

## ***Interactive comment on “A 70-yr record of oxygen-18 variability in accumulation from the Tanggula Mountains, central Tibetan Plateau” by D. R. Joswiak et al.***

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This manuscript describes a relationship between oxygen stable isotope in an ice core obtained in the central Tibetan Plateau and north Indian annual precipitation for seven decades in the 20th century. Such obvious negative correlation among precipitation and oxygen stable isotope in ice core, which was so called amount effect, has never been reported in previous studies. Although this is interesting and straightforward result, discussion before reaching their conclusion is not sufficient. I point out some unclear description of the manuscript below.

## Major comments

### 1) Temperature dependence on the isotopic depletion? (P1931L8, L12)

Does air temperature depend on the isotope behavior? I learned that the water isotope in precipitation tended to depend on air temperature. I misunderstand something?

### 2) No melt signal? (P1933L20)

Our observations (Fujita et al., 2000; Pu et al., 2008), which have been conducted in the same Tanggula Mts, suggest that an unignorable melt should have occurred at the same altitude where the authors retrieved their ice core. In addition, these mass balance measurements provide a significant 'validation data' for their ice core dating. More detailed discussions are required for this part.

Fujita K, Ageta Y, Pu J, Yao T (2000) Mass balance of Xiao Dongkemadi Glacier on the central Tibetan Plateau from 1989 to 1995. *Annals of Glaciology*, 31, 159-163.  
Pu J, Yao T, Yang M, Tian L, Wang N, Ageta Y, Fujita K (2008) Rapid decrease of mass balance observed in the Xiao (Lesser) Dongkemadi Glacier, in the central Tibetan Plateau. *Hydrological Processes*, 22(16), 2953-2958. doi:10.1002/hyp.6865.

### 3) Seasonality of sulfate (P1933L28)

Nothing is addressed for the seasonality of sulfate. I suppose high-SO<sub>4</sub><sup>2-</sup> in winter and vice versa. In addition, I don't think SO<sub>4</sub> is NOT sulfate.

### 4) Flow-model (P1934L3-5)

This is certainly outlined in Henderson et al. (2006) but this is NOT their idea. The authors should pay due respect to and cite the original works (Haefeli, 1961; Nye, 1963) for the model instead of Henderson et al. (2006).

### 5) Cutting interval (P1934L6)

I cannot catch the authors' assertion, in which the unclear seasonality of oxygen isotope is due to coarse cutting interval, because the sulfate shows an obvious seasonality. Are their sampling intervals different?

6) Previous ice core in the Tanggula Mts. (Yao et al., 1995)  
Please depict this in figure. The first author is the co-author of the manuscript.

7) Warming on Tibetan Plateau (P1934L28)  
A significant warming was found NOT in summer temperature BUT in winter temperature by Liu and Chen (2000). The oxygen isotope in the ice core is of summer precipitation as the authors mentioned. In this context, Liu and Chen (2000) do not support their result.

8) Statistic significance (P1935L29)  
What is degree of freedom for 5yr running means? I suppose this does not exceed  $n=14$  ( $=70/5$ ) so that  $p$  is less than 0.01, NOT 0.001 with  $r=-0.72$ .

9) oxygen isotope vs. north Indian precipitation (P1936L1)  
I have never seen such a clear 'amount effect' on oxygen stable isotope! This is interesting figure. However, more discussions have to be made here because this is quite different from the findings of many other previous studies. Only citing the ice core from Geladaindong Mts. is insufficient because many ice cores have been retrieved from the Tibetan Plateau in these days. Thompson et al. (2000) showed, for instance, that a significant correlation among stable isotope and northern hemisphere temperature rather than precipitation in the Dasuope ice core, which was more affected by Indian monsoon. In addition, analyses of climatological data will help to understand where the boundary of Indian monsoon locates, how the boundary fluctuates year by year, and how the fluctuation affects differently in the neighboring ice cores in Geladaindong and Tanggula Mts. I wonder why the authors did not analyze the precipitation records at Tuotuohe and Amdo.

10) Nothing was addressed about the effect or interaction of 'westerly'.

#### Specific Comments

11) I don't think SO<sub>4</sub> is NOT sulfate. (P1933L28, Fig. 3 and others)

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- 12) Do not cite a reference in abstract (P1930L5).
- 13) Ohata et al. (1994) did not show any obvious result among water isotope and precipitation amount. They just showed temporal changes in them. This should be excluded.
- 14) I suppose Mts. is better than Mtns. for Mountains.
- 15) I suppose 'per year' should be removed because it was addressed 'annual'.
- 16) 'the early-' instead of 'an early-'? (P1934L22)
- 17) The sentences are incomplete. (P1937L3-6)
- 18) Duration to obtain averages should be addressed. (Fig. 2)
- 19) Superimposition of oxygen isotopes in two ice cores is appreciated for understanding. (Fig. 4)

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