Sedimentary Differentiation Characteristics of Organic Matter and Phosphorus in Eutrophic Lake Special Zones

LIU Ya-ping [1,2], SONG Di [1], JIAO Li-xin [2], ZHENG Jin-long [1,3]*, Zhang Miao [3], Yao Bo [3], Yan Jing-yi [3], Wu Jian-xun [3], Wen Xin [3]

1. Yunnan Key Laboratory for Pollution Processes and Control of Plateau Lake-Watersheds, Yunnan Research Academy of Eco-environmental Sciences, Kunming 650034, China;
2. State Key Laboratory of Environmental Criteria and Risk Assessment, Chinese Research Academy of Environmental Sciences, Beijing, 100012, China;
3. Kunming Institute of Ecological and Environmental Sciences, Kunming 650032, China.

Table.S1 Geochronological data from sediment cores.

Ecosystem	Period	Depth (cm)	T (year)	Average V ($cm \cdot yr^{-1}$)
Macrophyte-dominated	1970s	20–24	1971–1980	
	1980s	16–20	1980–1988	
	1990s	12–16	1988–1997	
		10–12	1997–2001	
Algal–dominated	2000s	8–10	2001–2006	0.46
		6–8	2006–2010	
	2010s	4–6	2010–2014	
		2–4	2014–2019	
	2020s	0–2	2019–2023	

Table S2 Changes of water environment in Qilu Lake

Category	1976	1980s	1990s	2000s	2010s
Ecological health status	ND	Good	Poor-Moderate	Moderate-Good	Poor
Aquatic vegetation coverage (%)	70%	ND	ND	ND	ND
Algal density (10^6 ind. / L)	ND	3.11	10.8	85.9	66-1610
TN(mg/L)	ND	0.75	1.94–4.03	2.07–3.40	3.40–5.03
TP(mg/L)	ND	0.04	0.04–0.08	0.04–0.061	0.065–0.109
Phytoplankton abundance (10^6 ind./L)	ND	314	799.50–932.42	120.16–941.83	96.89–468.73
Chlorophyll-a (mg / m^3)	ND	14.57	30.29–42.79	16.9–80.1	44.23–145.17

DO	ND	7.43	6.79–7.73	6.35–8.92	7.7–8.6
COD_{Mn}	ND	5.35	7.38–9.01	5.69–9	10.35–14.83
BOD_5	ND	1.81	2.56–4.08	3.05–5.96	6.03–8.85

ND indicates no data available. Reported values from multiple studies show observed variability within each decade, reflecting the progressive eutrophication of Lake Qilu, characterized by increasing nutrient levels and algal blooms over time[6,18,21,22].

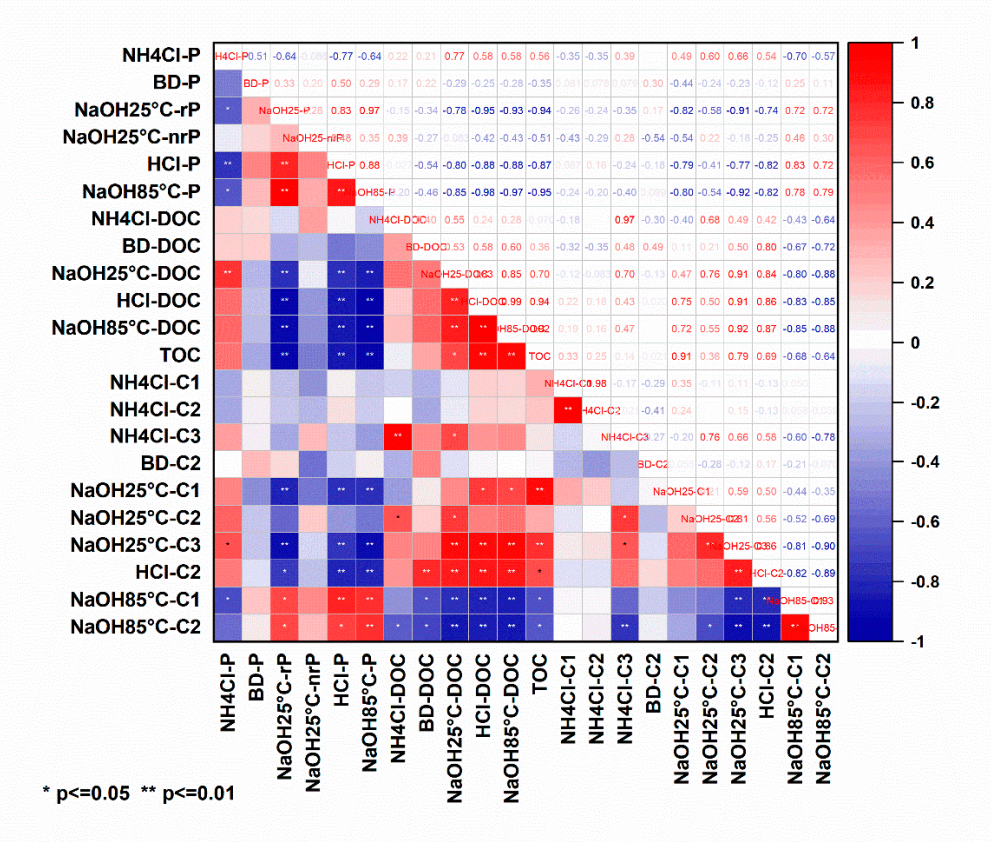

Figure S1 presents the correlation coefficients between phosphorus fractions and the corresponding fluorescence components, DOC and TOC in sediment extracts.