could also be subjected to change when the volcanic deposition is dominated by the dry deposition which maybe stochastic. However, we do not have such information to make the assessment. When ice core observations similar to number of Tambora observations become available for Pinatubo, Samala or other eruptions, we will be better equipped to evaluate the assumption. A brief discussion of how realistic is the assumption has been added in section 4.3.1.

(5) L174 – It would be useful to state the difference in the number of cores included for each ice sheet compared to Toohey and Sigl (2017)

Response: The discussion has been revised by adding the difference in the number of cores among the different estimates, and as copied below:

"Toohey and Sigl (2017) also obtained a LTD estimation for Pinatubo using 4 Greenland and 18 Antarctic ice core records, and the result is 35% - 50% larger than LP. Our new ice core set includes most of the 22 records, accept SP04 whose Tambora signal is much smaller than the other four South Pole cores and the W10k record in Law Dome. And the newly obtained SH-LTD$_P$ is about 80% larger."

(6)L184 – It is not clear exactly how the loading for Agung has been calculated and it would be clearer to introduce the hemispheric partitioning at the beginning of this section.

Response: *The paragraph has been modified according to the reviewer's suggestion, as copied below:*

"Agung volcano lies close to Tambora (Figure 6), while its 1963 AD eruption size is much smaller in terms of the sulfate aerosols (9.5Tg in Southern Hemisphere), therefore more sulfate aerosols may have stayed in the atmosphere longer and reached the ice sheets. By dividing the Southern Hemispheric loading with the Antarctic deposition of 10.25kg/km^2 averaged over the 24 ice core records available (Table 2), we obtain the SH-LTDA = 0.95×109 km^2. According to Table 3, with 75 % precision the Monte Carlo simulation suggests the distribution range of SH-LTD$_A$ to be (0.95±0.048) ×109 km^2."

(6) L214, Table 4 and Figure 5 – Please check the units of the conversions - the model BTD factors in Marshall et al. (2018) are between deposition in kg SO_4 km^{-2} and sulfate burden in Tg SO_4, not the aerosol loading. I think there is therefore a mismatch, and these should be scaled for comparison with the LTD factors.

Response: *We thank the reviewer for pointing out this unit issue. The BTD values have been scaled up in the revised Table 4 and Figure 5.*

(7) L246 – it would be useful to explicitly state why the sampling is important here and the implications for other eruptions

Response: *The following has been added:*

"The Monte Carlo sampling procedure provides an estimation of LTDT uncertainty associated with the different number of ice core records used to calculate the conversion factor. Such information enables us to anticipate the level of uncertainty in LTD and subsequent forcing estimations for other eruptions with reduced number of ice core records."

(8) Figure 5 – please add a and b labels. Why is Tambora 80 Tg not included on the top panel?

Response: *The labels have been added. The results for Tambora 80 Tg have been added to the top panel.*