Revision Notes

Dear Editor and Reviewers:

Thank you for your letter and for the reviewers' comments concerning our manuscript entitled "Evaporation, infiltration and storage of soil water in different vegetation zones in Qilian mountains: From a perspective of stable isotopes" (Manuscript Number: Hess-2021-376).

According to the reviewers' comments, we have revised our manuscript carefully. The revised portions have been marked in red in the revised version of the manuscript. The main corrections and the response to the reviewers' comments are as follows.

Responses to the reviewer's comments:

Response to Reviewer #1

Reviewer#1: This is an interesting study conducted in a mountain region in China. The research is based on the use of stable isotope in water to understand the main mixing processes and hydrological processes. The manuscript is logically organized and clearly illustrated. However, there are serious issues that in my opinion should prevent the publication of this manuscript in the present form. First of all, the English language is very poor, and sometimes (especially in the Introduction) it's hard to follow the reading. Secondly, the are serious flaws in the Abstract and mostly in the Introduction that fails to reach the focal point of this work (see specific comments below). Third, the discussion is well complemented with literature references but is quite often vague and appears to be not well supported by the observations. No reference to figures and tables are reported in the discussion and it seems that the processes explained by the Authors are based on a previous knowledge of the area and by results taken from the literature than supported by their own results. I suggest to more strictly base the inference on hydrological processes on the observed results.

In the end I suggest to resubmit this manuscript after fixing all these major issues.

Thanks for your comments.

Specific comments

Comment 1: The title does not read well. I suggest changing into "Evaporation, infiltration and soil storage in different mountain zones" or "Evaporation, infiltration and soil storage in different vegetation zones in a mountain catchment". Perhaps also "Evaporation, infiltration and soil storage in different mountain zones: an isotope perspective". But there is no strict need to stress the isotopic perspective, in my opinion.

Response 1: Based on the suggestions of the two reviewers, I have revised the title of the manuscript.

L1-3: Evaporation, infiltration and storage of soil water in different vegetation zones in the Qilian mountains: a stable isotope perspective

Comment 2: The abstract lacks to report the main objective, or the research questions.

Response 2: I added the main research objectives and questions in the abstract according to your suggestion.

L13-17: In order to further understand the process of soil water movement and runoff generation in different vegetation zones (Alpine Meadow, Coniferous Forest, Mountain Grassland and Deciduous Forest) in mountain areas, this study monitored the temporal and spatial dynamics of hydrogen and oxygen stable isotopes in the precipitation and soil water of the Xiying River.

Comment 3: The introduction suffers from different weak points and needs a severe restructuring.

1) It is not clear what different vegetation zones are, and what role they play in water exchange in the environment, and why they are important in this research.

2) The text focuses too much on the variability of the isotopic composition in vegetated environments without going deeper into the main physical processes that still need to be understood. Isotopes are just a tool, and the goal here is to understand hydrological processes with the help of isotopes, not which are the factors affecting isotopic variability.

3) Very importantly, no research gaps is put forward. We understand that studying and understanding hydrological processes in different vegetated areas is important but what is the real problem here? As a result, the specific objectives are disconnected from the rest of the Introduction and fluctuate in their own space. Moreover, what is the memory effect? Why is it important? What is not known about it? How does it fit the general story behind this paper?

Response 3: I rewrote the introduction based on your suggestions and other reviewers' comments. The memory effect refers to the indicative profile produced by the stable isotope of soil water in response to the event after precipitation or drought. We highlighted its importance in the manuscript. The memory effect refers to the indicative profile produced by the response of stable isotope of soil water to precipitation or drought. We highlighted its importance in the manuscript.

L31-98: In arid inland river basins, changes in climate and vegetation will affect the hydrological cycle process, which is essential for assessing regional water balance and future changes in water resources (Wang et al., 2012; Tetzlaff et al., 2013; Ning et al., 2020; Sharma et al., 2021). To cope with the changing natural environment, managers have formulated a series of scientific ecological management policies based on species selection (Wookey et al., 2010), crop rotation (Zhu et al., 2019), and ecological water conveyance (Zhang et al., 2019), which has been improving their adaptability to the changing natural environment.

Soil water in the unsaturated zone can be converted from precipitation to steam or groundwater recharge. Evaporation, infiltration and water storage are critical for understanding the regional hydrological process and water balance under the background of climate and vegetation changes (Brooks et al., 2010; Grant and Dietrich, 2017). Isotopes, as "fingerprints" of water, have been used to track eco-hydrological processes, such as evaporation (Barnes and Allison, 1988; Zhu et al., 2021b), groundwater recharge (Koeniger et al., 2016), infiltration path (Tang and Feng, 2004; Duvert et al., 2016; Zhu et al., 2021a), evapotranspiration distribution (Xiao et al., 2018; Gibson et al., 2021) and water absorption by plants (Rothfuss and Javaux, 2017).

The water seepage in the unsaturated soil zone and the evaporation of water at the air-soil interface are the main forms of soil water transport. Seasonal variations of precipitation isotopes are often used to track the process of soil water leakage (Stumpp et al., 2012). During the piston infiltration process, the precipitation with different δ^2H and $\delta^{18}O$ peaks retained in the soil profile and gradually disappears as the infiltration depth increases (Sprenger et al., 2016a), while the preferential flow will keep these peaks until the deep soil layer (Peralta-Tapia et al., 2015). During a precipitation event, the response of water isotope in surface soil to precipitation is more obvious, showing a changing trend similar to that of stable isotope of precipitation. With the deepening of the soil layer, the seasonal variation of precipitation isotope signals is rapidly attenuated, and the influence of precipitation on soil water gradually weakens (Sprenger et al., 2017). Evapotranspiration is the main form of soil water dissipation. Because the mass of hydrogen and oxygen atoms that make up water molecules are related to their thermodynamic properties, isotope fractionation of water will occur in the process of the water cycle. The evaporation of liquid water produces water vapor enriched in ^1H and ^{16}O, while the remaining water is enriched in ^2H and ^{18}O (Ferretti et al., 2003). Dansgaard (1964) proposed the concept of d-excess (d-excess=δ^2H-8δ^{18}O) to illustrate the intensity of evaporative fractionation. In the state of isotopic equilibrium, the value of the d-excess is 10. Compared with d-excess, lc-excess can explain the evaporative fractionation process better. The main reason is that lc-excess in precipitation and soil water changes smoothly and has relatively small seasonal changes (Landwehr et al., 2014). The dynamic changes of isotopes record the signal of soil water evaporation. This enrichment from dynamic fractionation exists in soil water isotopes in different climatic regions. Compared with temperate regions, the signals of evaporation in arid and Mediterranean environments penetrate deeper into the soil (Sprenger et al., 2016b). Some water will be stored in the soil after evaporation and seepage processes. The water storage capacity of humid areas is higher than that of arid areas, the water storage capacity of forests is higher than that of grassland, and the water storage capacity of middle and lower soil layers with higher clay content is higher than that of surface soil layer (Heinrich et al., 2019; Sprenger et al., 2019; Kleine et al., 2020; Snelgrove et al., 2021).

In alpine mountains, climate warming will accelerate the melting of glaciers and frozen soil, and the dynamic interaction between water bodies stored in different media will become the main focus of the water cycle (Penna et al., 2018). Previous studies on evaporation, infiltration and storage of soil water mostly focused on different climatic regions or vegetation types under the same climatic region. Understanding the climatic and hydrological conditions of different vertical vegetation zones and clarifying the regulating role of vegetation in the water cycle process can help to better adapt to the influence of climate change on the hydrological process in the source area. In this study, the stable isotope composition of precipitation and soil water, and soil water storage's spatiotemporal dynamics were monitored in four vegetation zones (Alpine Meadow, Coniferous Forest, Mountain Grassland and Deciduous Forest) with different hydrothermal conditions in the Xiying River Basin. In order to explore the differences in soil water evaporation, infiltration and storage processes in these four different climates, vegetation and terrain regions, the following research objectives are proposed: (1) Exploring the evolution of isotope evaporation signals and the "memory effects" of precipitation input, mixing and rewetting; (2) Understand the soil water storage capacity and influencing factors of four vegetation areas in the mountain areas.

Comment 4: L349-354. This paragraph and the related Fig. 7 fit much better in the Results than in the discussion. I suggest restructuring this part.

Response 4: According to your suggestion, I have adjusted this part of the content to the Results.

L343-365: **4.4 Variation of water storage capacity of 0-40cm soil layer in different vegetation areas**

This study used soil water to calculate the water storage of the 0-40cm soil layer in the four vegetation zones during the observation period (Fig 7). The water storage capacity of the Alpine Meadow gradually decreases from April to July (209.7 mm~167.2 mm), and the water storage capacity increases after July (167.2 mm~201.8 mm). The monthly average water storage capacity is the least for 0-10 cm (43.0 mm) and the most for 30-40 cm (51.7 mm). The water storage capacity of the Coniferous Forest gradually decreases from April to July (150.1 mm~101.2 mm), and the water storage capacity increases after July (101.2 mm~160.0 mm). The monthly average water storage capacity is the least for 0-10 cm (28.0 mm) and the most for 30-40 cm (40.0 mm). The water storage capacity of the Mountain Grassland gradually decreases from April to July (80.3 mm~64.0 mm), and the water storage capacity increases after July (64.0 mm~104.6 mm). The monthly average water storage capacity is the least for 0-10 cm (17.5 mm) and the most for 20-30 cm (22.0 mm). The water storage capacity of the Deciduous Forest gradually decreases from April to June (159.3 mm~104.0 mm), the water storage capacity increases from June to August (104.0 mm~154.0 mm), and there is a decrease from August to October (154.0 mm~111.8 mm).The monthly average water storage capacity is the least for 0-10 cm (29.1 mm) and the most for 20-30 cm (35.0 mm). In general, the soil water storage capacity of the 0-10 cm soil layer is less than that of other soil layers. The order of the water storage capacity of the 0-40 cm soil layer in the four vegetation zones is AM > DF > CF > MG.

Comment 5: L365-366. Which are the results that lead the Authors to believe this? Please, explain.

Response 5: I reinterpreted this point of view.

L417-421: The soil moisture profile showed a trend of water increase from top to bottom, indicating that this period was caused by the influence of the previous precipitation. The soil is humid, so the replenishment of soil water by precipitation has the characteristics of top-down piston replenishment.

Comment 6: L422-424. Again, here we need some experimental evidence about this process. Section 5.3. All this is interesting but it sounds a bit general and vague, these statements look not so related to the results, there are no references to the figures, and the reader has the impression that the Authors present their own preliminary idea that does not reflect the data. I'm happy to be mistaken here but we need to have evidence of all the described processes. Moreover, the title does not reflect the content of the section.

Response 6: We logically sorted out the full text based on the reviewers' comments. The discussion on runoff generation in the watershed does not match the theme of this manuscript (Evaporation, infiltration and storage of soil water in different vegetation zones in the Qilian mountains: a stable isotope perspective). Therefore, the manuscript focused on soil moisture's evaporation, infiltration, and storage mechanism in the study area. Based on this, we reorganized this part of the content.

L367-492: **5. Discussion**

5.1 Evaporation of soil moisture in different vegetation zones

In the arid river source area, the replenishment of soil moisture mainly comes from precipitation. The slope of the regional atmospheric precipitation line can reflect the strength of local evaporation. In Alpine Meadow, due to low atmospheric temperature, low cloud base height, and low air-saturated water vapor loss, it is weakly affected by secondary evaporation during precipitation. The slope of LMWL (8.4) is even higher than that of GMWL (Zhang et al., 2012). As the altitude decreases, the secondary evaporation under the cloud strengthens, and the slope of the LMWL of each vegetation zone decreases (Pang et al., 2011) (Fig 5). The dynamic changes of lc-excess of soil profiles in different vegetation areas reflect the process of soil water evaporation caused by drought during the study period. The monthly average value of SWlc-excess in Alpine Meadow was less than 0, and the minimum value was -11.9‰ (July). Although the vegetation belt is subject to different degrees of evaporation each month, it is less affected by drought and it is difficult for evaporation to penetrate into the middle and lower soils. The SWlc-excess of the Coniferous Forest belt is greater than that of the alpine meadow from April to June. The evaporation is the strongest in July (-11.2‰, lc-excess). Similar to alpine meadows, evaporation mainly occurs in the top soil. The vegetation coverage of Mountain Grassland is low, and the arid environment makes the isotopes of the surface soil produce strong evaporation signals (lc-excess is close to -40‰). In most samples, the SWlc-excess of the 60-80 cm soil layer is negative. The evaporation signal moves to the lower layer of the soil. (Zimmermann et al., 1966; Barnes and Allison, 1988). Similar evaporation signals have been found in the Mediterranean and arid climate regions (Sprenger et al., 2016b; McCutcheon et al., 2017). Evaporation signal only exists in the surface soil in humid areas, and there is no difference between lc-excess and 0 in the soil layer below 20cm (Sprenger et al., 2017). The monthly surface soil evaporation of Deciduous Forest is less than that of Mountain Grassland from April to June, and it is greater than mountain grassland after July, which is mainly due to the influence of vegetation and reservoirs. There were commonalities in soil moisture changes in different vegetation zones characterized by more enriched isotopes, stronger evaporation signals, and lower moisture content in shallow soil. With the increase of soil depth, the isotope was gradually depleted, and the evaporation signal was gradually weakened until it disappeared. The evolution of isotopes, lc-excess, and GWC in unsaturated soil showed the differences among different vegetation zones. From high altitude to low altitude, the isotopic value of the surface gradually enriched, and the evaporation signal increased (Fig 4) (Fig 6).

5.2 "Memory effects" of precipitation input, mixing and rewetting

The changes of soil water isotope and soil moisture can evaluate the input, mixing and rewetting process of precipitation in different vegetation areas. The main methods of precipitation input are plug flow and preferential flow. Plug flow is the complete mixing of water through the soil matrix with shallow free water. Under the action of the plug flow, precipitation infiltrates along the hydraulic gradient, pushing the original soil water downward. Preferential flow means that precipitation uses soil macropores to quickly penetrate shallow soil to form deep leakage (Tang and Feng, 2001). After precipitation, the variability of isotope signals at a certain soil depth can identify the seepage way of water (Peralta-Tapia et al., 2015). During the study period, the soils of Alpine Meadow and Coniferous Forest were seasonally frozen and thawed all year-round, and the isotope difference of soil isotope profile was small. The soil moisture profile showed a trend of water increase from top to bottom, indicating that this period was caused by the influence of the previous precipitation. The soil is humid, so the replenishment of soil water by precipitation has the characteristics of top-down piston replenishment. Preferential infiltration showed high variability of isotopic signal (Brodersen et al., 2000), and rainwater in Mountain Grassland and Deciduous Forest flowed into deep soil rapidly through soil matrix through exposed soil fissures and roots. It is manifested by the sudden depletion of soil isotopes at a depth of 60-100 cm. This may be due to the recent relatively depleted precipitation that quickly reached this depth along with the preferential passage in the soil. Water movement and mixing in the unsaturated zone can be observed in the space-time variation of isotope within 1 meter of the soil profile, Alpine Meadow and Coniferous Forest zone were rich in rainfall. After a short period of weak evaporation, the soil will be rewetted by the next rainfall. Especially in Alpine Meadow, the soil moisture is kept above 20% each month. The Mountain Grassland and Deciduous Forest zone had only sporadic precipitation from mid-May to late July, and the soil moisture evaporates rapidly. With the decrease of air temperature and the occurrence of continuous precipitation after July, the soil was re-wetted after two months of drought, and both vegetation zones showed the replacement and mixing of soil water isotope and precipitation. The results showed that the soil water storage capacity of the alpine grassland was seriously insufficient, reflecting the incomplete rewetting of the soil by precipitation at the end of the study. In addition, low soil water storage capacity will enrich the remaining soil water isotope (Zimmermann et al., 1966; Barnes and Allison, 1988). We observed the "memory" effect of soil re-wetting caused by precipitation input and the mixing of different vegetation areas during the entire study period. The changes in soil moisture in each vegetation area reflect different climatic and hydrological characteristics (Fig. 4) (Fig. 6).

5.3 Influencing factors of soil water storage capacity in arid headwaters areas

As the temperature decreases rapidly with the increase of height, precipitation and humidity increase to a certain extent, and the vegetation shows a strip-like alternation approximately parallel to the contour line, forming zonal vegetation with obvious differentiation (Yin et al., 2020). The dry-wet conditions of different vegetation zones restrict the soil water storage capacity in the basin. In the process of low-altitudes vegetation zones replacement, precipitation decreased, temperature rose, the groundwater level dropped, and the soil water storage capacity was weak (Coussement et al., 2018; Kleine et al., 2020). The soil water storage capacity of Alpine Meadow with low temperature and rainy weather was higher than that of other vegetation zones (value of 0-40cm soil layers from April to October: AM: 187.8 mm; CF: 128.4 mm; MG: 81.2 mm; DF: 132.1 mm). During the study period, the soil water storage capacity (0-40 cm) exceeded 165 mm in each month, with little difference between months and no obvious change between months. With the decrease of altitude, the monthly difference of dry-wet conditions in each vegetation zone gradually became obvious. With the increase of temperatuer in summer, the environment became dry, and the soil water storage capacity weakened (Sprenger et al., 2017). The soil water storage capacity of Coniferous Forest began to decrease in April, and the water storage capacity of 0-40 cm reached the minimum value (101.2 mm) in July. The variation of temperature and precipitation was the main reason for the monthly difference (Dubber and Werner, 2019). Although there was a certain water storage capacity in Coniferous Forest with some water transpiration loss, the soil water storage capacity in this vegetation zone was not strong. The water storage capacity of Mountain Grassland soil was lower than that of other vegetation zones. The continuous dry and warm weather in spring and summer led to the water storage capacity of 0-40 cm soil being lower than that of 100 mm every month. Particularly, drought stress leads to insufficient soil moisture, making it difficult to maintain plant demand, resulting in sparse vegetation and large-scale exposed surface soil, which further accelerates surface water loss. The continuous precipitation from the end of July prevented further drought development, and the water input gradually restored the soil water storage capacity (Kleine et al., 2020). Deciduous Forest had similar hydrothermal conditions with Mountain Grassland, but the soil porosity of forest land is obviously larger than that of barren land, and its permeability was better than that of barren land. Precipitation was sent to the ground through roots and turned into groundwater. The forest was a reservoir with strong water storage and soil conservation capacity (Sprenger et al., 2019). The water storage capacity of 0-40 cm soil in Deciduous Forest was higher than 100 mm at each sampling time. In addition, the water content of the 0-40 cm soil layer in each vegetation zone increased with the deepening of the soil layer, and the water storage capacity of surface soil was weak. The difference in soil properties will also lead to more water storage in the middle and lower soil with higher clay content (Heinrich et al., 2019) (Fig. 7). Climate warming and the Spatio-temporal imbalance of water resources have disturbed the ecological-water balance of different vegetation zones in inland river source areas (Liu et al., 2015). Plants growth mainly depends on the water stored in shallow soil layers (Amin et al., 2020). Drought reduced soil water storage and inhibited the plants growth (Li et al., 2020). In order to effectively improve and manage water resources in arid water source areas, it is necessary to explore the heterogeneity among different vegetation zones. According to the current situation of climate, hydrology and social economy in the basin, scientific and reasonable management policies should be formulated according to local conditions for different ecological-hydrological contradictions and extended to more areas.

Minor comments and technical corrections

Comment 7: L58-59. D-excess is introduced here without any explanation on its formulation and physical meaning.

Response 7: "d-excess" has been introduced in detail.

L65-67: Dansgaard (1964) proposed the concept of d-excess (d-excess=δ^2H-8δ^{18}O) to illustrate the intensity of evaporative fractionation. In the state of isotopic equilibrium, the value of the d-excess is 10.

Comment 8: L96. Is this the long-term average runoff? Please, specify.

Response 8: This is the average runoff over the years, which has been clarified.

L104-106: The average annual runoff of the Xiying River is 388 million cubic meters, which is mainly replenished by mountain precipitation and melting water of ice and snow.

Comment 9: Table 1. Are the meteorological parameters averages? Over which period of time? Please, specify.

Response 9: Based on your suggestion, I have changed and explained them here.

L143-145: **Table 1** Basic data of each Vegetation zone from April to October 2017 (*Long*-Longitude, *Lat*-Latitude, *Alt*-Altitude, *T*-Air Temperature (daily mean temperature), *P*-Precipitation (total precipitation during the observation period), *h*-Relative Humidity (daily mean relative humidity))

Comment 10: Section 3 (Methods). No explanations about the determination of the gravimetric water content are given. Please fix this issue.

Response 10: Based on your suggestion, I have added the determination of the gravimetric water content.

L191-194: *W* is gravimetric water content, which is expressed by formula as follows:

$$W = \frac{M_1 - M_2}{M_2} \times 100\% \quad (5)$$

In the formula: M_1 is the gravimetric of the wet soil (g), and M_2 is gravimetric of the dry soil (g).

Comment 11: L140-142. I suggest including a reference to the correction of the memory effect (e.g., Penna et al., 2012 and/or Qu et al., 2019).

Penna, D., Stenni, B., Šanda, M., Wrede, S., Bogaard, T. A., Michelini, M., Fischer, B. M. C., Gobbi, A., Mantese, N., Zuecco, G., Borga, M., Bonazza, M., Sobotková, M., ÄŒejková, B., and Wassenaar, L. I.: Technical Note: Evaluation of between-sample memory effects in the analysis of δ^2H and δ^{18}O of water samples measured by laser spectroscopes, Hydrol. Earth Syst. Sci., 16, 3925–3933, https://doi.org/10.5194/hess-16-3925-2012, 2012.

Qu, D, Tian, L, Zhao, H, Yao, P, Xu, B, Cui, J. Demonstration of a memory calibration method in water isotope measurement by laser spectroscopy. Rapid Commun Mass Spectrom. 2020; 34:e8689. https://doi.org/10.1002/rcm.8689

Response 11: I have added the necessary references here.

L153-155: In order to avoid the memory effect of isotope analysis, we discarded the first two injection values, used the average value of the last four times as the final value (Penna et al., 2012; Qu et al., 2020).

Comment 12: L169. Please explain the role of 10 in the equation.

Response 12: Here, we calculate the water storage capacity of the 10cm soil layer, so we multiply it by 10.

Comment 13: L176. Add "2017".

Response 13: This problem has been corrected.

L198-201: During the study period (April-October 2017), the potential evapotranspiration was 872.8 mm, and the daily evapotranspiration ranged from 7.5 mm (July 14) to 0.9 mm (October 9) in Xiying River Basin, showing a fluctuating trend around July, and the PET value in April-July was higher than that in August-October.

Comment 14: L194: Precipitation events?

Response 14: This problem has been corrected.

L215-217: During the observation period, there were 72 precipitation events in the Alpine Meadow zone, the total precipitation was 534.3 mm, which was relatively evenly distributed in each month.

Comment 15: L213-220. This part can be reported in a Table or in a boxplot.

Response 15: Based on your suggestion, we have drawn a table.

L254-256: **Table 2** General characteristics of precipitation δ^2H and δ^{18}O in different vegetation areas from April to October 2017

Vegetation zone	δ^2H/‰				δ^{18}O/‰			
	Max	Min	mean	SD	Max	Min	mean	SD
AM	13.7	-163.9	-73.1	36.3	-1.3	-23.1	-10.0	4.3
CF	13.0	-117.8	-42.0	37.2	-0.1	-17.4	-7.1	4.7
MG	4.2	-103.1	-37.4	30.5	-0.9	-15.1	-5.9	3.9
DF	23.2	-110.2	-31.8	42.8	3.2	-15.2	-5.8	5.5

Comment 16: Fig. 3. Use different colours to distinguish between the different variables. Particularly, I suggest using different closures for the two isotopes and then keep them in all the other graphs.

Response 16: According to your suggestion, I modified Figure 3.

L257-260:

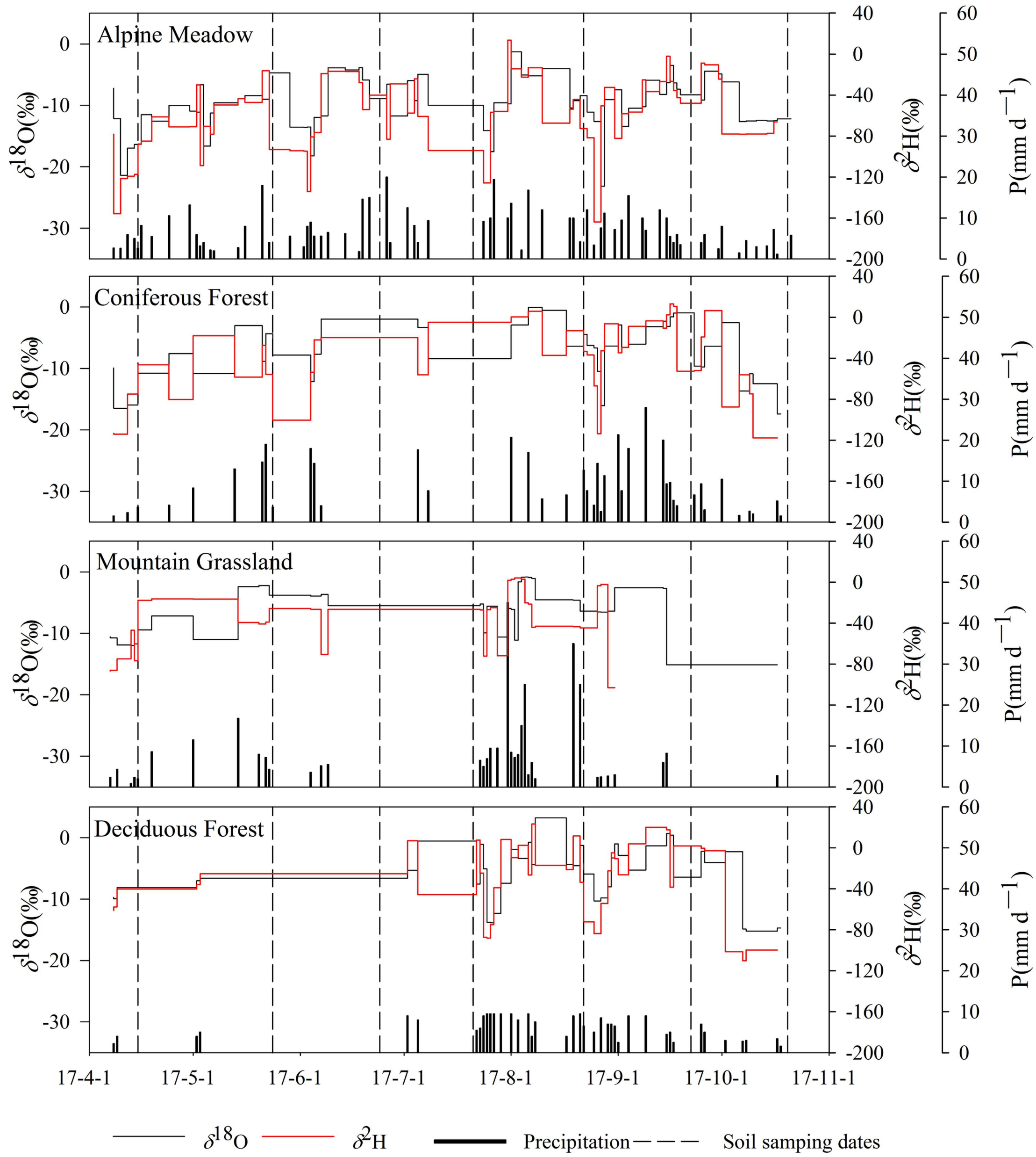

Fig. 3 Time series of rainfall and isotope characteristics in different vegetation zones in Xiying River Basin, with dotted lines indicating the date of soil water sampling

Comment 17: L263? Does "deep" mean "grey"? In that case use the correct term.

Response 17: This problem has been corrected.

L300-302:

Fig. 4 Heat map of the soil depth profile of δ^2H, $\delta^{18}O$, lc-excess and GWC in different vegetation zones, and the layer lacking measurement is indicated by grey color

Comment 18: L266. The diagram is normally called "dual isotope space".

Response 18: This problem has been corrected.

L304-306: Isotope data of precipitation and soil water obtained from different vegetation zones were shown in the dual-isotope space (Fig. 5).

Comment 19: L272-274. This part can/could be moved to the discussion.

Response 19: We have moved this part to the discussion according to your suggestion.

L373-378: In Alpine Meadow, due to low atmospheric temperature, low cloud base height, and low air-saturated water vapor loss, it is weakly affected by secondary evaporation during precipitation. The slope of LMWL (8.4) is even higher than that of GMWL (Zhang et al., 2012). As the altitude decreases, the secondary evaporation under the cloud strengthens, and the slope of the LMWL of each vegetation zone decreases (Pang et al., 2011) (Fig 5).

Comment 20: L311. As far as I understand the plot does not show the "differences" but the raw values. Please, correct.

Response 20: This problem has been corrected.

L341-342:

Fig. 6 the variation of δ^2H, $\delta^{18}O$, lc-excess and GWC in different vegetation zones in each sampling

Comment 21: L385-386. Add a reference to a figure to corroborate the statement.

Response 21: This problem has been corrected.

Comment 22: L409. I think the correct citation is Amin et al., 2020.

Response 22: This problem has been corrected.

Comment 23: L463. Typo.

Response 23: This problem has been corrected.