

Supplementary material

Quantitative prediction and typical factor effects of phosphorus adsorption on the surface sediments from the intertidal zones of the Yellow River Delta, China

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The Langmuir and Freundlich equations

Langmuir equation:

$$Q = \frac{K_L \cdot C_e \cdot Q_{\max}}{1 + K_L \cdot C_e} \quad (\text{S1})$$

where Q (mg kg^{-1}) was the phosphorus adsorption quantity of sediment per unit mass after adsorption equilibrium; Q_{\max} (mg kg^{-1}) was the phosphorus adsorption capacity of sediment per unit mass; C_e (mg kg^{-1}) was the adsorption equilibrium concentration; K_L was the equilibrium adsorption coefficient.

Freundlich equation:

$$Q = K_F \cdot C_e^{1/n} \quad (\text{S2})$$

where Q (mg kg^{-1}) was the phosphorus adsorption quantity of sediment per unit mass after adsorption equilibrium; C_e (mg kg^{-1}) was the adsorption equilibrium concentration; K_F and n were the equilibrium adsorption coefficients.

Table S1. Descriptions of the sampling sites

Site	Location	Surrounding land type
CK	38°15'59.5"E, 117°51'45.65"N	aquacultures
YG	38°7'31.04"E, 118°40'0.04"N	roadbuilding
YC	38°7'7.13"E, 118°39'59.01"N	roadbuilding
YCL	38°6'55.24"E, 118°40'0.96"N	roadbuilding
HG	37°49'8.91"E, 119°6'51.91"N	nature reserve
HH	37°49'7.33"E, 119°6'41.53"N	nature reserve
HC	37°49'11.6"E, 119°6'30.97"N	nature reserve
HL	37°49'14.2"E, 119°6'19.23"N	nature reserve
GD	37°55'41.3"E, 119°3'45.46"N	causeway
DWL	37°41'33.40"E, 119°1'47.85"N	aquacultures

Table S2. The physicochemical properties of sediments

Sal means the salinity; OM means the organic matter; Eh means the redox potential; the range of clay particle size was <3.9 μm , the particle size of silt ranged from 3.9 to 62.5 μm , the particle size of sand ranged from 62.5 to 2000 μm

Sample	Sal	OM (%)	Eh (mV)	pH	Size distribution (%)			Al (mg L^{-1})	Fe (mg L^{-1})	Ca (mg kg^{-1})	Mg (mg kg^{-1})	Mn (mg kg^{-1})	TP (mg kg^{-1})
					Clay	Silt	Sand						
CK	9.37	3.28	297.50	8.41	2.58	71.42	26.00	7.07	30.00	48791	11503	668	651
YG	12.62	2.25	521.07	8.66	1.85	91.53	6.62	3.51	21.00	37459	9399	447	741
YC	29.24	6.41	479.23	8.44	0.00	81.08	18.92	4.96	40.70	42410	12020	441	660
YCL	22.32	4.21	426.90	8.86	0.00	84.01	15.99	4.34	20.60	46764	14492	480	716
HG	11.14	2.46	458.73	8.51	0.00	40.08	59.92	4.05	29.10	33769	8478	453	563
HH	11.37	2.10	426.57	8.50	0.00	35.03	64.97	3.91	32.20	37447	9138	514	659
HC	21.42	4.38	490.37	8.82	0.00	60.57	39.43	3.89	29.20	41361	11728	434	687
HL	24.52	4.44	446.17	8.52	0.00	59.82	40.18	4.84	36.20	42726	12384	465	704
GD	16.01	6.62	383.67	8.03	0.00	81.57	18.43	6.10	40.00	49970	12234	536	641
DWL	12.45	5.20	331.77	8.45	1.75	90.72	7.53	8.03	31.30	52508	14367	627	605

Table S3. The adsorption rate of phosphorus at different sampling period ($\text{mg kg}^{-1} \text{h}^{-1}$)

Sampling site	Sampling period (h)												
	0–0.5	0.5–1	1–1.5	1.5–2	2–4	4–6	6–8	8–10	10–12	12–14	14–24	24–36	36–48
CK	271.10	272.30	271.70	274.80	69.13	69.80	71.48	71.93	72.40	72.78	14.84	12.60	6.26
HG	240.40	242.70	245.10	245.30	61.68	62.75	62.95	64.10	64.35	64.80	13.17	11.36	5.73
YG	232.00	231.80	236.90	238.00	59.83	61.20	60.88	62.38	62.48	62.96	12.72	10.74	5.37

Table S4. The observed and predicted Q_{\max} of phosphorus adsorption in 10 sampling sites

Obs., Observed value; Pred., Predicted value; e_i , the residuals between the observed value and predicted value

Sampling sites	Q_{\max}		
	Obs.	Pred.	e_i
CK	254.09	204.84	49.25
YG	86.63	101.82	-15.19
YC	255.43	234.39	21.04
YCL	233.136	212.71	20.426
HG	95.53	81.15	14.38
HH	106.25	98.20	8.05
HC	120.27	179.19	-58.92
HL	173.01	190.09	-17.08
GD	297.49	291.85	5.64
DWL	248.36	275.96	-27.6