Climate of the Past Discussions

Clim. Past Discuss., referee comment RC1
https://doi.org/10.5194/cp-2021-100-RC1, 2021
© Author(s) 2021. This work is distributed under
the Creative Commons Attribution 4.0 License.

Comment on cp-2021-100

Chaochao Gao (Referee)

Referee comment on "Magnitude, frequency and climate forcing of global volcanism during the last glacial period as seen in Greenland and Antarctic ice cores (60–9□ka)" by Jiamei Lin et al., Clim. Past Discuss., https://doi.org/10.5194/cp-2021-100-RC1, 2021

The paper titled "Magnitude, frequency and climate forcing of global volcanism during the last glacial period as seen in Greenland and Antarctic ice cores (60-9 ka)" is the first effort to reconstruct the volcanic history of the last glacial period, utilizing six bipolar ice core records. Results from this work will provide an essential forcing scenario for model simulations and climate investigation of this period. I recommend publication of this work, after careful consideration of the following questions and suggestions:

- Section 2.2, please explain briefly the choice of different filter length, i.e., 45yr for the Antarctic cores and NGRIP while 181yr for GISP2 & NEEM.
- Also in section 2.2, it is a bit confusing about which parameter was used to measure the volcanic signals, the depth or the yr. Based on the text, the background was filtered by window length indicated by year, while the duration of the volcanic signal was indicated by depth.
- Section 2.4 please provide some description of how the manual correction was performed. For example, what are the resolutions for the ECM and DEP records? How many or what percentage of the signals have been corrected. It would also be great to give an example of how the correction was done.
- "A sulfate deposition of 20 kg km^{-2} corresponds to half the Greenland deposition from the 1815 AD Tambora eruption, thus refers to quite large events in terms of total sulfur injections into the atmosphere." Please explain briefly how was the 20 kg km^{-2} (and also the 10 kg km^{-2} for Antarctic) cutoff line estimated. And was the 40 kg km^{-2} 1815 AD Tambora deposition corresponding to the average deposition from the three Greenland cores?
- Section 2.6 Please provide more details on the SVM model. For example, what are the requirements, the pro. and cons of the model in this particular application. What validation had been done on the model performance? For example, taken one of the 21 eruption signals used to train the model out from the analysis, could the model accurately simulate its location?
- Ln 305-307, the comparison between IC and CFA records in Fig 2e needs further demonstration. For example, what is the exact meaning of "very large uncertainties"? What is the implication of the uncertainties on the interpretation of the "face value"?
- Section 3.3 Please explain why borrow the bipolar eruptions from the previous studies,

rather than estimate a list using the results from this study.

- Ln 532-534 In my understanding, the VEI list is a discrete (i.e., it is not a complete but continuously evolving) reconstruction of historical volcanism based on geological investigation. So I am not sure it is appropriate to directly compare the event frequency from the ice-core-based reconstruction (which is assumed to be continuous) with that from geological investigation.
- Section 4.4 Please explain why do some events have forcing estimation in a range (for example, the #2 largest signal has forcing ranging from 17.8 to 176.5 W/m2), while others have finite forcing estimation (for example, the #3 largest signal has a forcing estimation of 82.8 W/m2)? If it was due to the number of ice cores available for signal extraction, this should be clarified.
- Is there any reason why the authors choose Tambora & Samalas for the magnitude comparison of #3 and #4 events, respectively?
- Please add captions for the supplementary figures.