Supplements to Detailed Response to Reviewer
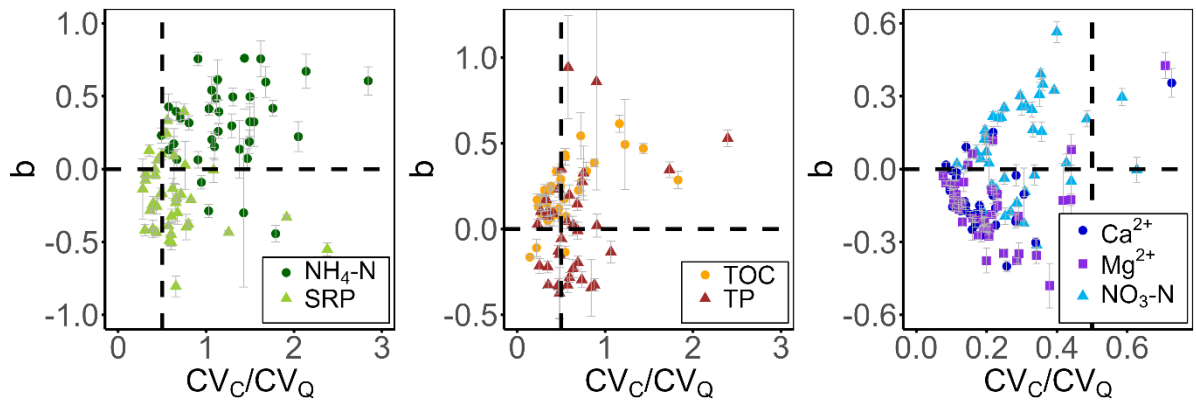
Figure 2: Illustration of the SEM for ▲ SRP, ● NH₄-N, ▲ TP, ● TOC, ▲ NO₃-N, ● Ca²⁺ and ■ Mg²⁺ clusters, with error bars representing ±1 standard error. Clusters represent temporal-dynamic solutes (green, left), short-term stable solutes (yellow/brown, middle), and long-term stable solutes (blue/violet, right). The vertical line separates chemostatic (left) from chemodynamic behaviour (right), while the horizontal line distinguishes enrichment (top) from dilution (bottom) patterns.
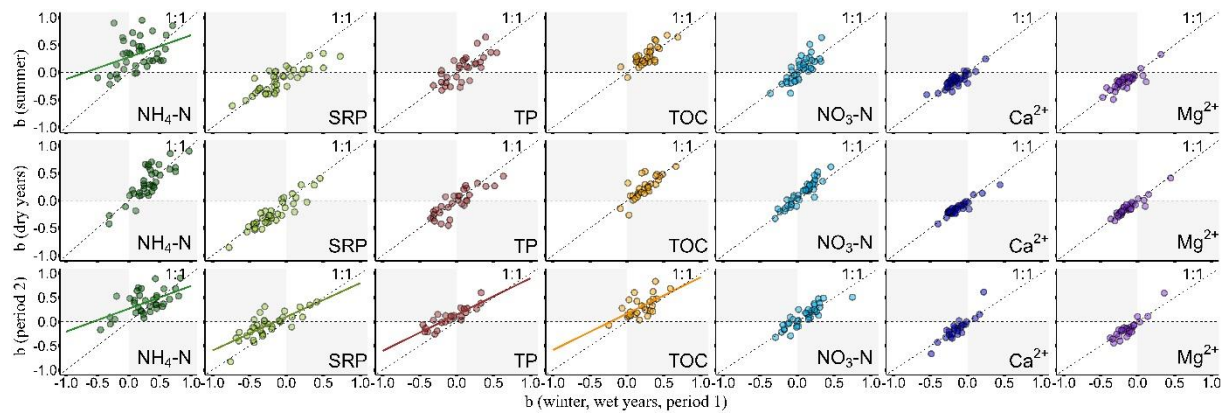
Figure 1: Differences in solute export mechanisms for NO₃-N, NH₄-N, SRP, TP, TOC, Ca, and Mg in response to temporal changes. Differences in solute export mechanisms: (top) summer and winter, (middle) dry years and wet years and (bottom) Period 2 and Period 1. Dots represent individual catchments. b = solute export mechanisms (b < 0: dilution; b > 0: enrichment behaviour). Regression lines included for significant temporal differences (p<0.05 and p<0.1 for TOC). Points above the 1:1 line indicate an increase in enrichment or a decrease in dilution behaviour, whereas points below the 1:1 line indicate a less pronounced enrichment or an increased dilution export pattern respectively. The gray areas indicate a directional shift in solute export.
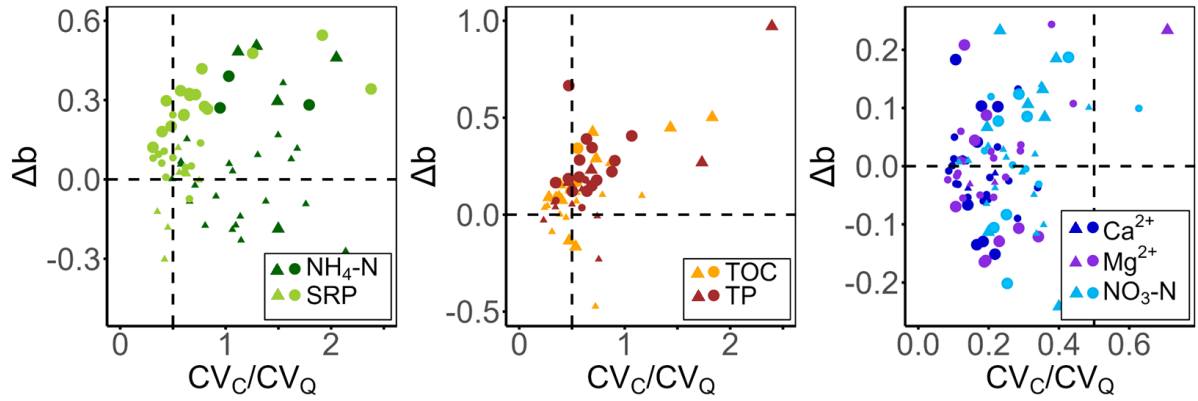
Figure 4: Change in cQ-relationships (Δb) for SRP, NH4-N, TP, TOC, NO3-N, Mg²⁺, and Ca²⁺ explained by climate change. Positive Δb values indicate an increasing enrichment behaviour. ▲ represent catchments exhibiting enrichment behaviour in Period 1, while ● indicate catchments with dilution behaviour in Period 1. Significant differences in slope b between Period 1 and Period 2 are highlighted by larger symbol sizes.

Table 2: Descriptive statistics of mean solute concentrations (C_{mean}, mg L⁻¹) and associated standard deviations ($C_{mean\pm SD}$) across all catchments. Interannual Trends in interannual solute concentrations are summarized as fraction of catchments (%) showing positive trends ($C_{increase}$), negative trends ($C_{decrease}$), or no significant trends (NC – no change). Trends were assessed using linear regression models (concentration vs. time), with p-values derived from F-tests and adjusted for multiple comparisons within each catchment dataset using the Benjamini–Hochberg procedure ($p < 0.05$). The number of catchments included in the analysis is denoted by _n_.

		NH₄-N (n=40)	SRP (n=40)	TP (n=38)	TOC (n=33)	NO₃-N (n=40)	Ca²⁺ (n=40)	Mg²⁺ (n=40)
$C_{mean + sd}$ (mg L⁻¹)		0.15 ± 0.11	0.11 ± 0.05	0.19 ± 0.09	4.77 ± 1.45	4.04 ± 1.81	66.06 ± 41.48	17.08 ± 12.71
Fraction of catchments	$C_{increase}$ (%)	2.5	0.0	2.6	15.2	2.5	15.0	12.5
	$C_{decrease}$ (%)	57.5	67.5	60.5	6.1	72.5	5.0	2.5
	NC (%)	40.0	32.5	36.8	78.8	25.0	80.0	85.0

Table 3: Pearson Correlation test between catchment descriptors of different categories and slope b showing influence of catchment characteristics on SEM: highly significant positive correlation (++ p<0.01), significant positive correlation (+ p<0.05), significant negative correlation (- p<0.05), highly significant negative correlation (-- p<0.01). Moderate (grey, r>0.3) and strong (dark grey, r>0.5) effect sizes were observed, indicating varying strengths of association. Differences between correlations in Period 1 and 2 are determined by using ANCOVA (p<0.05) showing increased impact of control due to climate change (△), decreased impact of control due to climate change (▽), no change (O). Pearson Correlation is corrected by Benjamini-Hochberg correction.

Category	Control	$NH_4\text{-}N$	SRP	TP	TOC	$NO_3\text{-}N$	Ca^{2+}	Mg^{2+}
Hydrology	Qmean							
	Qmedian							
	log(Qmean)			+ / ▽				
	q							
Topography	altitude							
	A							
Climate	P	- / O		++ / △		- / O		
	ET		++ / △	++ / △	++ / ▽	- / O		
	PET							
	dMI	- / △		++ / △		-- / O		
	ET/P			- / O				
	PET/P			- / O				
Land use	arable land					+ / O		
	pastures							
	forest							
	urban area					- / O		
Geology and soil	sandstone						+ / ▽	+ / O
	carbonate rock			+ / △				
	crystalline rock							
	clay rock		- / △	- / ▽				
	sediments							
	loess sediments							
	soil moisture	- / △		++ / △		- / O		