

Comments to specific items of text are referened as Pxxx Lyyy for Page xxx
Line yyy

1 General Comments

Zhang et al. “A new method of resolving annual precipitation for the past millennia from Tibetan ice cores” presents a detailed study on the average accumulation rate for 3 epochs in the last 2500 years for an ice core site on the Chongce ice cap, northwestern Tibetan Plateau. The paper combines annual layer thickness data (from ultra-high resolution ice core elemental chemistry) with a flow thinning model (constrained by water-insoluble organic carbon ^{14}C ages) to determine local net accumulation over 3 disjoint epochs. The authors have done a commendable job of addressing the issues raised during the previous review. In particular, I appreciate the information and revisions around my previous major comment concerning the data fitting for the flow model. However, there are some inconsistencies between the author response to the reviews (version 3-1) and the manuscript (version 5-2), at least for the versions I accessed. I recommend minor alterations and corrections detailed below.

2 Inconsistencies between authors response to reviews and manuscript

2.1 Minor Specific Comments

Original comment:

P2 2nd paragraph. This needs a restructure, at the moment, the sentence topics are annual layers, thinning, annual layers then thinning again. Suggest you move the sentence staring “In addition, the nonlinear” to after the sentence staring “The most common approach”. Then change “The thinning parameter” → “This thinning parameter”.

The authors response is:

We agree with the reviewer, and have revised the sentence accordingly.
The revised sentence is as follows;

The most common approach is to obtain annual-layer thickness based on the seasonal cycles of ice core parameters such as stable isotope ratio of oxygen in the water ($\delta 18\text{O}$), the concentration of major ions (e.g. Ca^{2+} , Mg^{2+} , NH_4^+ , SO_4^{2-}), and the presence of melt layers (Thompson et al., 2018). In addition, the nonlinear thinning of annual layers caused by ice flow must be suitably constrained (Bolzan, 1985; Henderson et al., 2016; Roberts et al., 2015).

This change is not reflected in the revised manuscript, with the second sentence still being before the first (as it was in the original manuscript).

Original comment:

P6 L188–189 These grouped peaks could also be from independent snow events with dry wind blown dust deposition between these snow events.

The authors response is:

We agree with the reviewer, and have revised the text accordingly. The revised sentence is as follows;
These grouped peaks are interpreted as independent snow events with elevated element concentrations or with wind-blown dust deposition between these snow events.

There is no such sentence in the revised manuscript.

2.2 Technical corrections

P6 L149 Delete “were”. Still need to delete first occurrence of “were”, now on line 157, i.e. change “in the ice were by filtration” to “in the ice by filtration”

There were several other cases where the authors response to minor comments stated that “Change has been made accordingly” but the manuscript does not reflect this. However, the cases not listed here were only for suggested word changes rather than an error, so I have not listed them.

3 New comments

3.1 Technical corrections

P3 L64, I think neither Roberts et al 2015 or Winstrup et al 2012 are appropriate references for alpine ice cores. Suggest either find a more appropriate reference, or reword sentence to “because of the difficulties in identifying annual layers and obtaining accurate chronologies in the deeper part of ice cores due to rapid thinning (Roberts et al., 2015; Winstrup et al., 2012), with this issue especially problematic for alpine locations.”

P3 L70, suggest adding “e.g.,” to the start of the reference list.

P3 L83, change “Fig. S1” to “Fig. 1”

P3 L85–86, change “first time to preform the” to “first application of”

P7 L193, change “Fig.1” to “Fig. 4”. If this reference is really figure 4 then need to swap the order of figures 3 and 4 so that they are first referenced in the correct order.

P7 L189, change “Fig.1” to “Fig. 2”

P9 L244, delete “roughly”, the two age estimates agree within a small fraction of their uncertainties.

P11 L314–315, annual precipitation reconstructions based on ice cores has indeed already been achieved for both Greenland (e.g., Dahl-Jensen et al 1993) and Antarctica (e.g. Thomas et al 2017, doi:10.5194/cp-13-1491-2017). I suggest you include these (or other) references.

P12 L328, change “ice core model” to “ice cap flow model”