

Figure 1. The location of the study area and the distribution of sampling points.

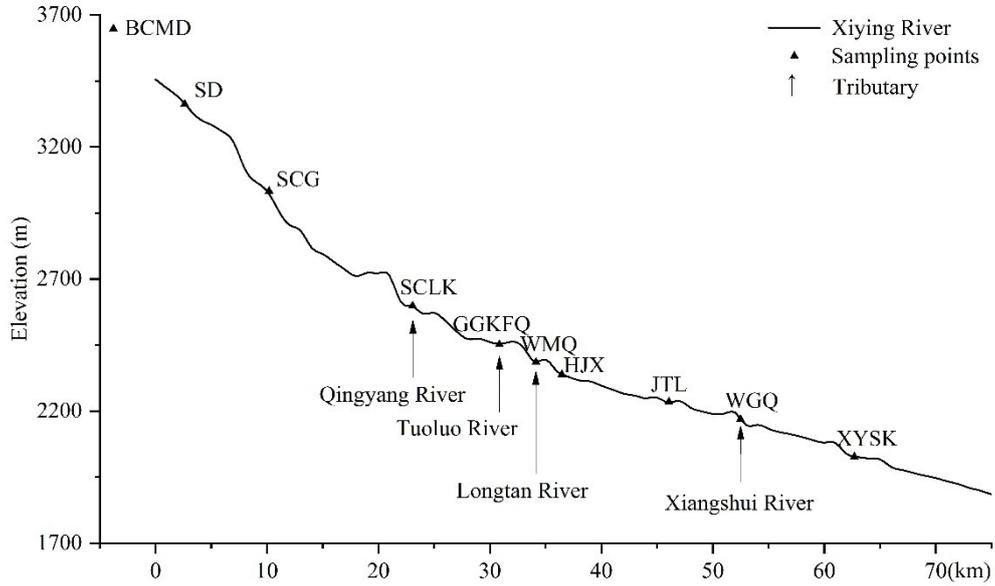


Figure 2. Channel longitudinal profile in the Xiying River.

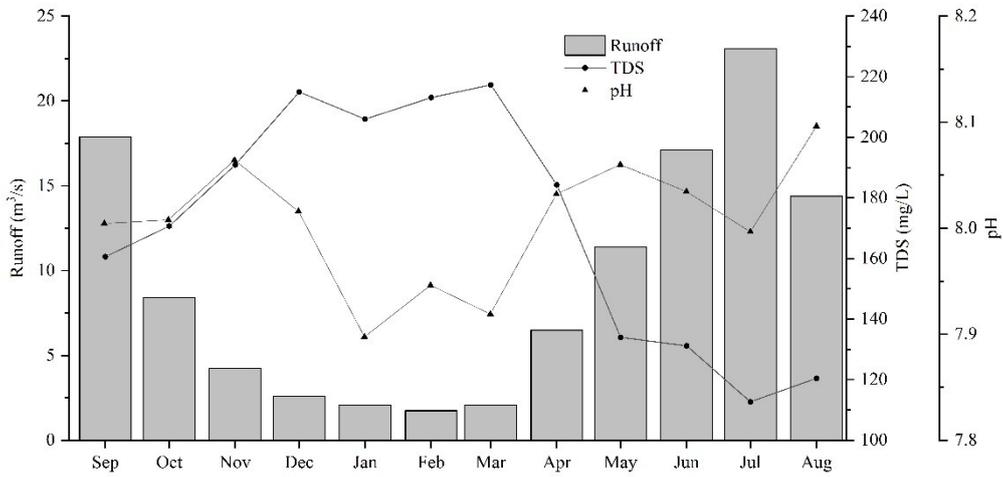


Figure 3. Annual variation of TDS, pH and flow in main stream of the Xiying River.

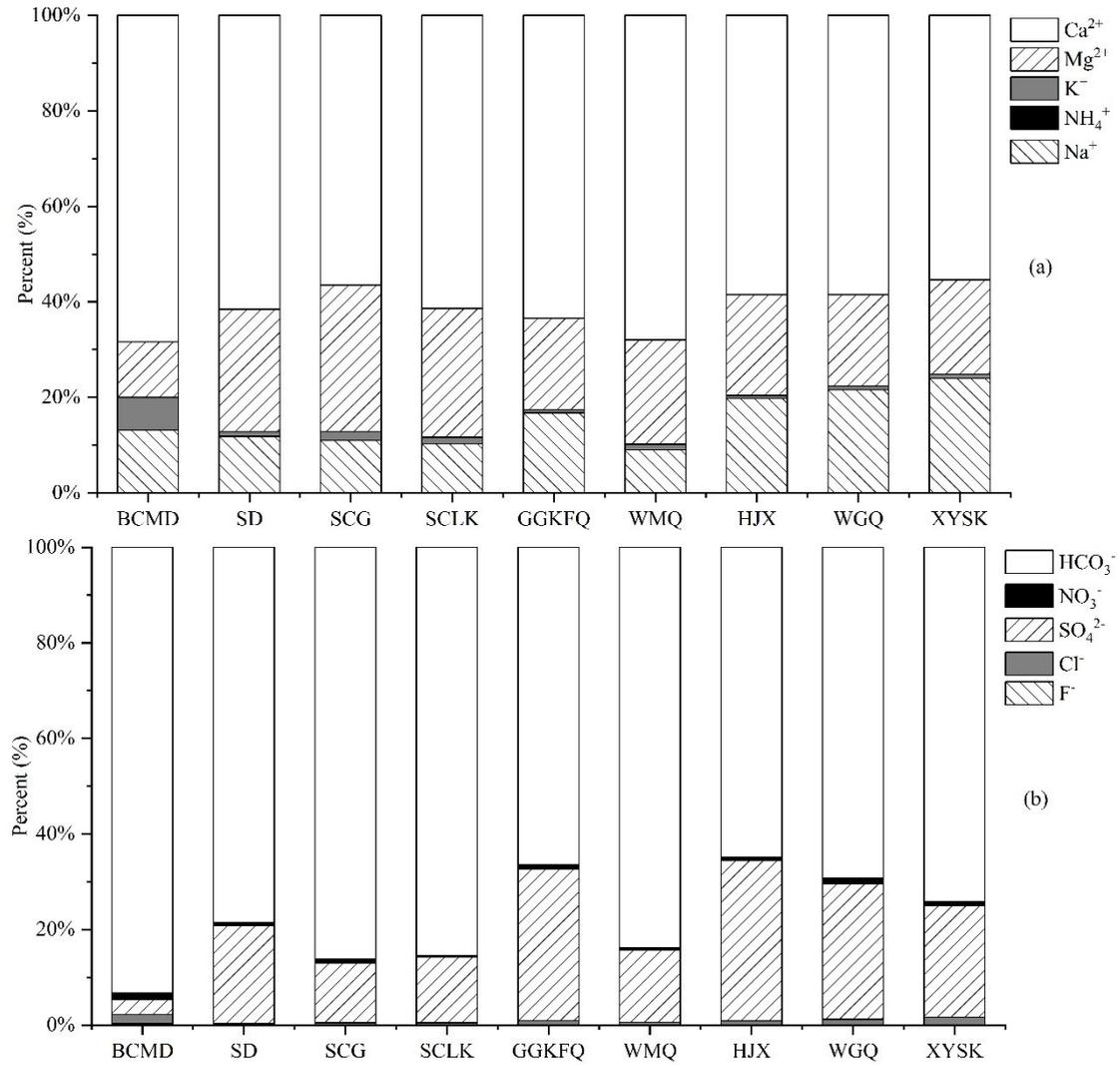


Figure 4. Composition ratio of cations (a) and anions (b) in the Xiying River.

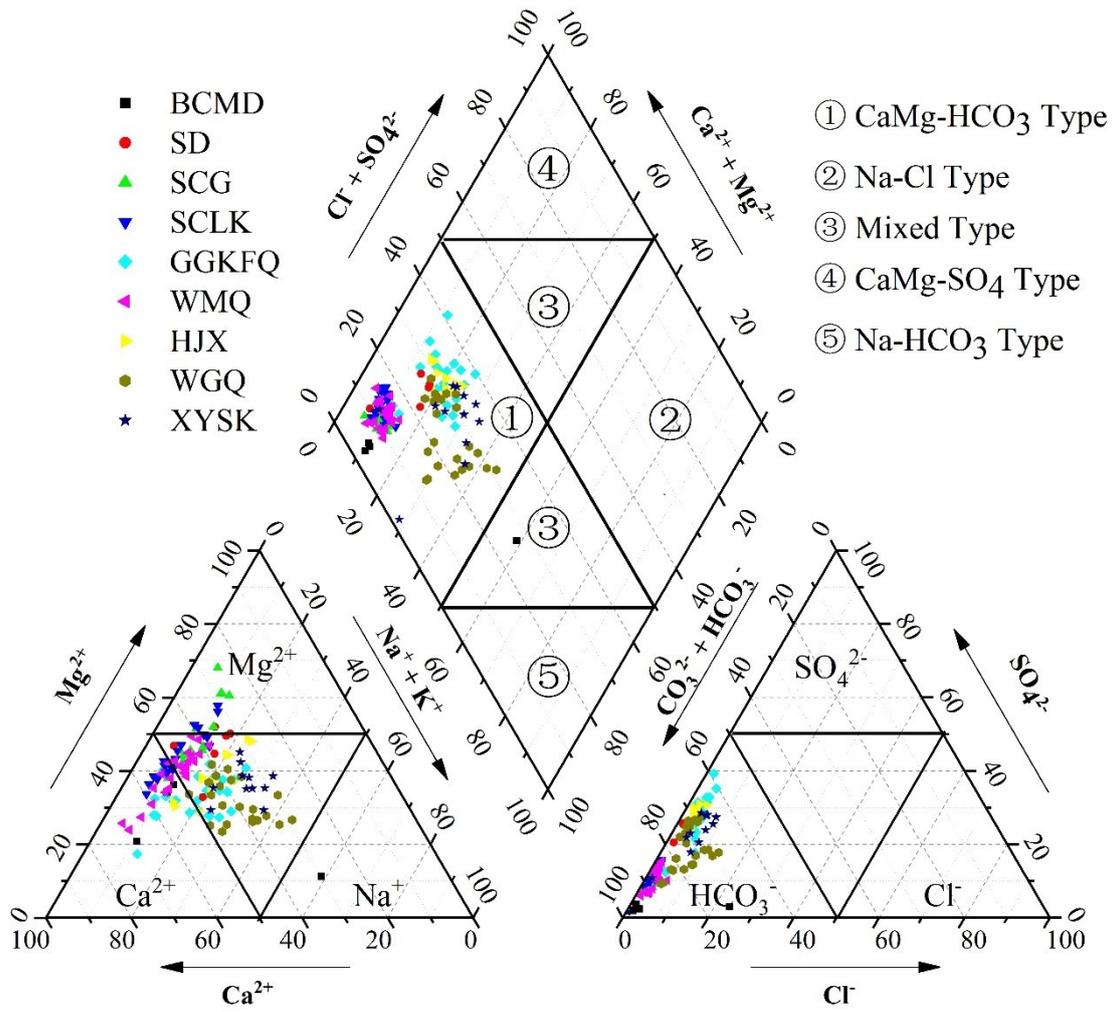


Figure 5. Piper three-line diagram of samples in the Xiying River.

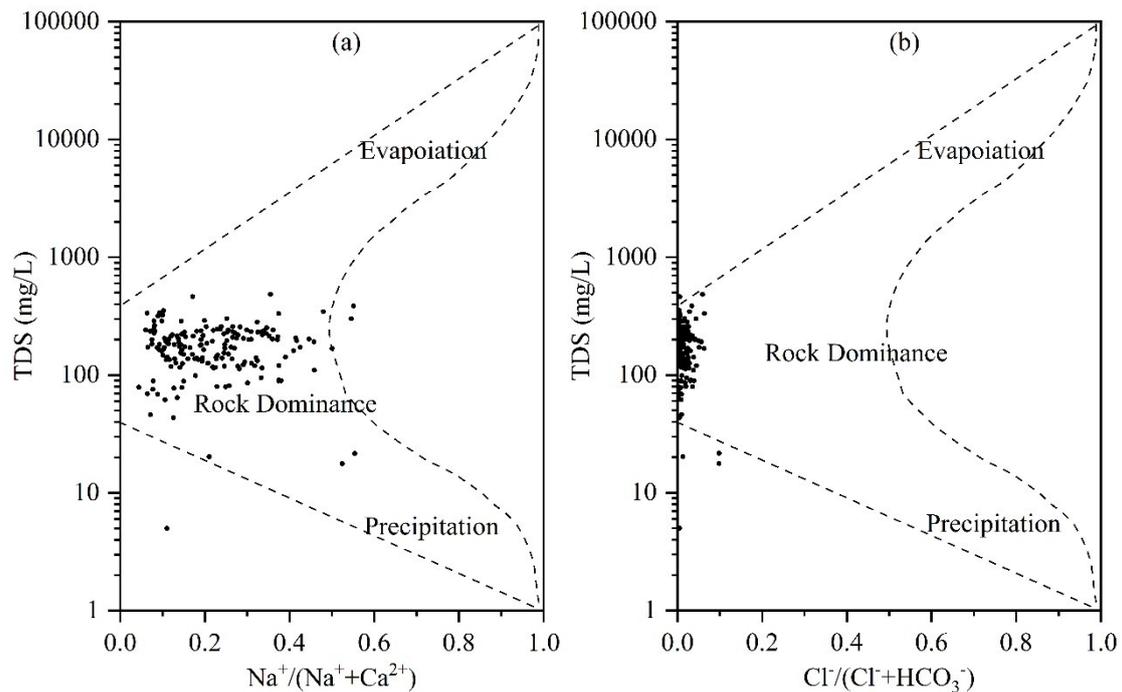


Figure 6. Gibbs model of the Xiying River: (a) cations (b) anions.

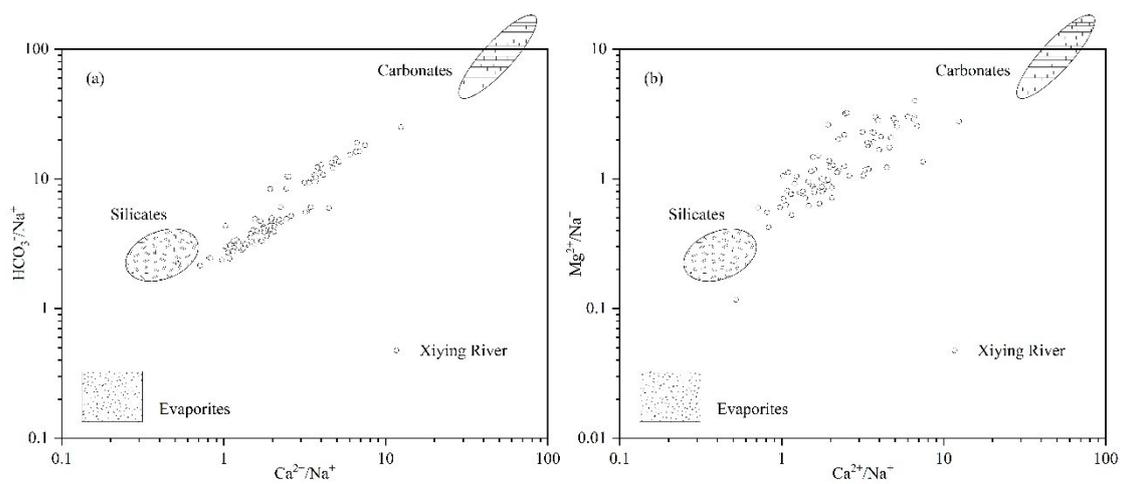


Figure 7. Diagram of ion combination ratio of the Xiying River.

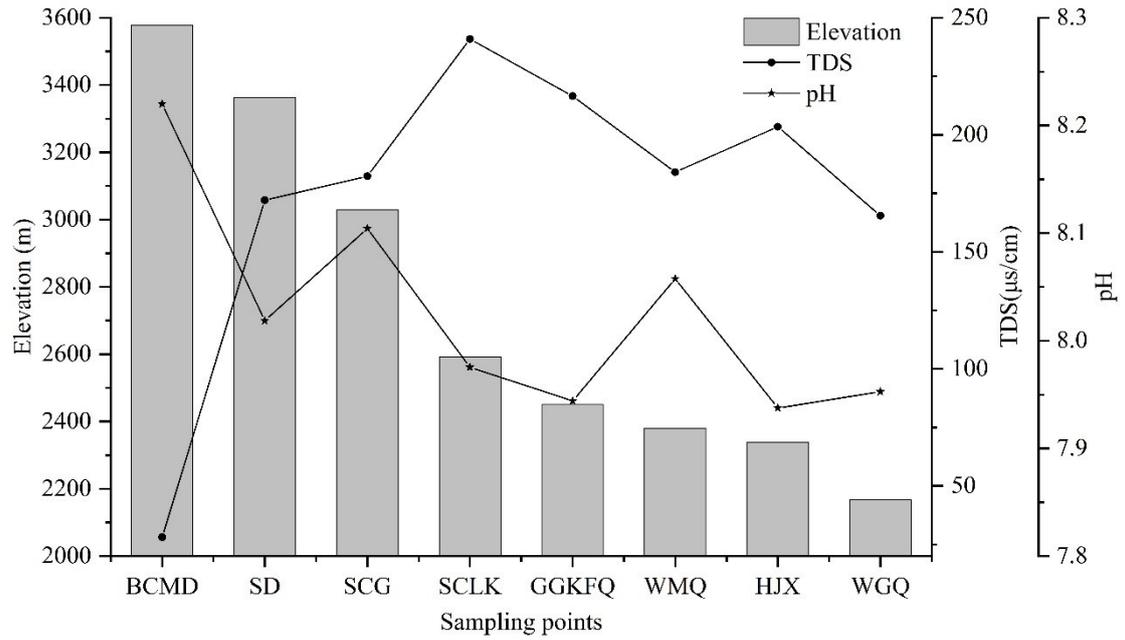


Figure 8. Spatial variation of TDS and pH in the Xiying River.

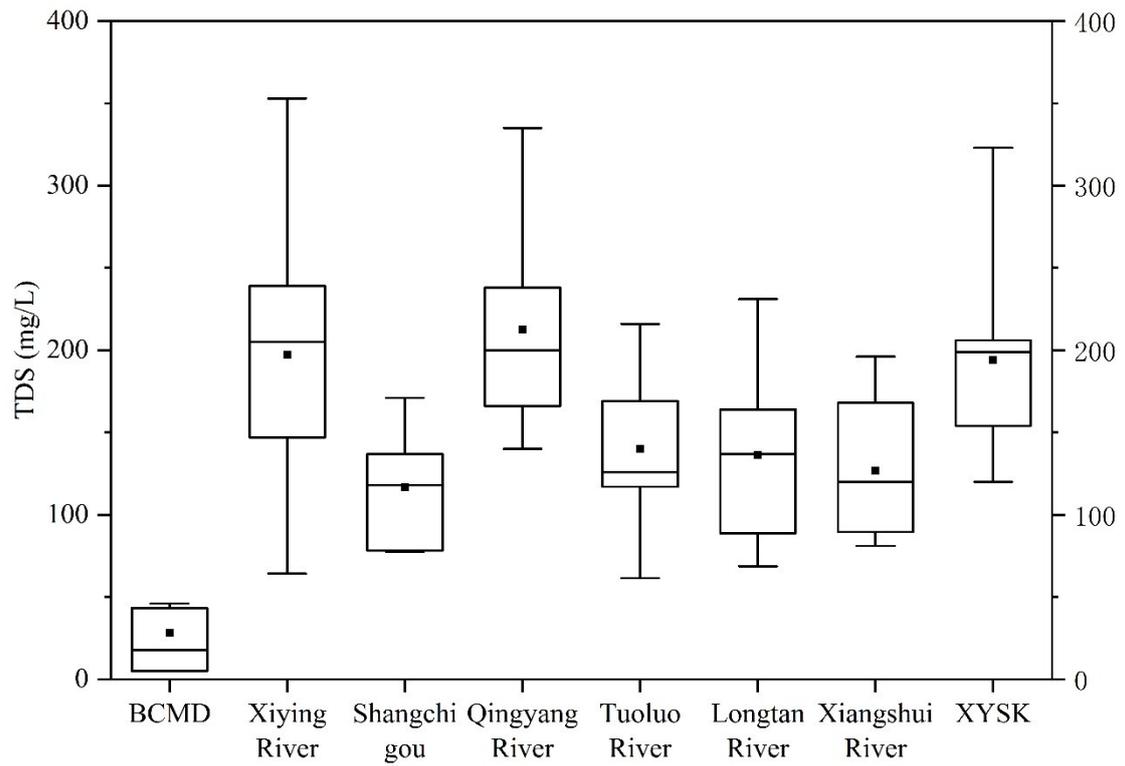


Figure 9. TDS distribution interval of some tributaries and main stream in the Xiying River.

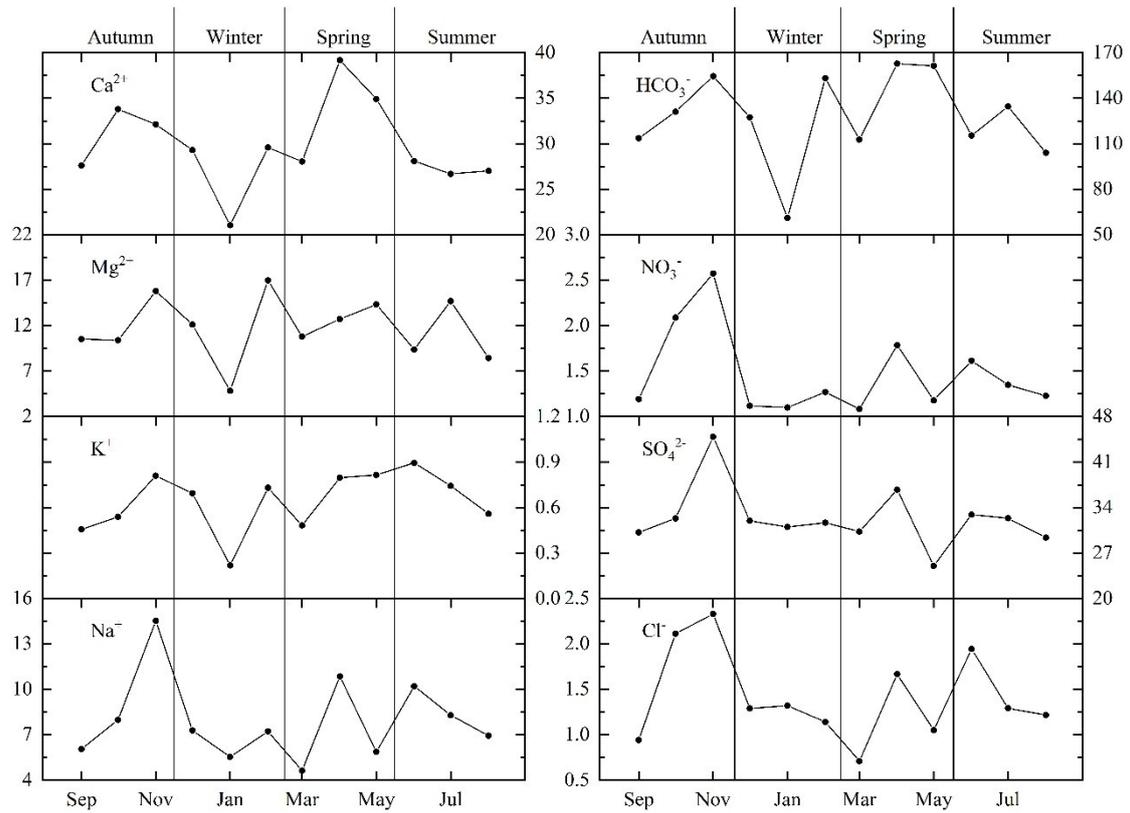


Figure 10. Annual variation of main ion concentration in the Xiying River ($\text{mg}\cdot\text{L}^{-1}$).

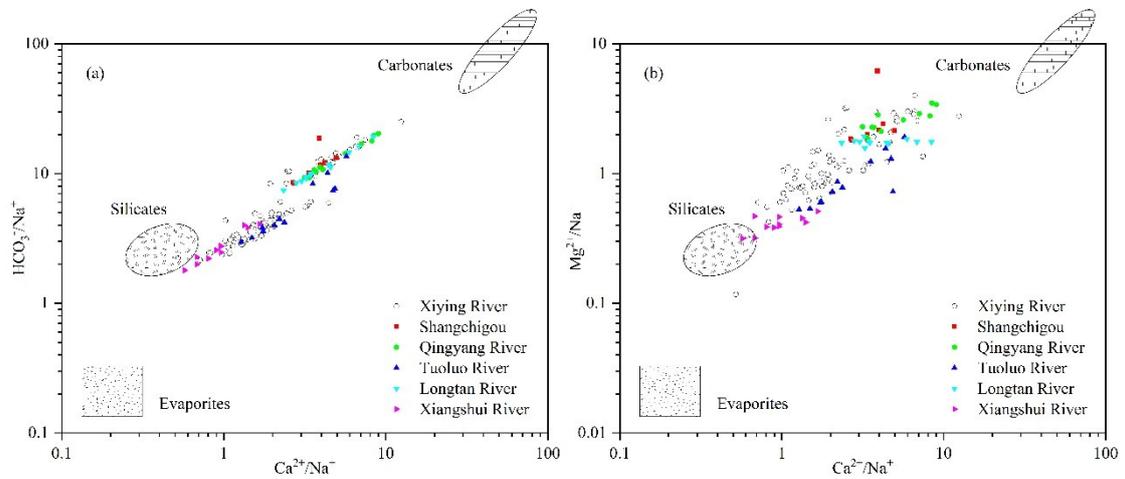


Figure 11. Ion ratio diagram of the Xiying river and its tributaries.

Table 1. Sampling location and sample quantity.

Samplin g point	Sample quantit y	Longitud e (E)	Latitude (N)	Elevatio n (m)	Sample type	Note
BCMD	4	101.85°	37.55°	3577	River	Bingchuanmoduan

SD	7	101.84°	37.58°	3364	River	Suidao
SCG	14	101.85°	37.64°	3029	River	Shangchigou
SCLK	22	101.93°	37.72°	2592	River	Sanchalukou
GGKFQ	24	101.98°	37.77°	2451	River	Gaigekaifang Bridge
WMQ	24	102.00°	37.81°	2380	River	Weiming Bridge
HJX	12	102.01°	37.83°	2338	River	Huajian Township
WGQ	22	102.12°	37.89°	2167	River	Wenge Bridge
XYSK	12	102.22°	37.92°	2025	River	Xiying Reservoir
JTL		102.07°	37.88°	2235	Hydrological Station	Jiutiaoling

Table 2. Ion combinations and ratios of three kinds of rocks [27]

Ion Type	Carbonates	Silicates	Evaporites
Ca ²⁺ /Na ⁺	50	0.35 ± 0.15	< 0.2
Mg ²⁺ /Ca ²⁺	10	0.24 ± 0.12	< 0.12
HCO ₃ ⁻ /Na ⁺	120	2 ± 1	< 1

Table 3. Correlation of various ions in the Xiying river.

Type	TDS	Na ⁺	K ⁺	Mg ²⁺	Ca ²⁺	Cl ⁻	SO ₄ ²⁻	NO ₃ ⁻	HCO ₃ ⁻
TDS	1								
Na⁺	0.641* *	1							
K⁺	0.373* *	0.304* *	1						
Mg²⁺	0.549* *	0.271* *	0.797* *	1					
Ca²⁺	0.577* *	0.174* *	0.712* *	0.840* *	1				
Cl⁻	0.435* *	0.828* *	0.236* *	0.110	0.100	1			
SO₄²⁻	0.819* *	0.531* *	0.345* *	0.630* *	0.646* *	0.343* *	1		
NO₃⁻	0.410* *	0.729* *	0.244* *	0.090	0.100	0.807* *	0.266* *	1	
HCO₃⁻	0.546* *	0.251* *	0.827* *	0.938* *	0.956* *	0.140	0.573* *	0.130	1

Note: **means p<0.01 (two-tailed); *means p<0.05 (two-tailed).

Table 4. Seasonal variation of main ion concentrations in tributaries of the Xiying River (mg·L⁻¹).

Tributary	Season	Na ⁺	K ⁺	Mg ²⁺	Ca ²⁺	Cl ⁻	SO ₄ ²⁻	NO ₃ ⁻	HCO ₃ ⁻
Shangchigou	Spring	6.81	0.98	22.86	79.01	1.14	62.93	1.31	293.58
	Summer	6.43	1.02	17.67	62.05	1.36	50.17	1.39	230.23

	Autumn	7.24	1.10	22.00	74.56	1.35	53.60	1.39	288.31
	Average	6.82	1.03	20.84	71.87	1.28	55.57	1.36	270.71
Qingyang River	Spring	6.93	0.90	15.03	47.55	1.31	35.95	0.92	192.39
	Summer	8.71	1.20	22.91	57.66	1.59	51.60	1.48	247.52
	Autumn	6.10	1.06	15.68	50.01	1.28	36.25	1.85	199.97
	Winter	4.04	0.78	14.35	63.27	0.62	45.75	0.98	217.68
	Average	6.52	1.00	17.76	58.07	1.21	45.02	1.32	225.65
Tuoluo River	Spring	7.45	1.25	13.78	39.72	2.38	23.33	1.69	177.56
	Summer	11.86	1.00	24.05	66.39	3.11	47.12	1.56	291.00
	Autumn	5.35	0.83	11.00	36.88	1.77	23.05	1.21	150.35
	Winter	4.65	0.75	14.15	55.73	0.85	36.85	1.06	206.07
	Average	7.33	0.96	15.75	49.68	2.03	32.59	1.38	206.24
Longtan River	Spring	5.28	0.75	8.27	32.99	1.23	19.68	1.31	129.43
	Summer	7.59	0.22	7.19	22.07	1.18	34.55	1.00	77.44
	Autumn	7.98	0.49	8.25	26.20	1.67	29.57	0.95	102.38
	Winter	1.80	0.34	3.30	23.98	0.42	7.33	0.37	84.84
	Average	5.66	0.45	6.76	26.31	1.12	22.78	0.91	98.53
Xiangshui River	Spring	9.23	0.32	4.27	13.96	2.25	15.34	1.98	63.97
	Summer	14.66	0.39	5.12	17.65	4.65	24.25	2.44	78.12
	Autumn	8.02	0.31	5.20	16.61	2.07	22.52	1.63	65.06
	Winter	4.74	0.24	4.40	13.94	0.81	16.64	1.06	54.23
	Average	9.16	0.32	4.75	15.54	2.44	19.69	1.78	65.35
Xiyang River	Spring	7.56	0.71	12.62	34.64	1.20	31.40	1.40	147.59
	Summer	8.42	0.72	9.96	27.36	1.50	31.26	1.39	114.02
	Autumn	8.63	0.56	11.60	31.00	1.70	34.17	1.84	129.23
	Winter	6.95	0.62	12.55	27.90	1.24	31.68	1.17	124.76
	Average	8.07	0.64	11.62	30.58	1.47	32.49	1.53	129.50