

Title: Simulation of Groundwater Dissolved Organic Carbon in Yufu River Basin during Artificial Recharge: Improving the SWAT-MODFLOW-RT3D Reaction Module

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Additional information on the parameters required for modeling

In this study, the Harmonized World Soil Database (HWSD) was used to establish the soil database for the SWAT model, and the soil parameters required for the SWAT model are shown in Table S1.

Table S1. List of Soil Parameters Required for SWAT Model

Parameters	Source	Meaning
SNAM	HWSD	Name of soil
NAYERS		Number of soil horizons
SOL_ZMX		Maximum rooting depth
SOL_Z		Depth of soil
SOL_CBN		organic carbon content
CLAY		Percentage of clay
SILT		Percentage of silt
SAND		Percentage of sand
ROCK		Percentage of rock
TEXTURE	Default Value	soil structure
ANION_EXCL		Anion-exchange porosity
SOL_ALB		surface reflectance
SOL_CRK		Ultimate compression
SOL_EC		conductivity
SOL_BD		wet density
SOL_AWC		moisture content
SOL_K		hydraulic conductivity
USLE_K	Calculated by Formula 1	Soil Erosion factor
HYDGRP	calculate and group by formula 2、3 and Table S3	Hydrologic group

$$K_{USLE} = f_{csand} \times f_{cl-si} \times f_{hisand} \times f_{orgc} \quad (1)$$

Where K_{USLE} is soil erosivity factor; f_{csand} is erosion factor for coarse sandy; f_{cl-si} is erosion factor for clayey; f_{hisand} is erosion factor for highly sandy soils; f_{orgc} is soil organic matter factor.

The soil infiltration coefficient was first calculated based on Equations 2 and 3, and then the hydrologic grouping of the soil was determined based on the SCS soil hydrologic grouping table (Table S2). The specific formulas are listed below:

$$X = 20Y^{1.8} \quad (2)$$

$$Y = 0.003Z + 0.002 \quad (3)$$

Where X is the infiltration coefficient of the soil, mm/h; Y is the average particle size of the soil particles, mm; Z is the sand content of the soil, %.

Table S2. SCS Soil Hydrology Grouping

Soil classification	Minimum infiltration rate (mm/h)	Soil hydrological properties under complete wetting
A	>7.6	High hydraulic conductivity
B	3.8-7.6	Medium drainage and hydraulic capacity
C	1.3-3.8	Low hydraulic conductivity
D	0-1.3	Very low hydraulic conductivity

Figure

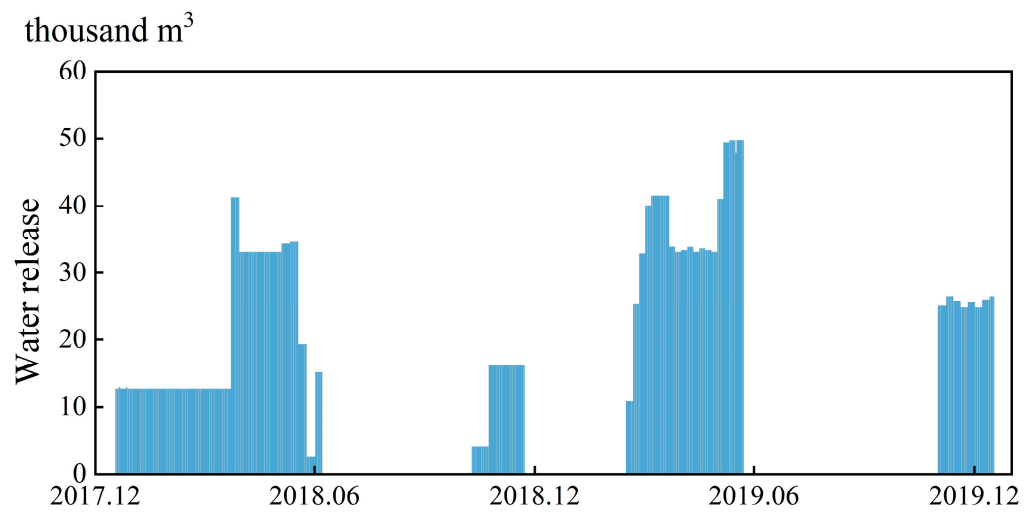


Figure S1. Artificial recharge volume of Wohushan Reservoir during the simulation period.

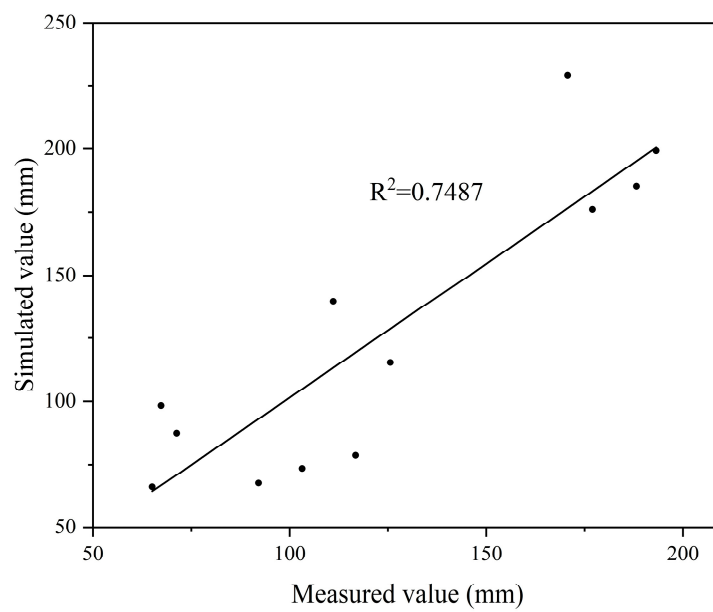


Figure S2. Correlation analysis between measured and simulated values of evaporation.

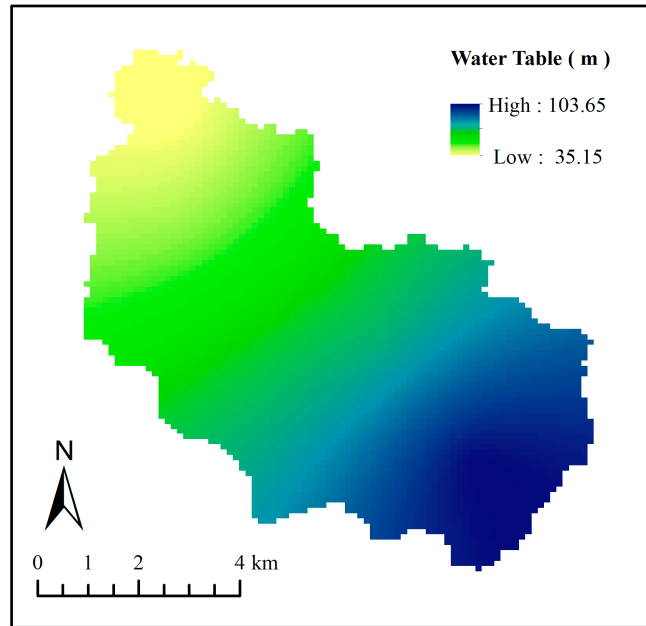


Figure S3. Initial groundwater flow field in the study area.

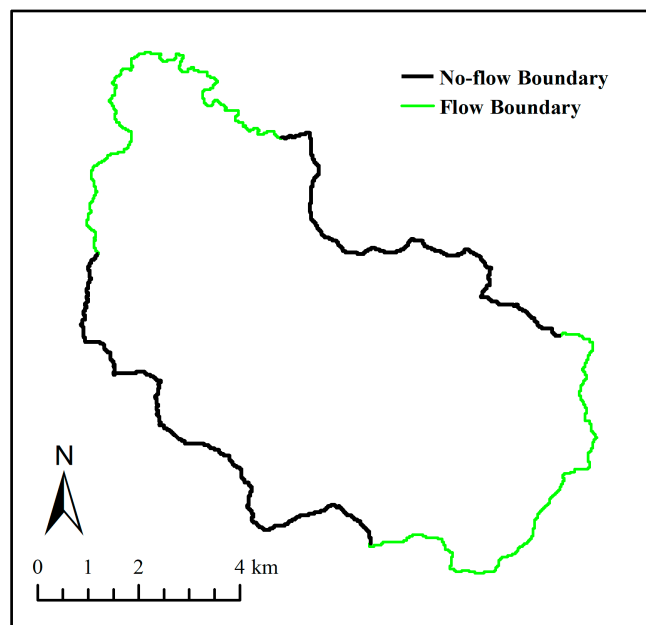


Figure S4. Generalization of aquifer boundary conditions.

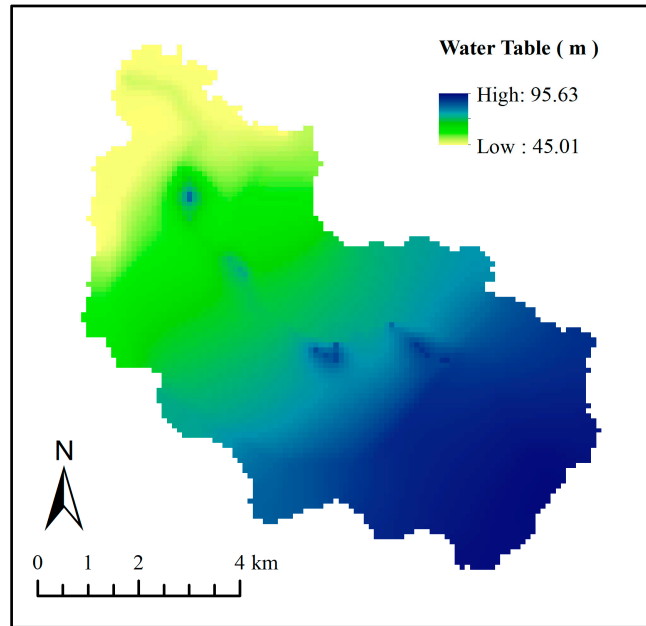


Figure S5. The simulated flow field in January 2020.

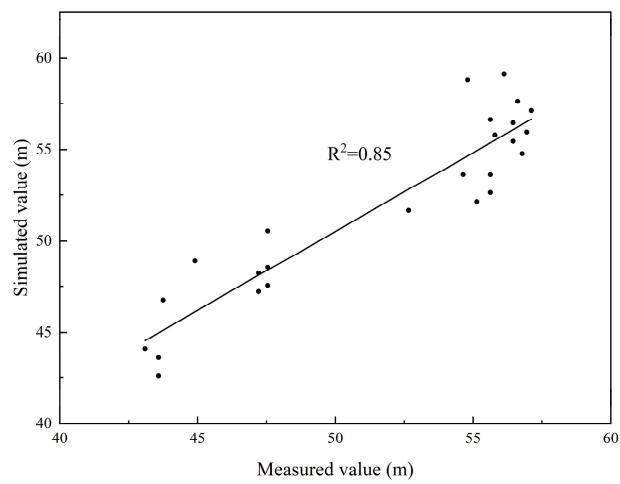


Figure S6. Correlation analysis between measured values and simulated values of groundwater level.

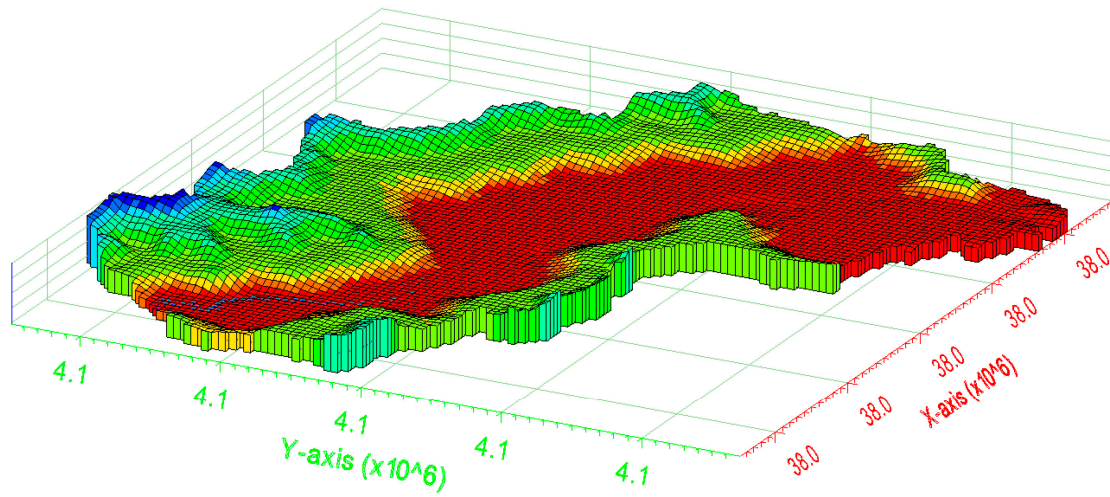


Figure S7. Schematic diagram of the conceptual model of the study area.

Table

Table S3. Water recharge and DOC input under multiple scenarios

Data (year)	Precipitation (mm)	Recharged by Yellow River water(mm)	DOC Input (kg/ha)	Recharged by Yangtze River water(mm)	DOC Input (kg/ha)	Recharged by multi- source water	DOC Input (kg/ha)
2021	779.8	55.89	6.14	33.68	5.23	65.22	9.58
2022	796.6	56.28	6.18	33.94	5.55	65.64	9.66
2023	813.4	56.34	6.22	34.05	5.53	65.72	10.13
2024	831	56.68	6.55	34.25	5.75	66.05	10.27
2025	847.4	56.48	6.86	34.27	6.50	65.64	10.35
2026	864.6	56.09	6.24	34.31	6.14	64.93	10.39
2027	881.5	55.33	6.40	34.37	6.13	63.96	10.39
2028	898.5	54.39	7.18	34.15	5.88	62.78	10.36
2029	915.4	52.97	6.35	33.46	5.23	61.28	10.12
2030	932.7	52.07	6.47	32.69	5.01	60.54	9.95

Table S4. Results of sensitivity analysis

Parameter	ΔX_i			
	-20%	-10%	10%	20%
K	0.12	0.12	0.04	0.11
X_{AR}	0.20	0.10	0.10	0.10
φ	0.63	0.67	0.67	0.65