Title: Evaporation loss estimation of river-lake continuum of arid inland river: Evidence from stable isotopes

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MS type: Research article

Responses to the Reviewers:

1. Section 3.3: I would recommend adding more information on the calculations performed using the Hydrocalculator. I further encourage the authors to add a table showing the input parameters used for each section and explain in the main text how these values have been derived.

Reply: Thank you for your valuable suggestion. We have added the details on parameters used in Hydrocalculator as follows:

Despite the complexity of the hydrological cycle in the Shiyang River Basin, the influence of other water (precipitation, groundwater and irrigation water) input is ignored in the calculation of evaporation loss for each section. Based on the stable isotope composition of inflow water and outflow water, evaporation loss of each section can be calculated:

$$\frac{E}{I} = \frac{\delta_L - \delta_P}{m(\delta^* - \delta_L)} \quad (2)$$

The evaporation loss of each section is calculated based on the *Hydrocalculator* software. Due to the constant inflow or outflow of river water in these sections, the steady-state model should be selected for the calculation of evaporation loss at each section. Therefore, we should select the value of columns *EI_H* and *EI_O* in the *output* file as the estimation results of the evaporation loss in these sections.

All parameters and their descriptions used in *Hydrocalculator* are listed in Table

1.

Table 1 Parameters and their description involved in evaporation loss calculation.

Parameters	Parameter description	
T	Temperature (℃)	Measured or assumed
h	Relative humidity (%)	
δ_R	Stable isotopes of precipitation (‰)	
δ_P	Stable isotopes of inflow water (‰)	
δ_L	Stable isotopes of outflow water (‰)	
δ_A	Stable isotopes of air ambient moisture (‰)	
$Slope_{LEL}$	The slope of local evaporation line	
ε_K	Kinetic isotope fractionation factor (‰)	Calculated from the model
ε^+	Equilibrium isotope fractionation factor (‰)	
ε	Total isotope fractionation (‰)	
C_k	The kinetic fractionation constant (‰)	
α^+	Equilibrium isotope fractionation factor (‰)	
δ^*	Limiting isotopic composition (‰)	
m	Isotope enrichment slope	
E/I_H	Evaporation loss calculated based on hydrogen (%)	Results
E/I_O	Evaporation loss calculated based on oxygen (%)	

2. Section 5.1: The author should clarify the specific estimation error between δD and δ18O. More evidence/calculations should be provided in terms of the errors.

Reply: Thank you for pointing this out. This error occurs in almost all similar studies, and the reasons for the error are multi-factors. At present, it is difficult to clearly analyze the specific influence of a single factor on the error of estimation results between δD and δ^{18}O. Currently, we have added comparative studies in terms of sampling (adding the control group), experiment (adding the control group), and calculation (comparative verification of different calculation methods), hoping to minimize the uncertainty.

3. Section 5.2.3: It's great to run sensitivity tests of the calculated evaporation loss to the model input variables. However, the authors only analyzed the sensitivity of temperature, humidity, outflow water and precipitation. Please add the sensitivity analysis of inflow water to the model.

Reply: Thank you for your valuable suggestion. We have added the sensitivity analysis of inflow water to the model and rewrite this section as follows:

The estimated evaporation loss (E/I) exhibits an increasing trend with the increase of temperature (T), relative humidity (h) and isotopic values of outflow water (δ_L), while shows a decreasing trend with the increase of isotopic values of precipitation (δ_R) and inflow water (δ_P) (Fig. 7). In addition, the response of evaporation loss to different variables differed substantially. Isotopic composition of atmospheric water vapor (δ_A) is the direct controlling factor of evaporation loss, but in this work, δ_A is calculated from isotopic composition of precipitation (δ_R) because it is difficult to measure it directly in remote regions (Gibson, 2002; Li et al., 2021; Wu et al., 2017). The high variability in δ_R possibly increases the uncertainty of the calculated evaporation loss values. As observed in Fig. 7ab, an increase in $\delta^{18}O_R$ by 3‰ or δ^2H_R by 10‰ will lead to a decrease in evaporation loss at any given δ_L. Evaporation loss increased more sharply with an increase in δ_L under low δ_R values. The deviation between δ_P and δ_L determines the value of E/I. As can be seen from Fig. 7cd, for a given δ_P, the trends of E/I change parallel to each other as δ_L changes, indicating that E/I shows a linear variation with both δ_P and δ_L for a given other parameters.

Temperature and relative humidity are the two most important meteorological factors controlling surface water evaporation. The relative humidity significantly influences evaporation flux over the surface water and determines the isotope kinetic fractionation. With other variables held constant, E/I increases continuously with increasing relative humidity (Fig. 7ef). Besides, evaporation loss increased most steeply with high relative humidity conditions (h=70%) (Fig. 7ef). Although evaporation loss ratios change slightly with the variation of temperature (Fig. 7gh), the temperature is also an important factor influencing the evaporation flux over surface water (Kumar and Nachiappan, 1999). It determines the isotopic fractionation at the interface between the surface water and air (Horita et al., 2008), and affects the estimation of evaporation loss. In general, E/I is more sensitive to relative humidity variation than to temperature variation.

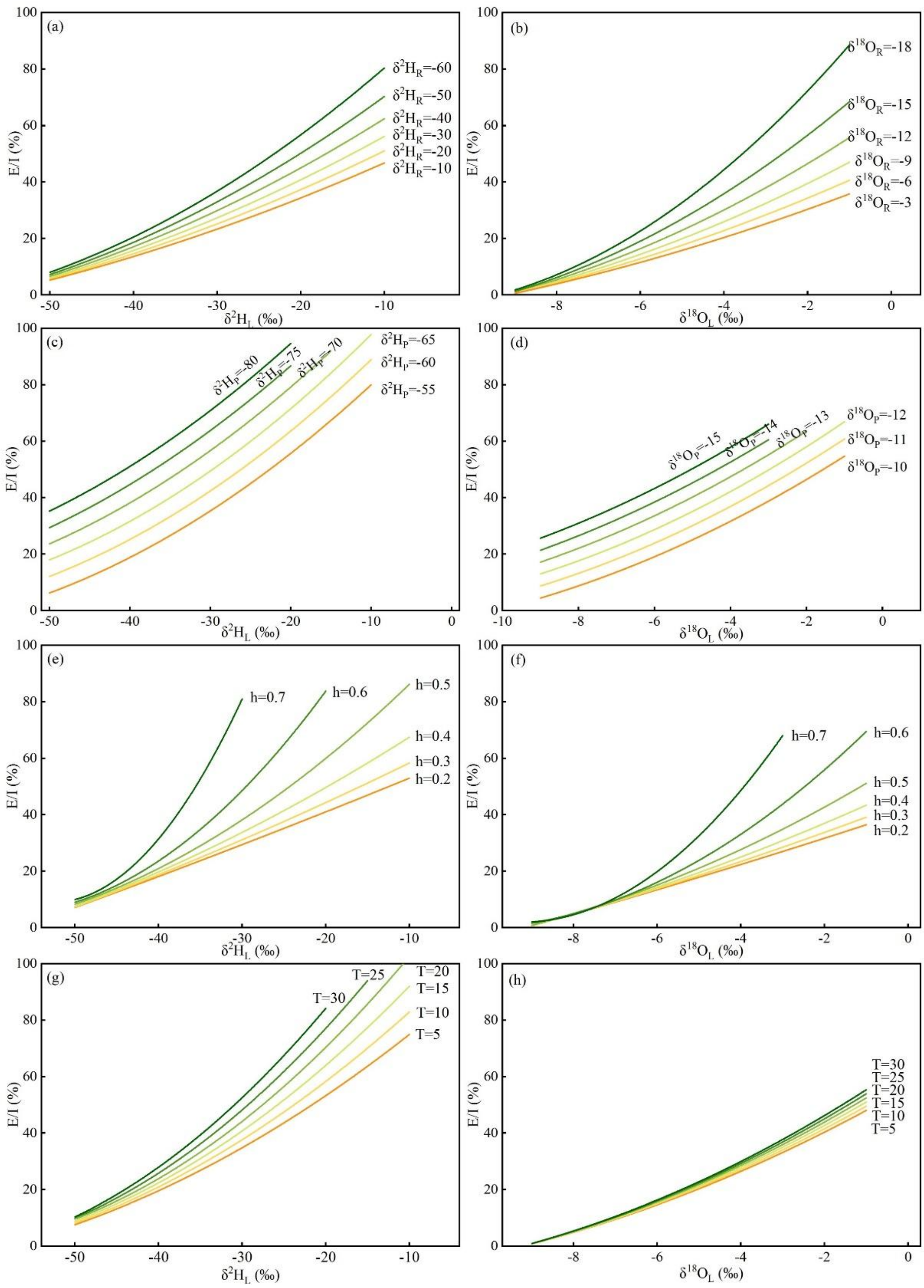

Fig. 7 The uncertainty assessment of E/I as the variations of input variables ($\delta^{18}O_L$, δ^2H_L, $\delta^{18}O_R$, δ^2H_R, $\delta^{18}O_P$, δ^2H_P, h, T).

4. The paper should also be thoroughly edited for language, as I detected many odd wordings and grammatical errors. Some sentences are not clear and sometimes convey incorrect and confusing messages for readers.

Reply: Thank you for pointing out detailed errors in our manuscript, we have carefully revised all minor comments you mentioned.