

Reply to the Comment on “Origin of water in the Badain Jaran Desert, China: new insight from isotopes” by Wu et al. (2017)

By *Xiujie Wu* (xiujiewu1990@foxmail.com).

Thanks to the group of Dr. Zhan who wrote this Comment. Now, I find the mistake I have made.

So I make the corrigendum below:

- 5 Due to the ignoring calculation of annually weighted average values, I misused the mean values as the weighted average values of isotope ratios of precipitation at the IAEA-GNIP (IAEA/WMO, 1986-2003) station in Zhangye.

So the words “**weighted annually average**” in the figure caption of Figure 4 in the page of 4225 and “**weighted mean**” in the section 5.2 (Page 4426, Line 28 left side), which should be “**annually average**” and “**mean**”, respectively.

In addition, I add the true annually weighted average values (IAEA/WMO, 1986-2003) to the Figure 4 and Figure 5a.

- 10 As shown in the Figure 4 and Figure 5(a), the weighted average value (black square in the Figure 4&5a) is higher than the intersection of the evaporation line and the GMWL in the $\delta^{18}\text{O}$ - δD plot. This may indicate preferential recharge by winter precipitation in such an arid region, unlike in humid region where the groundwater generally has a composition similar to the weighed mean annual precipitation in the watershed. In other words, the local groundwater is perhaps recharged primarily by snowmelt in the area and/or surrounding mountains, with little or no summer rain making it to the water table due to high
15 evaporation and/or the plant evapotranspiration in the summer.

I also have two suggestions to this comment:

1. This comment make some good theoretic analysis of the altitude effect on the stable isotopes of precipitation, however, I did not see more isotopic data from the Qilian Mountain. Considering they questioned the representability of the samples from Shiyang River (Li et al., 2016), I think more data from the Qilian Mountain would make this comparison more
20 clearly.
2. In my opinion, the more specific description of the hydrogeological processes and the evolution of water isotopes is necessary to support the remote Qilian Mountain as the major recharge area.

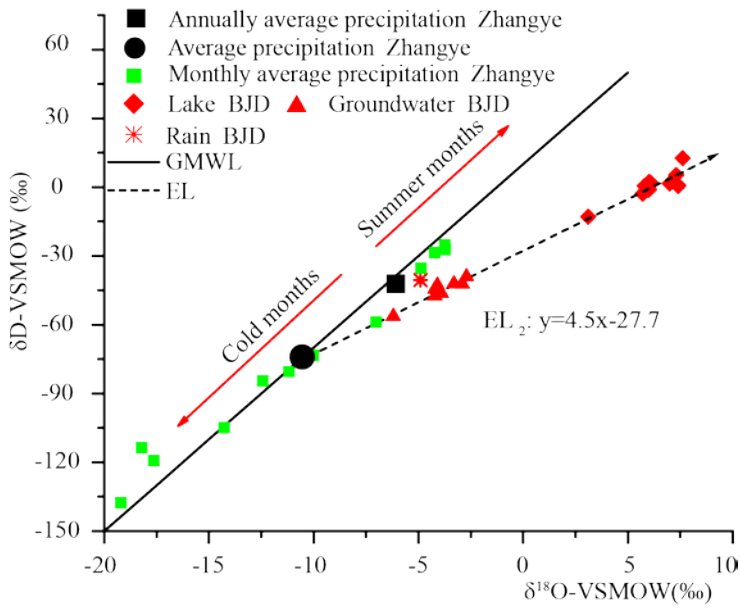
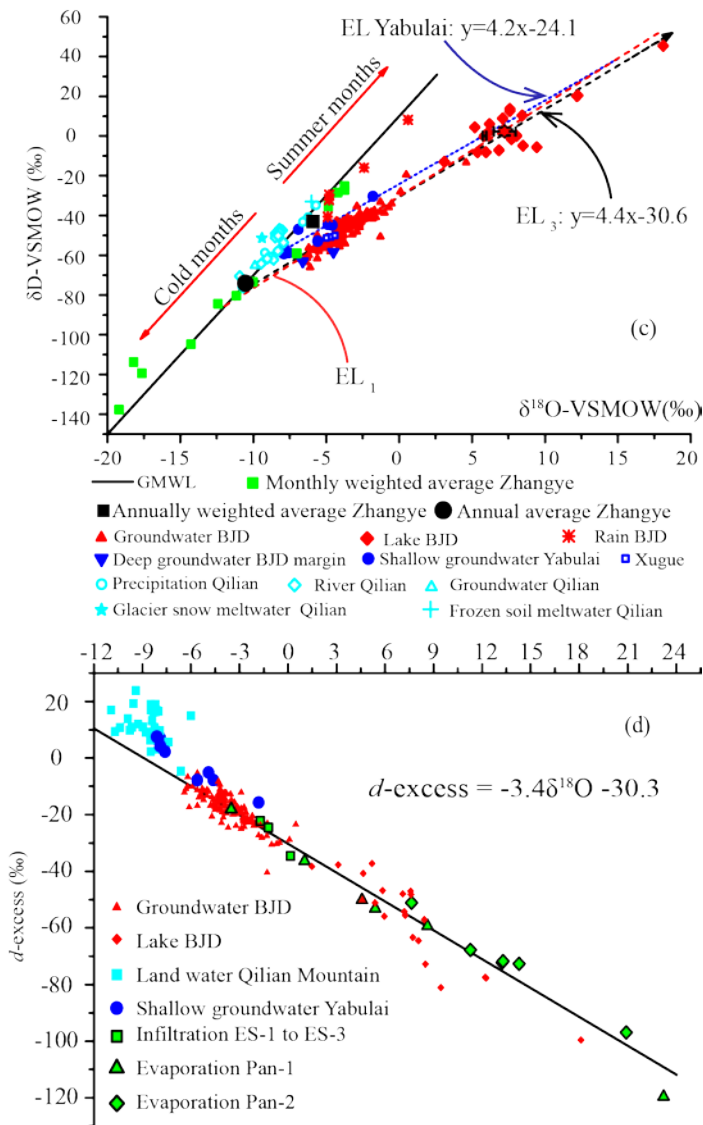


Figure 4: The δD vs. $\delta^{18}O$ plot of natural groundwater, lake water, and precipitation in the desert. Also shown are weighted monthly average and weighted annually average isotope ratios of precipitation at the IAEA-GNIP station in Zhangye.



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Figure 5: The plot of δD vs $\delta^{18}O$ values (a) and d -excess vs $\delta^{18}O$ values (b) of groundwater and lake water samples from the BJD (red symbols), including new data from his study and previously published data from the literature (Gates et al., 2008a; Zhang et al., 2011; Zhao et al., 2012). The trend line in (b) is established from our evaporation experiments (Fig.4b). Also shown are the isotope data from the Qilian Mountain area (light blue symbols) for comparison. The two larger diamond dots with black cross inside are the average values with error bar for the Sumu Jaran and Sumu Badain Jaran lakes sampled at different depths. Isotope data for deep groundwater in Gurinai and Xugue and shallow groundwater in Xugue and Yabulai Mountains in (A) are from Gates et al. (2008a). The water isotope data for the Qilian Mountains include precipitation (Wu et al., 2010; Chen et al., 2012), and land water including groundwater (Li et al., 2016), rivers (average for each river) (Chen et al., 2012; Li et al., 2016), glacier snow melt water and frozen soil melt water (Li et al., 2016).

References

IAEA/WMO, 1986-2003. Global Network of Isotopes in Precipitation. <<http://www.iaea.org/water>, 2018>.

Li, Z.X., Feng, Q., Wang, Q. J., Yong, S., Cheng, A. F., and Li, J. G.: Contribution from frozen soil meltwater to runoff in an in-land river basin under water scarcity by isotopic tracing in northwestern China, *Global Planet. Change.*, 136, 41-51, doi: 10.1016/j.gloplacha.2015.12.002, 2016.