Dear Reviewer:

Thank you for your letter and for the reviewer's comments concerning our manuscript entitled “Stable water isotope monitoring network of different water bodies in Shiyang River Basin, a typical arid river in China” (Manuscript Number: essd-2021-465).

According to the comments of the reviewer, we have revised our manuscript carefully. The primary corrections and the response to the reviewers’ comments are as follows.

## Response to Reviewer #2

**Reviewer #2: This data description manuscripts refers to an extensive dataset, consisting of water stable isotope from different hydrological compartments and hydrological data, derived from a single river catchment in north central China. The data are deposited at Mendeley in the form of three excel spreadsheets. Authors note, that these data will be extended in the future. The data are certainly interesting and relevant for a community of hydrologists and isotope geochemists, and principally this is a work that justifies publication in ESSD. However, there is some weakness in the way the data are organized and presented. Especially, some inconsistencies in labelling the sites makes it difficult for the reader to approach and comprehend the presented data (see specific comments below). Further a conclusive statement describing the broader relevance of the data (picking up the aim of the study as formulated in the introduction) is missing. The authors put specific emphasis on isotopes (starting with the title). I think the accompanying hydrological data are equally interesting and should be further highlighted. Data interpretation (section 6) does not need to be extensive in a data description manuscript, and I think is sufficient in the present form. However, also here some adjustments in presenting the data would further highlight the value of the data; for example I´d like to see seasonal isotope values plotted for each year, instead of average values for 2015-2020 (Fig. 5). Concluding, I recommend acceptance of this manuscript, in**

**case authors succeed in revising their manuscript, following the major comments mentioned above and the specific comments listed below.**

Response: We have optimized the site's markup based on your suggestions, adding in the introduction the work we have done and the preliminary research results we have obtained using this dataset to achieve the purpose we set out in the introduction. In addition, in response to your specific suggestions, we have changed the corresponding places in the article. The particular revisions can be found in the revised manuscript.

**Specific comments**

**hydrological dataset:**

**1. are all these data in each spreadsheet for QTH? => clarify.**

Response: In the hydrological dataset, the first spreadsheet is the water volume of Qingtu Lake, and the other three spreadsheets are the daily flow, monthly flow and water level of the Shiyang River basin.

**2. There is a mixture of abbreviations and full names in the "monthly flow" spreadsheet, why not combining "daily flow" and "water level" to one single spreadsheet?**

Response: We have unified the names of hydrological stations in "monthly flow" and consolidated the two spreadsheets "daily flow" and "water level" together. We re-uploaded the data set. The new data set is available at https://data.mendeley.com/datasets/vhm44t74sy/1 (Zhu, 2022).

**isotope dataset:**

**1. there is some inconsistency in the format of reporting sampling date in the different spreadsheets**

Response: We have unified the date format of the data set and re-uploaded the data set. The new data set is available at https://data.mendeley.com/datasets/vhm44t74sy/1 (Zhu, 2022).

**2. 62: define JTL and CQQ.**

Response: We have revised this sentence to write out the full name of the hydrological site. The revised sentence reads as follows:

There are five hydrological stations in the Shiyang River Basin, Miscellaneous Wood Temple, Jiu Tiaoling, Cai Qiqiao, Nanying Reservoir, and Huanyang River Reservoir, with average annual flows of 7.33 $m^3/s$, 10.07 $m^3/s$, 9.15 $m^3/s$, 3.92 $m^3/s$, and 3.86 $m^3/s$, respectively.

**3. 77ff: these sample counts do not match the numbers as reported in the Mendeley datasets (description and data tables)**

Response: We carefully checked the number of samples in the Mendeley dataset and modified this sentence. The modified content is as follows:

6756 samples were collected, including 1206 precipitation samples, 1101 surface water samples, 161 groundwater samples, 3779 soil water samples, and 509 plant water samples.

**4. l75 and l88 and original datatables (and other parts of the manuscript): the authors should try to make it as easy as possible for the reader to comprehend the abbreviations and relate them to study sites. For example, the data tables only contain abbreviations, with some singular explanations ("SRB stands for the Shiyang River Basin"). I think data tables should contain one sheet with an additional table with abbreviations, full name, coordinates. In the manuscript text, authors should be consistent with reporting either full names, abbreviations, or both. For example, figure caption 1 would benefit from also have the abbreviations included alongside the full names of sites. I´d suggest not to use a – h for labelling the sample points in the topmost panel of Fig. 1, but instead the respective abbreviations, similar in the labelling of the figures sub panels.**

Response:We have modified Figure 1 according to your suggestion. The modified Figure 1 is as follows:

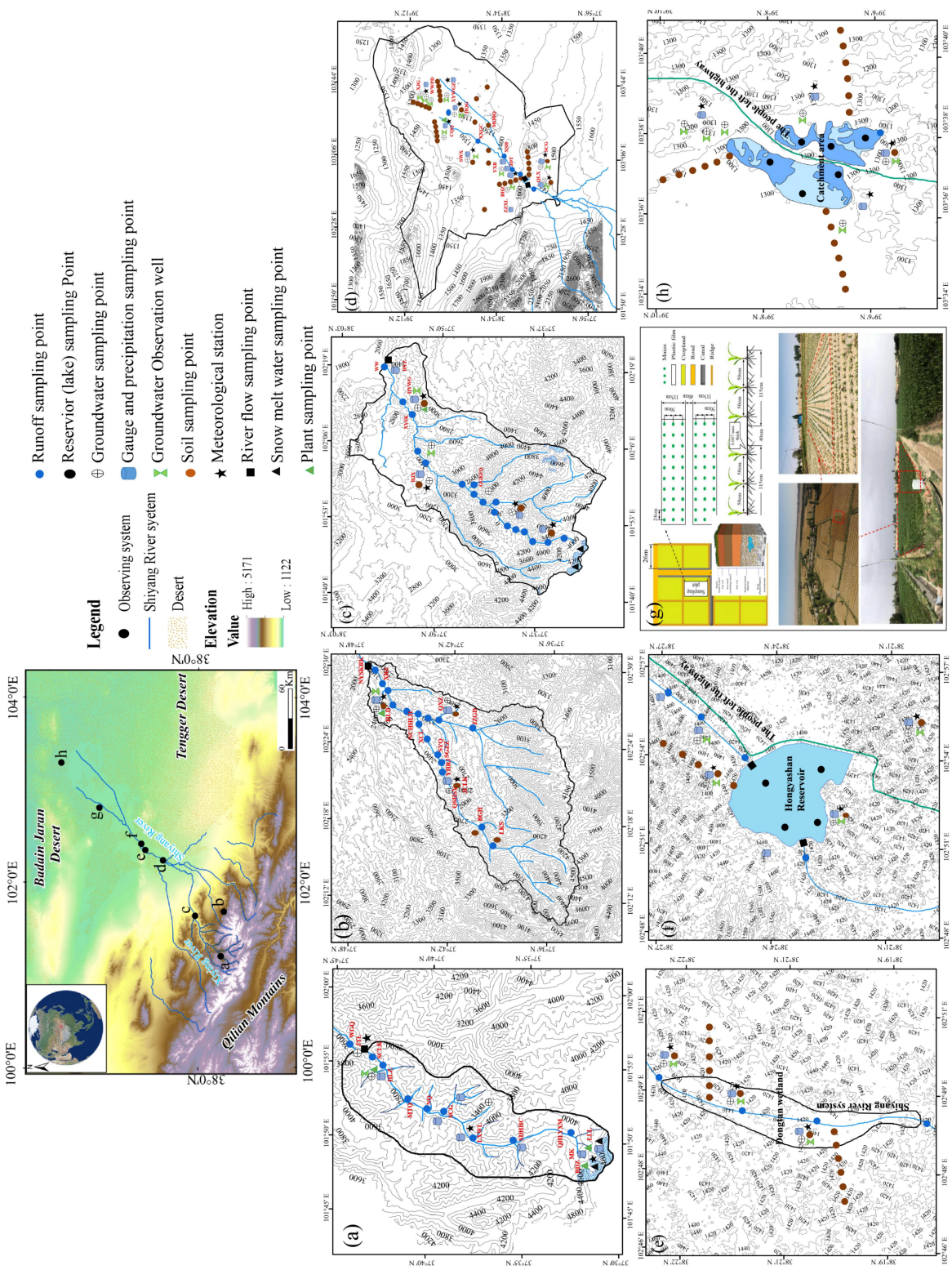



Figure. 1 Shiyang River Basin Monitoring Network (a: Ningchang River observation system, river source area; b: Ice trench observation system, river source area; c: Xiying River Basin, source observation system; d: Minqin soil system, oasis area; e: Dongtan Wetland 0bservation system, ecological engineering construction region; f: Hongyashan reservoir canal observation system, reservoir channel system region; g:

Datan Farmland observation system, oasis farmland area; h: Qingtu Lake observation system, salinization process area)

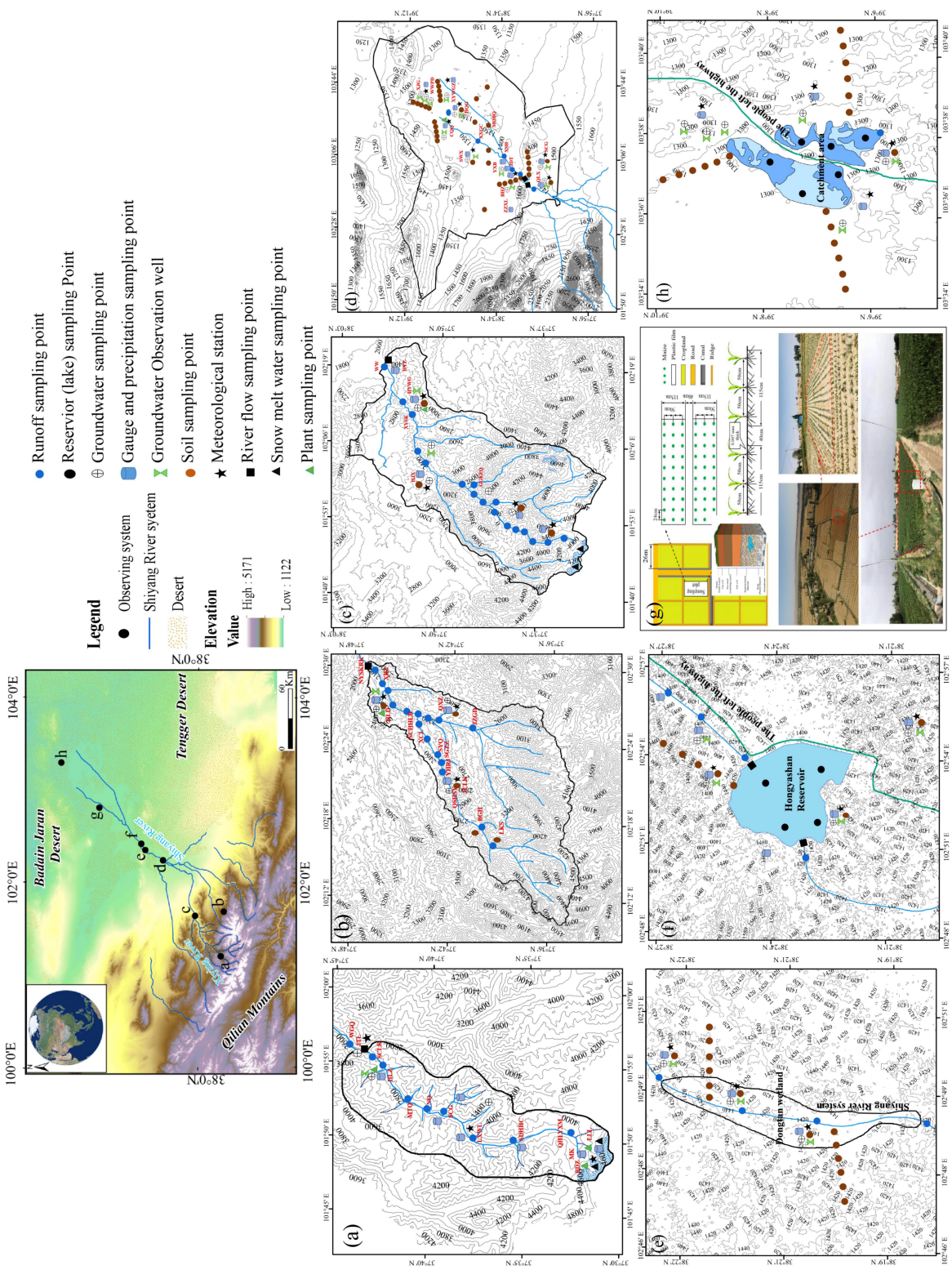
**Mendeley abstract:**

**1. related to the point above, it is not clear to which points P1-P12, S1-S35, etc precisely are referring to. => please try to be consistent in labelling the data in both the original dataset and the manuscript.**

Response:We have unified all the locations in the data set with the full name and re-uploaded the data set. The new data set is available at https://data.mendeley.com/datasets/vhm44t74sy/1 (Zhu, 2022).

**2. Fig. 1: panel (d) is occurring twice while (f) is missing. Error in caption "0bservation syste m".**

Response: We have modified Figure 1 according to your suggestion. The modified Figure 1 is as follows:

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Datan Farmland observation system, oasis farmland area; h: Qingtu Lake observation system, salinization process area)

**3. l96: maybe providing a picture of the rain sampler in the supplement would be an option?**

Response: We have added a sample collecting device in the appendix according to your suggestion. The following are the additions:

Figure. B2 Sampling instruments. (a) Rain gauge collecting precipitation, (b) surface water sampling, (c) sampling shears collecting vegetation stems, and (d) earth drill collecting soil samples.

Figure. B3 Analytical instruments. (a) Li-2100 Automatic Vacuum Condensation Extraction instrument, (b) LWIA-24D Liquid water isotope Analyzer.

**4. l113: please provide information, at which spot soil samples have been taken in text and table caption. Why just reporting soil characteristics from one site (there have been multiple sites samples, according to the datatable)?**

Response:We have modified the title of Table 1 according to your suggestion. This is because we have set up a farmland observation system in Datan Township(DTX) (Fig. 1g). There we carried out systematic observation of soil and plants, so we took the soil characteristics of Datan Township as a typical analysis.

Table 1 Basic information of soil samples in DTX (Zhu et al., 2021b)

| Soil depth (cm) | Clay (%) | Silt (%) | Sand (%) | Soil bulk density (g/cm$^3$) |
|---|---|---|---|---|
| 0-10 | 10.20 | 38.85 | 50.95 | 1.05 |
| 10-20 | 12.94 | 37.76 | 49.30 | 1.19 |
| 20-30 | 10.33 | 44.23 | 45.44 | 1.30 |
| 30-40 | 13.48 | 38.69 | 47.83 | 1.18 |
| 40-50 | 12.01 | 35.09 | 52.90 | 1.14 |
| 50-60 | 11.21 | 42.83 | 45.96 | 1.21 |
| 60-70 | 10.34 | 42.98 | 46.68 | 1.21 |
| 70-80 | 11.09 | 38.96 | 49.95 | 1.11 |
| 80-90 | 11.75 | 37.72 | 50.53 | 1.20 |
| 90-100 | 7.21 | 35.97 | 56.82 | 1.27 |

**5. l137: rather write “isotope analysis” instead of isotope experiment**

Response: We have modified it according to your suggestion, and the modified content is as follows:

**4.2.2 Isotope analysis**

**6. l165 and 167: there is something wrong with these sentences. I suggest rephrasing, e.g. don´t start with "the error is..." or the "error in…" but rather write "for vegetation samples…" etc.**

Response:We have modified it according to your suggestion, and the modified content is as follows:

For vegetation samples, the error is mainly from the samples' collection process.

For soil samples, the error is that we collected soil samples that contained many microorganisms.

**7. l189ff:there is some repetition to the methodology section in this paragraph**

Response: We have modified the content of this part. The revised content is as follows:

Firstly, we conducted field sampling to obtain samples of different water bodies. According to the samples' types, the samples can be divided into two categories: precipitation, river water, lake water, and groundwater can be directly tested after filtration, while soil samples and vegetation samples need to be vacuum condensed and extracted to separate the water in soil and vegetation for testing and analysis. The assembly of the data set relies mainly on the monitoring data and instrument-tested data. The extraction apparatus's use is BJJL - 2200 fully automatic vacuum condensate extraction system. The analysis instrument is LWIA - 24 d liquid water isotope analyzer. We use LIMA to test the original data produced by the analyzer. If the data passes the detection of the software, it can be included in the data set. If the data does not pass the detection of the software, we need to reuse the analyzer for analysis until the data passes the detection of the software. We use the M-K test to eliminate abnormal meteorological and hydrological data (Fig. 2).

**8. l196: "The stable isotope data set and the meteorological and hydrological data set are combined into one data set." Actually this is not the case, i.e. they are in separate sheets.**

Response: We have deleted the sentence according to your suggestion.

**9. Table 3: where are evaporation data are coming from?**

Response: Evaporation data were measured at each hydrological observation site.

**10. Fig. 4 and 5: I think it´s not "different water bodies" but rather different hydrological compartments (plant, soil water, etc). The color codes do not come out clearly in each of the sub figures legends of Fig 5.**

Response:We have modified Figures 4 and 5 according to your suggestions. The revised figures 4 and 5 are shown below:

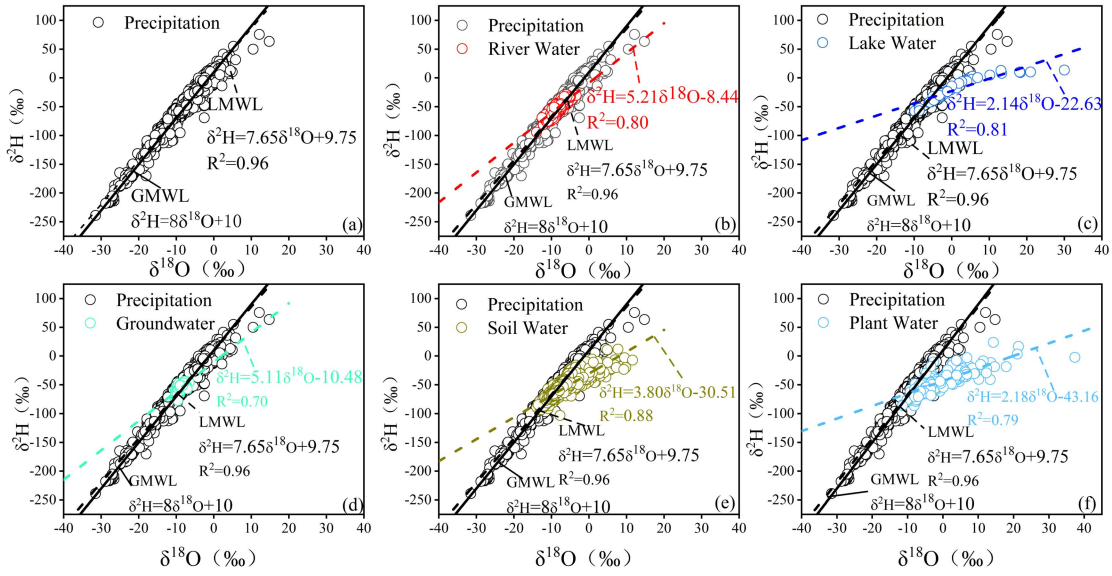


Figure. 5 The change of $\delta^2H$ and $\delta^{18}O$ in different hydrological compartments in the Shiyang River Basin, (a) is precipitation, (b) is precipitation and river water, (c) is precipitation and lake water, (d) is precipitation and groundwater, (e) is precipitation and soil water, and (f) is precipitation and plant water

**11. Fig. 4: while this is interesting, there appears to be large variability in the seasonal isotope values from the different years, especially in the soil and lake compartments. Maybe it would make more sense to present data similar as for discharge flows in Fig3 (i.e. different colours for different years, instead of average values across the sampling period).**

Response: We have modified Figure 4 according to your suggestion. The modified Figure 4 is as follows:

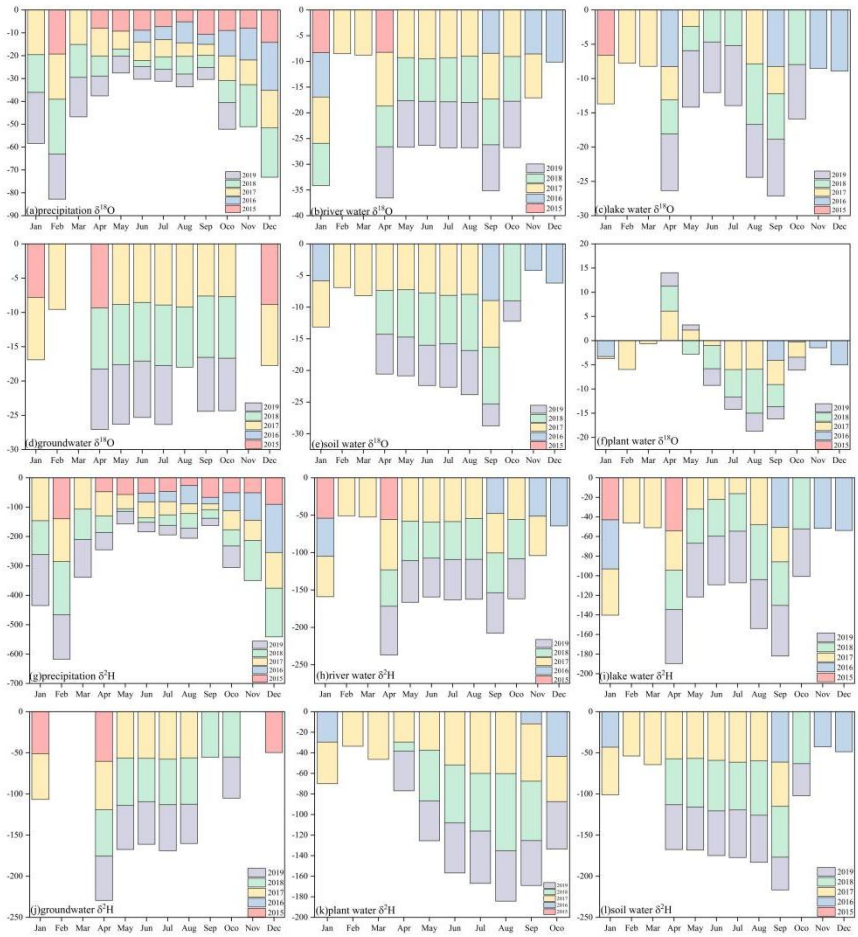


Figure. 4 Distribution of different hydrological compartments' $\delta^2H$ and $\delta^{18}O$ in the Shiyang River Basin from 2015 to 2020

**12. l275: "Due to systematic error, there are some errors in isotopic measurement results. However, the observation accuracy is affected by the operation characteristics of the instrument and the sensitivity difference of moisture to specific spectralabsorption, and the observation results usually have obvious nonlinear response problems, which require a lot of experimentation." => yes, but what´s the conclusion from this statement? Are the data reliable or not? I suggest rephrasing this paragraph.**

Response: Due to systematic error, there are some errors in isotopic measurement results. However, the observation accuracy is affected by the operation characteristics of the instrument and the sensitivity difference of moisture to specific spectral

absorption, and the observation results usually have obvious nonlinear response problems. Therefore, the data measured under the current level of technology is highly reliable. But a lot of experiments are still needed.