Supplementary Materials

Arsenic Source-Sink Dynamics under Phosphorus Competition in Sediments from River-Lake Connected Systems

SI Data analysis

The arsenic (As) and phosphorus (P) adsorption capacity of the sediment samples at each time period, Q_t ($mg \cdot g^{-1}$), was calculated by the following equation:

$$Q_t = \frac{(C_0 - C_t)V}{W}$$

where C_0 ($mg \cdot L^{-1}$) was initial mass concentration of As or P, C_t ($mg \cdot L^{-1}$) was the blank corrected mass concentration of As or P at time t, V (L) was the volume of the solution, and W (g) was the quality of dried sediment sample.

Modified Freundlich and Freundlich crossover models were used to draw the adsorption isotherm of As or P (Liu et al., 2021; Mozaffari Majd et al., 2021). The equations of As and P were the same, and taking As for the examples, the equations of the models are as follows:

$$Q_e = K_F C_e^n - K_F (C_e^0)^n - Q_e^0$$

$$\mathrm{NAAs} = K_F (C_e^0)^n + Q_e^0$$

$$\mathrm{EAsC_0} = \sqrt[n]{\frac{\mathrm{NA}As}{K_F}}$$

Where K_F is the adsorption coefficient calculated by modified Freundlich ($L \cdot g^{-1}$); C_e is the As or P concentration in the aqueous phase at equilibrium ($mg \cdot L^{-1}$); NAAs is the native adsorbed As ($mg \cdot kg^{-1}$); $\mathrm{EAsC_{0F}}$ is the zero equilibrium As concentration calculated by modified Freundlich ($mg \cdot L^{-1}$).

$$Q_e = K_f (C_e^n - \mathrm{EAsC_0^n})$$

$$K_{d-eq} = nK_f (C_{As})^{n-1}$$

Where K_f is the adsorption coefficient calculated by Freundlich crossover model ($L \cdot g^{-1}$), and $EAsC_F$ is the zero equilibrium As concentration calculated by Freundlich crossover model ($mg \cdot L^{-1}$); $K_{d\text{-}eq}$ was partition parameter; C_{As} was the As concentration in overlying water ($mg \cdot L^{-1}$).

Table S1. Physical and chemical properties of sediments

Sampling sites	pH	ORP(mV)	sAs($mg \cdot kg^{-1}$)10cm	sAs($mg \cdot kg^{-1}$)20cm	sAs($mg \cdot kg^{-1}$)30cm
R1	6.58	-162.2	6.23	3.15	0.87
R2	5.99	-138.6	5.79	2.31	0.46
R3	6.23	-92.8	6.58	3.05	1.28
R4	6.34	-104.1	5.36	2.18	0.73
R5	6.18	-197.9	4.88	1.68	0.42
R6	6.15	-121.6	5.57	1.96	0.38
L1	7.13	-135	9.14	7.41	5.49
L2	7.08	-146	9.06	7.36	5.89
L3	7.16	-139	9.14	7.49	5.99
L4	6.90	-148	7.92	4.02	2.09
L5	6.91	-152	6.82	3.99	1.60
L6	6.93	-144	7.52	4.39	2.23
LC1	7.21	-193	10.30	8.93	11.05
LC2	7.15	-198	9.38	8.61	10.54
LC3	7.22	-188	11.35	8.42	11.38

Figure S1. α diversity index

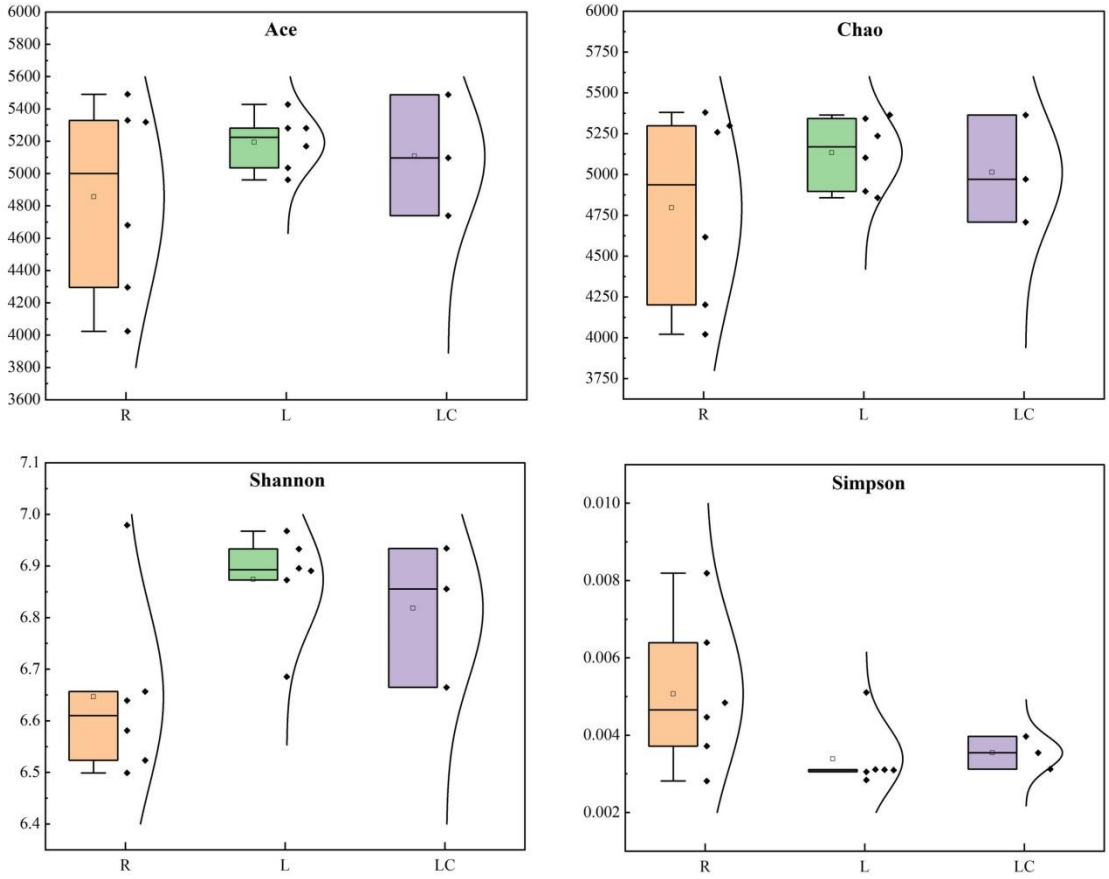
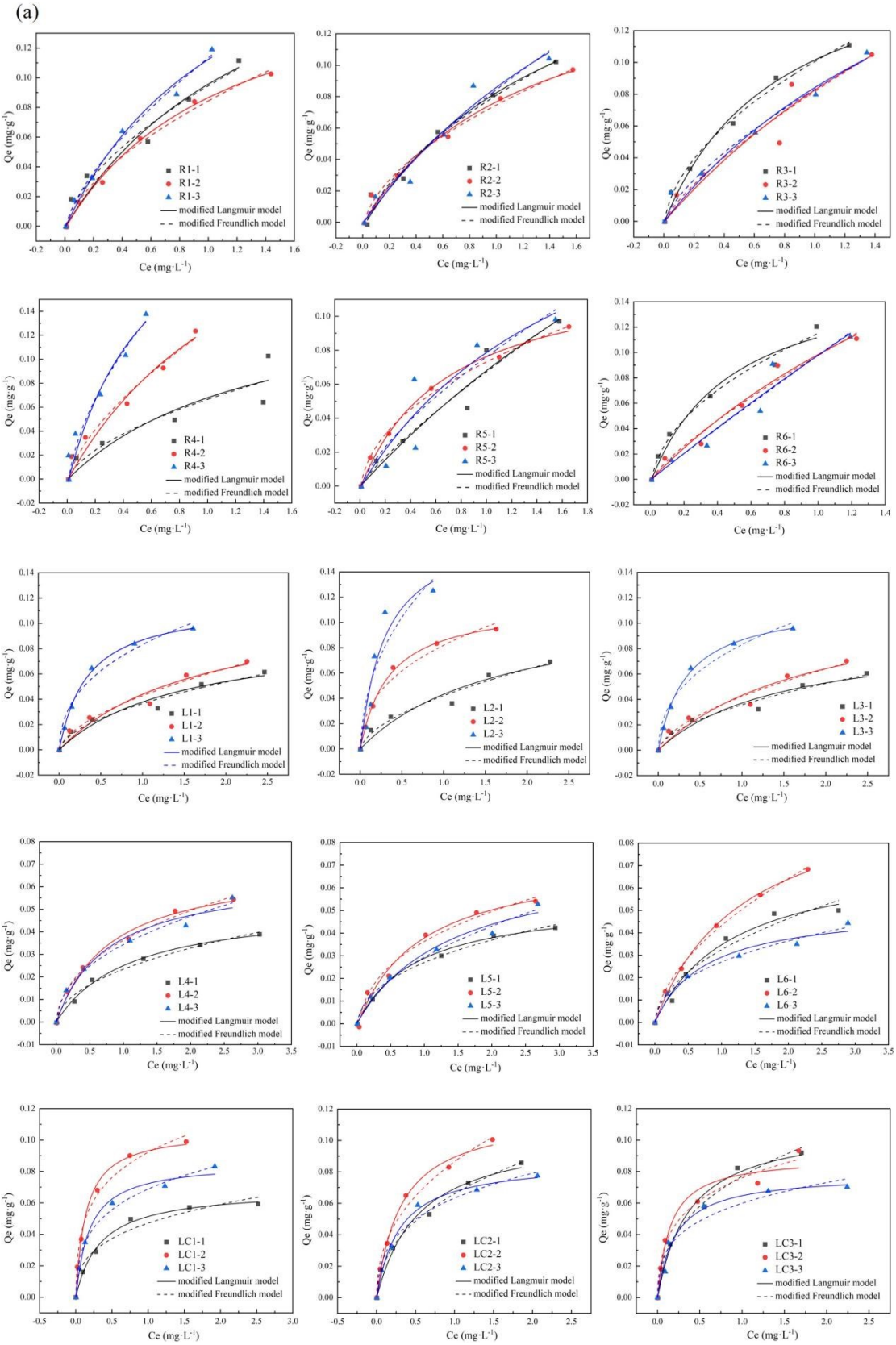


Figure S2. Two modified isothermal adsorption models, (a) for As,(b) for P



(b)

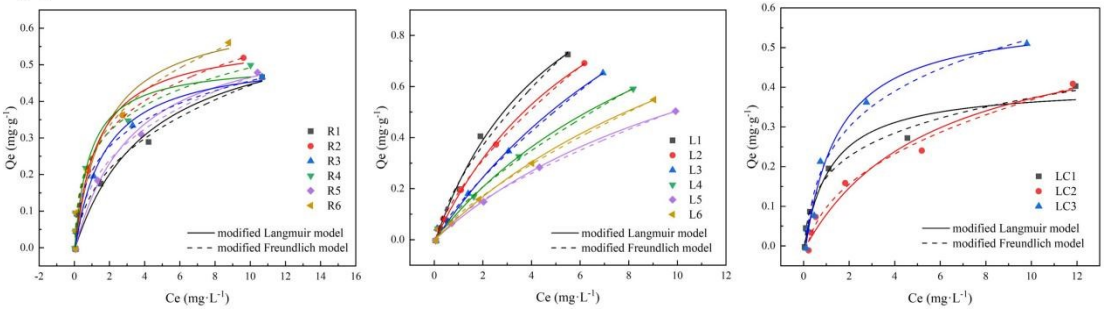
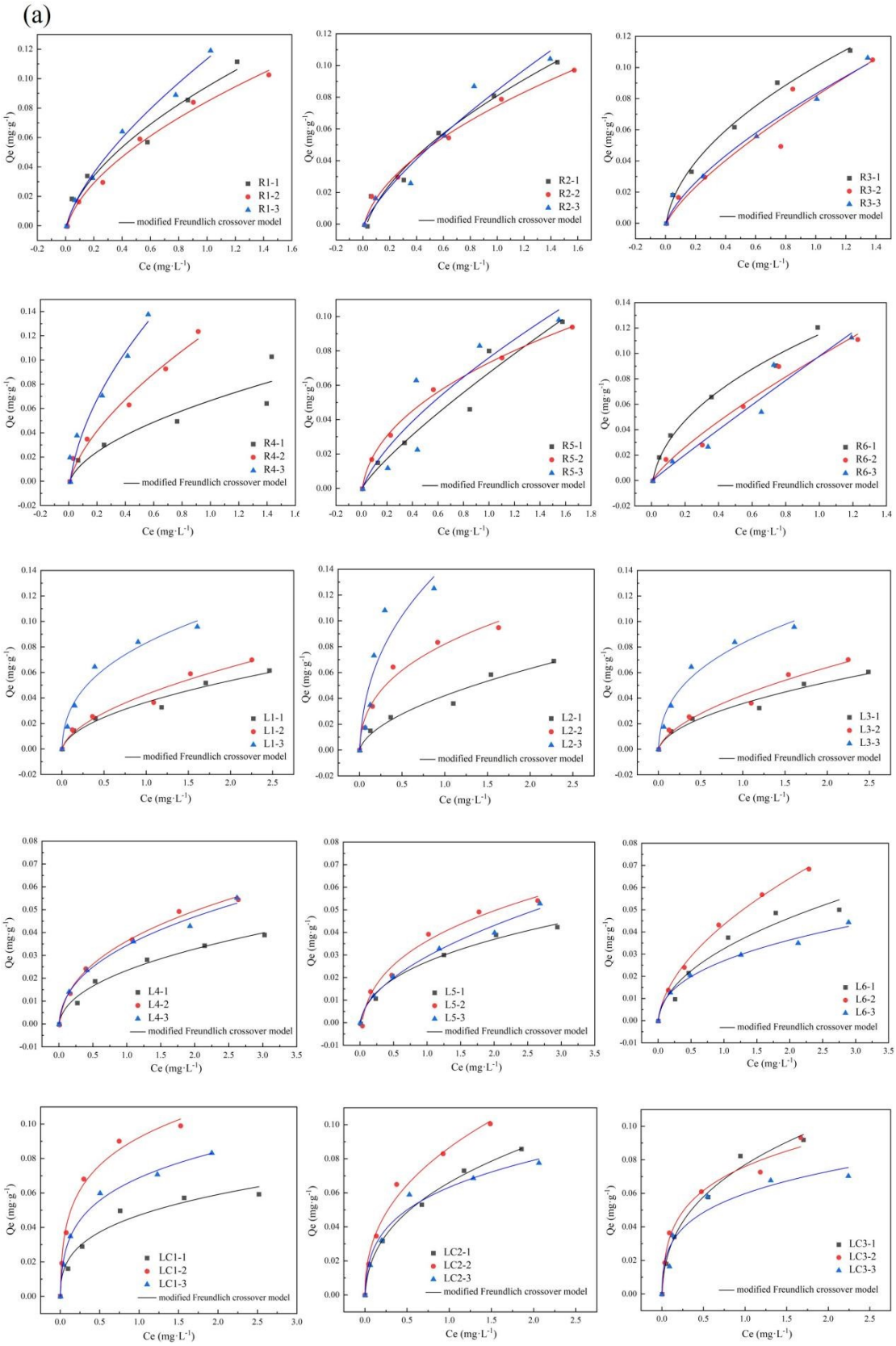
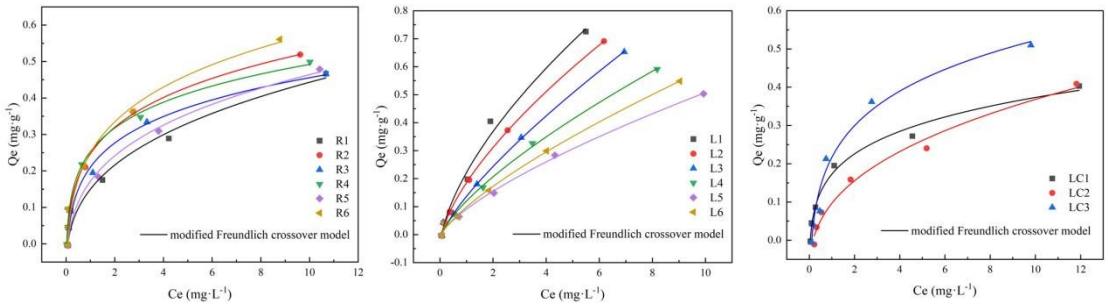

Qe (mg·g-1)
Ce (mg·L-1)
R1
R2
R3
R4
R5
R6
modified Langmuir model
modified Freundlich model
L1
L2
L3
L4
L5
L6
modified Langmuir model
modified Freundlich model
LC1
LC2
LC3
modified Langmuir model
modified Freundlich model

Figure S3. Modified Freundlich crossover model, (a) for As,(b) for P



(b)


Qe (mg·g-1)
Ce (mg·L-1)
R1
R2
R3
R4
R5
R6
modified Freundlich crossover model
L1
L2
L3
L4
L5
L6
modified Freundlich crossover model
LC1
LC2
LC3
modified Freundlich crossover model