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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Deep soil water ^{18}O and ^{2}H measurements preserve long term evaporation rates on China's Loess Plateau" *by* Wei Xiang et al.

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Response to Anonymous Referee #1

We appreciate your positive comments on our manuscript, and expect that we have a chance to revise the manuscript and can address all of the comments raised by the Referee #1. Overall, the two main suggestions were raised and responded as follow:

1. The selection and processing of data sources make it difficult to evaluate the validity of the results. Generally, the introduction and discussion look good but the results are very simple. It should be more detailed and stronger. The results should also include a table with the differences in this method and the other commonly-used isotope methods.

Response: Thank you very much for your suggestions. We will carefully revise our manuscript according to your suggestions. We have already validated our estimates by comparison with the estimates reported by previous studies in the Discussion (section 4.3, L250-260). We will present the estimates from the well-known Craig-Gordon model to further validate our results. Overall, we believe that these issues can be addressed and will further consolidate our main results and conclusions of this manuscript.

2. There are only four sampling sites for precipitation across this area and its variability is so large, which makes it unconvincing.

Response: Thanks for raising your concerns. We are assuming that the Referee concerns the variability of precipitation lc-excess, presented in the Figure 4. In the Figure, we presented the the Boxplot of the mothly precipitation lc-excess from all precipitation sampling sites. We believe that the variability of the precipitation lc-excess values would not originate from the limited precipitation sampling sites for the following reasons.

(1) The four precipitation stations cover the precipitation variability over the region. And all the monthly precipitation data collected from different periods, are closely plotted along a single line (the regional LMWL), and parameters (slope (from 6.11to 7.56) and intercept (from -7.76 to 7.72)) of LMWL did not vary much among the stations (Figure A1, which will present as the supplementary).

(2) the LMWL is comparable with that of the previous study in this region (δ2H = 6.90δ18O + 0.10, n = 277, R2 = 0.93) (Li et al., 2019), and the correlation coefficient of the regression equation is over 90%, suggesting the LMWL is reasonable (δ2H = 6.89 (0.15)δ18O -0.16 (1.23), n = 212, R2 = 0.91).

(3) For a single precipitation sample (monthly-based here), its lc-excess values would have a tiny deviation from the zero; however, the average value is zero. Because the LMWL parameters (slope and intercept) is derived from many of the monthly data, the uncertainty in these two parameters would be even smaller (please see in the method

section, L145-150). Therefore, the variability of precipitation lc-excess values would not affect the accuracy of our estimates.

Li, Z., Coles, A. E., and Xiao, J.: Groundwater and streamflow sources in China's Loess Plateau on catchment scale, Catena, 181, 104075, 2019.

Response to specific comments

Line12, what is the mean line-conditioned excess?

Response: We modified as "Our results showed that the deep soil water (2 - 10 m) had a mean line-conditioned excess (lc-excess, which describes the offset of a water sample from the Local Meteoric Water Line in the dual-isotope space) less than zero (-13.1‰ to -3.8‰ at the 15 sites across China's Loess Plateau, suggesting that evaporation effects are preserved in the isotopic compositions of the deep soil water."

Line155, only S11? Please show the temporal profile at more sites.

Response: We only monitored the soil water isotope data at one site temporally to address the temporal variation. Therefore, we do not have temporal data from other sites. And this is consistent with general understanding that deep soil water isotopes are not normally affected by precipitation infiltration and surface evaporation. Therefore, the missing temporal data for remaining sites would not affect our main results and conclusion, and we will address your concerns in the result and discussion sections in the new version.

Figure 2c is not described in results.

Response: We described in the L221-225.

Figures 2 and 3, why do you choose 2m? how about 1 or 1.5m?

Response: The critical assumption in the manuscript is that deep soil water isotopes are free of temporal variation. The precipitation infiltration and soil evaporation are two main factors to the variation of soil water isotopes. However, soil evaporation is limited

to a few to dozens of centimeters and precipitation infiltration depth rarely exceeds two meters at our study area. Therefore, we chose 2 m as the steady depth, which can be verified by the dynamics of soil water isotope at one site (S11). We discussed in the L211-220, and we will discuss it more details in the new version.

Figure 3, Missing 0-2m data at 5 sites.

Response: We added the data.

Figure 3, please show the SD as figure 2 did.

Response: Done.

Figure 4, how about 0-2 m?

Response: We will present the data.

Figure 5, please show the SD of x-variable in fig5 b-d.

Response: Done.

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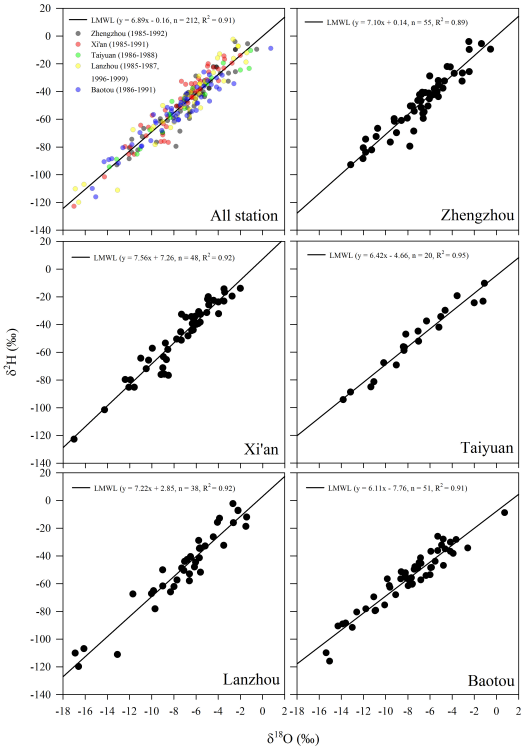

Fig. 1. The Local Meteoric Water Lines (LMWLs) on the China's Loess Plateau.