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Climate of the Past Discussions

Interactive comment on "Direct linking of Greenland and Antarctic ice cores at the Toba eruption (74 kyr BP)" *by* A. Svensson et al.

Anonymous Referee #2

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Although I am generally not a fan of papers that correlate volcanic events in ice cores only based on the acidity or sulfate records, because of the ad-hoc nature of some of the correlations, I am very impressed with the careful and thoughtful work that these authors present. I am convinced by the bipolar correlations presented, and believe that the conclusions that they draw are based on defensible analysis of the ice core data. The paper is well written and well illustrated.

Despite my overall very positive impression of the paper, I think that there are a few points that could be addressed more rigorously. Comments below keyed to "callouts" in the annotated PDF of the MS. Some other comments are also noted in the MS.

Comment #1. The annual layer counting appears to be very challenging, and the correlations shown in Fig. 1 are only moderately convincing. But, given how the whole

analysis ties together, I am willing to believe that the ties are valid. However, could the authors offer explanation for the big discrepancy in the number of years between Be-1 and L1? Also, an explanation of how the analytical uncertainties for the layer counting age difference between the volcanic ties in NGRIP and EDML need to be explained (unless I missed this in the text). Errors on layer counted ranges between tie lines are presented in Figure 2, but are absent from Table 1.

Comment #2. Are there several Toba eruptions? The authors suggest that their analysis of the cores may indicate that the enormous 74kyr Toba eruption may have consisted of multiple events. However, after suggesting this, they do not really delve into the question in much depth. I would suggest reading and citing more of the Toba field literature to try to find more support (or lack of support) for this idea, and provide a more in-depth discussion in the paper.

Comment #3. The information about the variability in the magnitude of the volcanic signal (acidity and sulfate spikes) between the Greenland cores and the Antarctic cores is interesting. I think that it would be worth having a more detailed analysis of this in the paper as well as some discussion about the possible origin of these differences. Although this may be hard to assess with only 3 Antarctic cores, is there any geographic control on the magnitude of deposition of same age spikes from core to core? Or is the variability completely decoupled from geography? I suspect that the reason for the variability may be a function of wind reworking of the snow that carried the chemical signal of the eruption, causing concentration of the signal (leading to a higher spike) in some places and reduction of the signal in others. I would think that this would result in some randomness in the magnitude of the signal on a very local scale).

Please also note the supplement to this comment:
http://www.clim-past-discuss.net/8/C2942/2012/cpd-8-C2942-2012-supplement.pdf

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Interactive comment on Clim. Past Discuss., 8, 5389, 2012.