

Interactive comment on “Ice core precipitation record in central Tibetan plateau since AD 1600” by T. Yao et al.

Anonymous Referee #1

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Review of the manuscript: "Ice core precipitation record in central Tibetan plateau since AD 1600"; by Yao et al. CPD, 4, 233-248, 2008

General assessment

This paper presents new accumulation data covering the last centuries derived from an ice core drilled on the Puruogangri Ice Field on the central Tibetan plateau. With this, it aims at providing essential data on the variability in atmospheric dynamics and water vapor transport onto the Tibetan plateau which is influenced by changes in the Asian summer monsoon. Accordingly, this study tackles an important question in climate dynamics. Unfortunately, it lacks the thorough treatment of the glaciological regime in which these variations in ice core layer thickness occur. This relates especially

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to the fact that the manuscript does not tell how glacier flow effects, which lead to thinning of annual layer thicknesses, have been corrected for. In fact, based on the information given in the manuscript, it appears that no corrections have been made at all. This, however, is not possible because vertical ice velocities and, thus, annual layer thicknesses have to go to zero at the bottom of the glacier, if no bottom melting occurs. Moreover, lateral inflow is likely to occur, which complicates the thinning function. No information on the topography and the flow regime is given in the manuscript.

On top of this essential glaciological problem of layer thinning the effect of lateral inflow of snow originally accumulated in regions with higher or lower snow accumulation has not been considered. There may be studies on the lateral variability of snow accumulation on the Puruogangri Ice Field in the inflow region, however, they are not discussed in this manuscript.

These points of criticism strongly compromise the representativeness of the study in terms of precipitation rate variability. In fact, long-term trends in snow accumulation and $\delta^{18}\text{O}$ as derived in the manuscript could easily be caused by such systematic inflow effects. While the comparison with other ice cores from the Tibetan plateau strengthens the case that indeed a long-term temporal trend in precipitation occurred, this can not be safely assessed based on the information and the data treatment presented in the paper so far.

On top of this, the authors should be strongly encouraged to thoroughly revise their writing and ask a native English speaking colleague to improve the text. This is not to be picky but in some instances the text does not allow to understand what exactly has been done. I started to correct the writing for the abstract but then stopped this and concentrated only on the scientific problems addressed in the manuscript.

In summary the paper is not suitable for publication in *Climate of the Past* in its current form. However, due to the importance of the data and the potential of the manuscript to address all the glaciological issues mentioned above as well as the potential of

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significantly improving the writing, the authors should be encouraged to resubmit a new, thoroughly revised version of the manuscript as soon as possible.

Specific comments

Abstract:

I1: "records from the northern" I3: "on the central Tibetan plateau" I8: "experienced higher precipitation, whilst the 19th century experienced lower precipitation."

This should be more quantitative, how much more/less precipitation, which exact time intervals?

I9: "feature is consistent" I10: "The results also point to a positive correlation of precipitation and temperature on the northern Tibetan Plateau."

This correlation could also be explained by a lateral inflow of snow from upstream regions

I13: "This feature is contrary to "

Introduction

Page 235 line 16: The authors say that depositional effects on snow accumulation can be neglected in this study. On what grounds is this statement substantiated? If there are glaciological studies on the upstream regime of the ice core than they should be discussed or at least the appropriate references should be provided.

Data and Methods

Page 236 I19: I guess there was 10 mm precipitation between November and April?

Page 236 I24: The authors derive a mean annual temp of close to -15°C and mean summer temperatures of -4°C. This seems to be warm enough to allow at least for percolation of melt water during summer times, which may alter the interannual variability in snow accumulation. It would be helpful to describe the snow stratigraphy somewhat

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more in detail to assess this effect.

Page 237 I14: The authors state there are clear seasonal cycles in d18O. Given the fact that there is nearly no winter precipitation it appears astonishing that such clear cycles do exist. It would be helpful to show a graph with a high-resolution dust and d18O record to assess the dating accuracy.

Page 237 I26: It is unclear what the authors mean, when they refer to the continuity equation. This would be the place to thoroughly discuss the thinning function of the glacier as well as the effect of lateral variability of snow accumulation in the upstream regime.

Page 238 I25: The authors perform a correlation analysis on the raw data as well as on a 5 year running average. It appears that the significance level for the running mean analysis does not take the reduced degrees of freedom into account when averaging the data. Accordingly, the 99% significance level is probably overestimated.

Page 239 I6: The use of a Cramer's test seems not to be necessary here, because one can see with the naked eye where the layer thickness is higher/lower in Fig. 3b. Such a test would be worthwhile to investigate the significance of deviations from the long-term mean but again the reduced degrees of freedom have to be taken into account when using running averages.

Page 249 I11: NAO (North Atlantic Oscillation), this abbreviation has not been explained before.

Page 240 I 27: "Oerlemans"

Fig. 1 The quality of this map is pretty bad. It is not clear which drill site is which. In fact a high-resolution map of the Puruogangri Ice Field also indicating the topography should be given here.

Fig.4 What kind of smoothing has been used to create these plots. It is not clear how much of these long-term trends can be explained by glacier flow and upstream effects

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and how much is of meteorological origin.

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4, S27–S31, 2008

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