Dear Editor,

Thank you very much for your constructive comments on our manuscript. These comments will be very helpful to improve the quality of the manuscript. We have carefully revised our manuscript in terms of your comments. Below is our point-by-point reply to these comments, editor's comments are shown in italic; authors' reply is shown in regular text and all the changes are highlighted in blue in the revised manuscript so that they may be easily identified:

**General comments:**

*1. However, I have the feeling that you provided a lot of explanations to many critical comments to particularly reviewer 2 that you have addressed in your reply, but that were not included in the revised paper. This can be justified in some cases, but we have to note that probably very few researchers will read your replies, but many more will read your paper that has to be a stand-alone complete contribution to the scientific literature. Thus, go one more time through both replies and check for relevant info that was not included yet in the paper.*

**Reply:** Thank you for your kind reminder. We have gone one more time through both replies and supplemented relevant info into the revised paper. The details are as follows:

Line 14 in revised paper: A series of changes in groundwater system caused by groundwater exploitation in energy base have been of great concern to hydrogeologists. The research aims to identify the origin and geochemical evolution of groundwater in Subei lake basin under the influence of human activities.

Line 151 in revised paper: As a small-scale lake basin, the main geomorphic types of Subei lake basin are wavy plateau, lake beach and sand dune from an overall perspective (Fig.1).

Line 156 in revised paper: There are no perennial or ephemeral rivers within the study area;

Line 159 in revised paper: In response to precipitation, diffuse overland flow and groundwater recharge the Subei lake and Kuisheng lake (Hou et al., 2006 ;Wang et al., 2010).

Line 166 in revised paper: Subei lake basin is a relatively closed hydrogeological unit given that a small quantity of lateral outflow occurs in a small part of southern boundary (Wang et al., 2010).

Line 200 in revised paper: As is shown in Fig.3, lateral outflow occurs in a small part of southern boundary by analyzing the contours and flow direction of groundwater.

Line 230 in revised paper: According to Hou et al. (2006), the maximum circulation depth of local groundwater flow system in the study area is also 120m by using a plenty of hydrochemical and isotopic data,

Line 244 in revised paper: The length of screen pipes in all sampling wells ranges from 1m to 10m and every sampling well has only one screen pipe rather than multiple screens. The distance between the bottom of screen pipe and the total well depth ranges from 0 to 3m in the study area, the bottom depth of screen pipe was assigned to the water samples.

Line 479 in revised paper: Although the cation exchange is widespread in

geochemical evolution of all groundwater, it is essential to know and identify the various changes undergone by water during their traveling processes in groundwater system under the influence of anthropogenic activities.

Line 577 in revised paper: the average values of $\delta^{18}O$ and $\delta D$ of the shallow Cretaceous groundwater are -8.3 and -66‰, -8.2 and -64‰, respectively in August and December; meanwhile, the average values of $\delta^{18}O$ and $\delta D$ of the deep Cretaceous groundwater are -8.4 and -67‰, -8.5 and -66‰, respectively in August and December. Thus, given the precision of the analysis, shallow Cretaceous groundwater and deep Cretaceous groundwater have similar isotopic characteristics in Subei lake basin,

**Furthermore, the following points have also been addressed.**

1. *Start the Introduction with putting the study into a larger (scientific) picture; 1-2 paragraphs. Outline the current scientific challenges and report to previous work here and elsewhere that justify the problem statement of your study. Make explicit later in the Introduction what is not known so far that the reader sees your specific contributions to the knowledge gaps.*

**Reply:** Thank you for your kind suggestions. The introduction section has been reorganized better in terms of your advice.

In the revised paper, the Introduction section begins with putting the study into a larger (scientific) picture, the first and second paragraphs in Introduction section outline the current scientific challenges and report to previous work that justify the scientific significance of the present study. The last two paragraphs explicitly illustrate the application of hydrochemistry and stable isotopes in hydrogeology at home and abroad, the primary purposes of this study, and the specific contributions to the knowledge gaps.

2. *The first para in the Introduction is too long and contains too many different aspects. Structure the paper better. Start also a new para at line 117.*

**Reply:** Thank you for your advice. We have made relevant modifications in the revised paper and structured the paper better according to your advice. In the revised paper, the first paragraph in Introduction section is shortened and illustrates the current scientific challenges from the perspective of a larger picture that justify the problem statement of this study. A new paragraph has been created at line 119 in the revised paper, which outlines the primary purposes of this study and the specific contributions to the knowledge gaps.

3. *Which evaporation is shown in fig.2? Potential E for which vegetation? Evaporation pan data?*

**Reply:** Thank you for your kind reminder. The evaporation data were collected from Wushenzhao meteorological station, so all evaporation data in this paper refer to evaporation pan data. Average monthly evaporation is shown in Fig.2. It is an error of expression in the section 2.1 (Physiography) and we are very sorry for the inconvenience, they have been revised as follows:

Line 146 in revised paper: “potential evaporation” has been revised as “evaporation”.

Line 148 in revised paper: “potential monthly evaporation” has been revised as “monthly evaporation”.

4. *Run spell check one more time. There are many small typos (also in the figures), note that there is always a space after a comma and before a bracket.*

**Reply:** Thanks for your advice. We have run spell check one more time and revised many small typos in the text and some figures. The details are as follows:

Line 102 in revised paper: “ecological environment problems has taken place” has been replaced by “ecological environment problems have taken place”.

Line 466 in revised paper: “the following reaction possibly occur” has been replaced by “the following reaction possibly occurs”.

Line 475 in revised paper: “The negative correlation characteristics of $pCO_2$ and pH show that the dissolution of feldspar does take place along groundwater flow path.” has been replaced by “The negative correlation characteristic between $pCO_2$ and pH shows that the dissolution of feldspar does take place along groundwater flow path.”.

Line 483 in revised paper: “molar Na/Ca ratios change” has been replaced by “molar Na/Ca ratio changes”.

Line 501 in revised paper: “the inverse reactions possibly occur” has been replaced by “the inverse reaction possibly occurs”.

Line 551 in revised paper: “The ratios of $Na^+/ (Na^+ + Ca^{2+})$ were” has been replaced by “The ratio of $Na^+/ (Na^+ + Ca^{2+})$ was”.

Line 555 in revised paper: “the ratios of $Na^+/ (Na^+ + Ca^{2+})$” has been replaced by “the ratio of $Na^+/ (Na^+ + Ca^{2+})$”.

Line 558 in revised paper: “the weight ratios of cations $Na^+/ (Na^+ + Ca^{2+})$ spread from low to high without great variation of TDS” has been replaced by “the weight ratio of $Na^+/ (Na^+ + Ca^{2+})$ spreads from low to high without great variation of TDS”.

Line 648 in revised paper: “Editor” has been replaced by “editor”.

Fig.3 in the revised paper: “Contours of confined groundwater levels” has been replaced by “Contours of confined groundwater level”.

Fig.5 in the revised paper: “Elevations” has been replaced by “Elevation”.

Fig.6 in the revised paper: “alkalics” has been replaced by “alkalies”.

The name of Fig.8 in the revised paper: “Inter-ionic relationships between ions in groundwater.” has been replaced by “Relationship between some pairs of ions in groundwater.”.

In addition, a space has been inserted after a comma and before a bracket in the whole revised paper (including the text and figures).

We hope these revisions are satisfactory and the new revised paper will meet the standard of HESS.

Thank you very much for your work concerning this paper.

Kind regards,

Sincerely yours,

Fei Liu

On behalf of all co-authors