Climate of the Past Discussions

Clim. Past Discuss., referee comment RC1
https://doi.org/10.5194/cp-2021-38-RC1, 2021

Review

Anders Svensson (Referee)

Referee comment on "New insights into the ~74□ka Toba eruption from sulfur isotopes of polar ice cores" by Laura Crick et al., Clim. Past Discuss., https://doi.org/10.5194/cp-2021-38-RC1, 2021

General comment:

The study presents the sulfur isotopes of the potential 74 ka Toba eruption sulfate spikes in the Antarctic EDML and EDC ice cores (would be good to mention ice cores in abstract) adding new and valuable information to the ongoing Toba saga. The study is carefully carried out, figures are good and illustrative, the study is well referenced and the message is clear. Nice work, I have only a few minor comments.

Specific comments:

- 124 onwards: What is the approx. time resolution of the obtained samples? I guess this info can be extracted from the supplementary info, but it would be good to mention in the main text as well.
- 154: '…, this integration also corrects for thinning.' It is not entirely clear to me how the integration, that I assume refers to the sulfate peak area, implies a thinning correction? Doesn't this correction need to be done separately after the peak integration? In any case, it would be good to know which thinning models you are applying for the thinning correction (with some reference), and also it would be helpful to know the magnitude of the thinning correction for each core, as this could be quite significant at least for EDML?
- 380: You may also compare to the results of (Corrick et al., 2020) for absolute ages.
- 400: 'This would remove…' -> 'This would suggest Toba to be unlikely as a trigger of ….' or similar.
- 402: Which candidate gives 3 times the Salamas 1257 CE stratospheric sulfur loading?

Figure 5: The repeated measurements eg for Salamas have different isotopic amplitudes and are probably obtained for different sample sizes? Would it be possible to show the temporal sample resolution (and maybe the sampled ice core) in the same Figure? In principle the 'true' amplitude of the sulfur isotopes could be extrapolated to infinitesimal sample size? There will still be diffusion in the ice that cannot easiy be accounted for, of course.

Figure 7: Strictly speaking the Buizert et al, 2015, publication has nothing to do with the release of the NGRIP isotope profile. A better reference may be (North Greenland Ice Core Project members, 2004).

References:

Corrick, E. C., Drysdale, R. N., Hellstrom, J. C., Capron, E., Rasmussen, S. O., Zhang, X., Fleitmann, D., Couchoud, I., and Wolff, E.: Synchronous timing of abrupt climate changes during the last glacial period, Science, 369, 963-969, 10.1126/science.aay5538, 2020.

North Greenland Ice Core Project members: High-resolution record of Northern Hemisphere climate extending into the last interglacial period, Nature, 431, 147-151, 2004.