

## ***Interactive comment on “Research on Hydrogeochemical Characteristics and Transformation Relationships between Surface Water and Groundwater in the Weihe River” by Jihong Qu et al.***

**Jihong Qu et al.**

346402642@qq.com

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Q1: Abstract shows some results with lack of valuable conclusions. What's the evidence for “There is a close relationship between the surface water and groundwater.” The authors should show some detailed data for the stable isotopic compositions in different water types in the ABSTRACT.

A1: Thanks for your comments. We deleted the sentence of “There is a close relationship between the surface water and groundwater” and added “It could be established

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that surface water recharges groundwater at 5 sections along the Weihe River, and each section has unique recharge intensity and relationship due to its specific hydraulic environment” of line 21-22.

Q2: The INTRODUCTION does not provide good background to the study and places it in an international context. It is overelaborate without giving a straightforward idea of what the paper would like to present. The authors did not point out the specific aims of this study. What is not clear is what new general information you hope to provide. What new and scientific contribution will come out of this paper?

A2: Thanks for your comments. We have rewritten the introduction and added the specific aims at the end of this section. 'This paper has three main objectives as follows: (1) To investigate the hydrogeochemical components formation of surface water and groundwater through the samplings in several typical sections of the Weihe River Basin; (2) To determine the recharge relationship between surface water and groundwater based on the hydrogeochemical and isotopic characteristics; (3) To provide a series of methods for hydrogeochemical analysis including Piper trilinear diagram, Gibbs diagram, factor analysis and cluster analysis.'

Q3: Study Area: What's the main environmental issue associated with water resources in this study area? Please show the full statement for 'EC, TDS, RDO, WHO' when they first occur in the paper.

A3: Thanks for your comments. (1) There are two primary reasons why we choose this study area. Firstly, the shallow groundwater along both sides of the water could provide sufficient groundwater samplings for research. Secondly, the influence of river pollutants on groundwater is mainly banded and has a relatively small area of influence and the samplings would cover the influence of pollutants from the Weihe River on groundwater. (2) All the abbreviation statements are added when they first occur in the paper which are listed as follows: EC: electrical conductivity (lines 50 and 97) TDS: total dissolved solids (line 116) RDO: Rugged Dissolved Oxygen (line 116) WHO:

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World Health Organization (line 135)

Q4: Materials and methods: : Line 119: 'The principle of division' For this method, does it have assumed condition? If use chloride or other tracers, how about the results? Line 127: '...is calculated with D as a standard.', please explain it

A4: Thanks for your comments. 'The principle of division' is mainly referred to ' Song Xian-Fang, Liu Xiang-Chao, Xia Jun, Yu Jing-Jie, Tang Chang-Yuan. A study of interaction between surface water and groundwater using environmental isotopes in Huaisha River basin[J]. Science in China (Series D), 2007, 37(1):102-110.' It doesn't belong to assumed condition. And it needs further investigation If chloride or other tracers are used.

Q5: Results and Discussion: Section 3 is too long and tries to describe too many things. The thrust of this paper is to identify the interaction between surface water and groundwater. You should try to keep this as the main focus of the paper. Apart from 3.4.2, most of the contents in the section 3 are results. Line 259: for the data source from the 27 GNIPs set up in China, please add the specific references.

A5: Thanks for your comments. (1) We have collected 5 surface water and 17 groundwater samplings, then conducted hydrogeochemical tests and diagram analysis upon them. The results are shown in the 'Results and discussion' section, separated by different parts. Each subsection includes results and the according discussion, together with indications and suggestions through the reliable data from samplings in this study area. The results of both surface water and groundwater are the basis of relationship establishment, so we would like keeping the descriptions combined with discussion. (2) We added two references related to 27 GNIPs in China. (line 260) 1. ZHANG Mingjun, WANG Shengjie. A review of precipitation isotope studies in China: Basic pattern and hydrological process[J]. Journal of Geographical Sciences, 2016, 26 (7): 921-938. 2. IAEA/WMO, 2015. Global Network of Isotopes in Precipitation. 2015-11-29.

Q6: Conclusions: This section just summarises the main findings of the project. In

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this section explain in more detail how your project helps us to understand processes in these environments more broadly; the paper will have more impact if researchers from elsewhere in the world can see relevance to their studies and a paper in a major international journal such as HESS needs to have broad appeal.

A6: Thanks for your comments. The main objectives of this paper focus on the hydrogeochemical characteristics and transformation relationships in the Weihe River, therefore, the primary results of this research should be listed in the conclusion section. Moreover, we added some sentences in this section to make sure that the research importance is addressed. 'This paper provides systematical methods for hydrogeochemical components analysis which could contribute to the relationship of surface water and groundwater.' 'The research results need to be improved by sufficient local measured data in future research. Moreover, the methods conducted in this paper could offer a new way of research on surface water and groundwater, and the specific results could also provide valuable information for the local water groundwater protection, restoration and management.'

Q7: Figure 1, please show the coordinates of the map. Could you add the groundwater level contours on Fig. 1? Figure 5, is it for showing the results on groundwater samples? not clear. Please be prudent to use the cluster analysis and avoid the false correlation, especially for the groundwater samples. Figure 6, add 'a' and 'b' for the left and right diagrams, respectively. Add the corresponding figure captions. 'Isotopic variation of surface water' There is only one data for one reach of the river. What's the variation? Figure 7, the types of lines are not clear.

A7: Thanks for your comments. (1) Considering that four spots are selected for groundwater levels detection and no coordinates are labeled in the published paper referred, we didn't mark the coordinates in Fig. 1. If reviewers are interested, we could arrange a field trip to this region. (2) We added '(a)' and '(b)' in Figure 5, which represent groundwater variables classification and surface water variables classification respectively. The caption of Fig 5 has been revised. (3) There are five types of lines in Figure

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7 whose legends are already shown. The Global meteoric water line and China line coincide on the top. Then the three lines are Shijiazhuang, Zhengzhou and groundwater samples respectively.

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