1. Introduction about the revision

Based on the suggestions and comments from reviewer, the paper has been substantially improved again. In this revision, a great deal of time has been spent for improving the language and general presentation again. And what's more, some minor revisions have been made in order to present the results with more proper styles.

2. Response to reviewer comments

In this work, Gui et al. has e quantified the runoff components of 11 major rivers in the Qilian Mountains and investigated the influence of cryosphere changes on mountain runoff based on 2164 environmental isotope samples in the transition zone between the Tibetan Plateau and the arid region. The data of this paper is very comprehensive and the method is reasonable. The analysis of this article is in a good logic. In general, this study is interesting. However, there are still some places that need to be revised, and I will mention it and suggest that the author supplement it. I suggested that this manuscript should be published after minor modifications.

1. The abstract lacks the improvement of the research height, and the practical application and scientific significance of this research should be summarized concisely.

Thank you very much for your comments. The abstract has been revised as: "As the transition zone between the Tibetan Plateau and the arid region, the Qilian Mountains are important ecological barriers and source regions of inland rivers in northwest China. In recent decades, drastic changes in the cryosphere have had a significant impact on the formation process of water resources in the Qilian Mountains. In this study, 2164 environmental isotope samples were used to quantify the runoff components of 11 major rivers in the Qilian Mountains and to investigate the influence of cryosphere changes on mountain runoff. The results showed that the mountain runoff mainly comes from the cryosphere belt, which contributes to approximately 82%、71%, and 80%, respectively, in the Hexi inland water system, upper stream of the Yellow River system, and Qinghai inland

river system. The maximum contribution ratio of glacier and snow meltwater to runoff occurred in May, but not in July and August, when the temperature was the highest. The important contribution of supra-permafrost water to runoff gradually increased from May to October and reached approximately 40% in some rivers in October. Cryosphere degradation in the Qilian Mountains after 1990s has caused a rapid increase in runoff, a change in the peak runoff time, and an increase in runoff in winter. These changes in hydrological processes bring opportunities and challenges to managing inland river water resources, and various adaptive measures to seek advantages and avoid disadvantages have been proposed. The findings from environmental isotope analysis provide insights into understanding water resources and realizing harmony of life, agriculture, industry, and ecological water use."

2. Line 19 please change "in the Hexi inland water system" to "in the Hexi inland River system"

Thank you very much for your comments. It has been revised as: "in the Hexi inland River system"

3. I respectfully suggest that brief subsections on laboratory analysis, using what instruments and where, and data analysis in Sample collection and analysis.

Thank you very much for your comments. In 2.3.1 sample testing, these details have been introduced. The details are as follows: All kinds of water were carried out in the Key Laboratory of Eco-hydrology of Inland River Basin, Chinese Academy of Sciences to analysis of the hydrogen and oxygen stable isotopes. For the analysis stable isotopes of soil water, water was extracted from soil using a cryogenic freezing vacuum extraction system (LI-2000, Beijing Liga United Technology Co., Ltd., China), which can achieve complete extraction with high precision. Then the stable isotopes in the all kinds of water were measured using a liquid water stable isotope analyser (Model DLT-100, Los Gatos Research, Inc., Mountain View, CA, USA). The accuracies of $18O/16O$

and D/H were 0.2‰ and 0.5‰, respectively, which conform to the rule of valid digits for stable isotope analysis.

4. L296-301: rewrite this sentence. This sentence is not clear. Please rewrite

Thank you very much for your comments. We have revised this sentence as: "This phenomenon can be explained by the following reasons: First, supra-permafrost water is mainly stored in the active layer of the permafrost, and under the strong evaporation, the stable isotope concentration would be unbalanced through the influence of dynamic fractionation. Second, the supra-permafrost water is replenished by a mixture of precipitation, glacier and snow meltwater, resulting in random fluctuations in stable isotope concentrations."

5. Please explain the term of d-excess.

Thank you very much for your comments. We have explained d-excess in Section 2.3.1 as "The d-excess can be defined as:

$$d\text{-excess}=\delta D-8\delta^{18}O \qquad (2)$$

The value of d-excess is equivalent to the intercept when the slope of local meteoric water is 8, which is used to represent the imbalance degree of the evaporation process."

6. L322: change 'less' to 'more depleted', 'more' to 'more enriched'

Thank you very much for your comments. We have changed 'less' to 'more depleted', changed 'more' to "more enriched".

7. Please make sure the citation appeared in the article are consistent with those listed in the Reference part.

Thank you very much for your comments. We have checked the full text carefully to make sure the citation appeared in the article are consistent with those listed in the Reference part.

8. L403-405: change "The contribution of supra-permafrost water to Danghe, Changma, Taolai, Heihe, Xiying, Nanying, and Zamu Rivers was…" to "Danghe River,

Changma River, Taolai River, Heihe River, Xiying River, Nanying River, and Zamu River".

Thank you very much for your comments. We have changed "The contribution of supra-permafrost water to Danghe, Changma, Taolai, Heihe, Xiying, Nanying, and Zamu Rivers was…" to "Danghe River, Changma River, Taolai River, Heihe River, Xiying River, Nanying River, and Zamu River".

9. L470-472: This sentence is not clear. Please rewrite

Thank you very much for your comments. We have changed this sentence to "In June, the contribution of precipitation to runoff from mountains in the HIRS, USYR system, and QIRS was 73%, 64%, and 72%, respectively."

10. Different styles have been used when citing figures in the text. Such as 'Figure(s)' and 'Fig(s)'. Please unify them.

Thank you very much for your comments. We have checked the full text carefully and unify the format of figures.

11. The conclusion part is too long. I recommend rephrase this paragraph and state the importance of the findings.

Thank you very much for your comments. We have reorganized the conclusion to make clear the main findings of the study. The new conclusions are as follows: Based on the isotopic data of 1310 precipitation, 338 river water, 96 glacier and snow meltwater, 108 supra-permafrost water, and 312 groundwater samples, the study quantified the runoff components of 11 major rivers in the Qilian Mountains and investigated the influence of cryosphere changes on runoff from mountains. It was found that the stable isotopes of river water and groundwater in the study area were relatively invariable, unlike that of precipitation, which showed significant seasonal variation. The annual mean values of $\delta 18O$ of river and groundwater in the Qilian Mountains were -8.49‰ and -8.76‰, respectively.

The stable isotope relationships of various waters showed that the river water was fed by precipitation, glacier and snow meltwater, and supra-permafrost water. EMMA was used to determine the contribution ratios of different water bodies to runoff. The calculations showed that precipitation was the main recharge source of seven rivers in the HIRS, the contribution ratios to Danghe, Changma, Qiaolai, Heihe, Xiying, Nanying, and Zamu Rivers being 65%, 51%, 69%, 59%, 75%, 80%, and 79%, respectively. Supra-permafrost water was also an important recharge source for the HIRS. The contribution of supra-permafrost water to Dang, Changma, Taolai, Heihe, Xiying, Nanying, and Zamu Rivers was approximately 21%, 33%, 20%, 33%, 19%, 15%, and 16%, respectively. As the third end-member, the corresponding glacier and snow meltwater contributed approximately 14%, 16%, 11%, 8%, 6%, 5%, and 5% to runoff, respectively. In the USYR system, the contribution of glacier and snow meltwater to the runoff was clearly low, the contribution ratios of precipitation, supra-permafrost, and glacier and snow meltwater to Datong River being 63%, 35%, and 2%, respectively. Jinqiang River was mainly replenished by precipitation and groundwater, which contributed 30% and 70%, respectively, while Huangshui River was mainly replenished by precipitation and supra-permafrost water, which contributed 83% and 17%, respectively. Located in the QIRS, the Buha River was mainly replenished by precipitation, supra-permafrost, and glacier and snow meltwater, with the contributions of these three end-members to the runoff being 58%, 40%, and 2%, respectively.

Runoff in the inland rivers of the Qilian Mountains is mainly derived from the cryosphere belt. Calculations using a binary mixed segmentation model showed that the contribution ratios of the cryosphere belt to mountain runoff in the HIRS, USYR system, and QIRS were 82%, 71%, and 80%, respectively. Cryospheric changes have changed the hydrological processes in the Qilian Mountains. After the 1990s, the runoff from the Qilian Mountains generally increased rapidly, the peak time of runoff changed, and runoff showed an increasing trend in winter. These changes in hydrological processes provide both opportunities and challenges, and requires various measures to exploit advantages and avoid disadvantages so as to achieve harmony in ecological, living, and production water use.

12. Please refer to the journal requirements to modify the format of the references

Thank you very much for your comments. We have modified the reference format as required to make it consistent with the journal format

13. Figure 3 is not clear. Please redraw it.

Thank you very much for your comments. We have re-edited Figure 3 to make it clearer
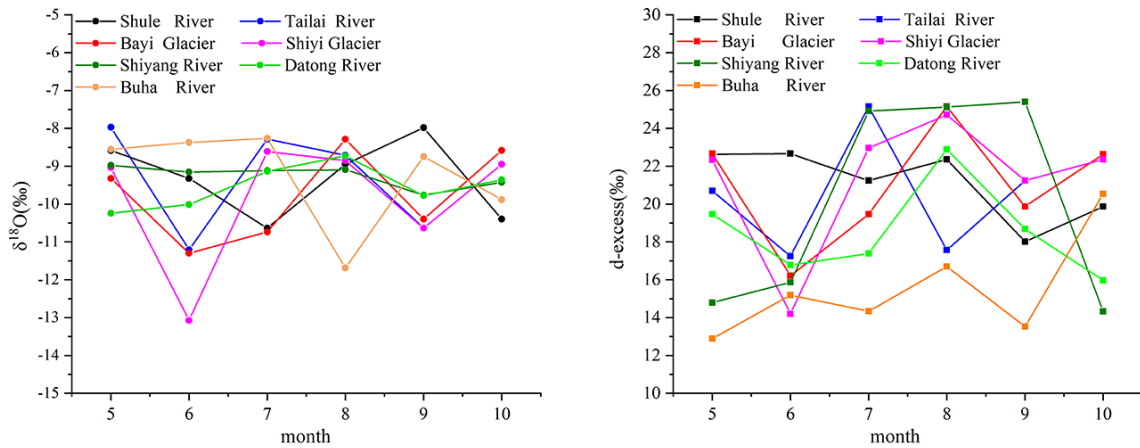
Fig.3

14. English writing: The English writing of this manuscript should be improved thoroughly. The issues include the choice of word, grammar issue and the structure of sentence.

Thank you very much for your comments. We have spent a great deal of time for improving the language and general presentation again.