Supplementary material

Averages and standard deviations of campaign concentrations for each site of the ROK(1).

Site	Depth (cm)	Ca	Mg	K	Na	Si	N=
R8	15	1.01±0.05	0.46±0.01	0.07±0.09	0.86±0.09	3.98±0.43	4
	30	0.67±0.13	0.32±0.04	0.04±0.03	1.24±0.3	5.4±0.4	6
	45	0.58±0.07	0.29±0.04	0.18±0.13	1.18±0.24	5.41±1.14	7
	60	0.66±0.06	0.34±0.02	0.15±0.05	0.86±0.03	5.06±0.84	7
	75	0.95±0.25	0.35±0.07	0.22±0.25	1±0.26	3.07±0.47	7
		0.78±0.21	0.35±0.06	0.13±0.15	1.03±0.25	4.58±1.19	31
R5	15	1.65±0.13	0.65±0.05	0.59±0.17	1.89±0.14	6.72±0.82	8
	30	2.91±0.48	0.97±0.12	0.88±0.15	2.2±0.18	7.48±0.92	7
	45	2.96±0.44	1.01±0.12	0.93±0.1	2.23±0.13	7.81±0.67	8
	60	3.33±0.26	1.07±0.06	0.84±0.1	2.34±0.09	8.39±0.54	8
	75	3.64±0.28	1.15±0.07	0.84±0.15	2.43±0.19	8.93±0.36	8
		2.9±0.76	0.97±0.19	0.82±0.18	2.22±0.24	7.87±1.01	39
R6	15	1.61±0.45	0.6±0.15	0.6±0.25	1.73±0.12	5.45±0.53	8
	30	1.41±0.33	0.5±0.1	0.29±0.26	1.73±0.21	6.23±0.31	8
	45	2.13±0.2	0.65±0.05	0.26±0.24	1.87±0.13	7.44±0.34	8
	60	3.92±0.12	1.1±0.03	0.16±0.04	2.04±0.05	10±0.28	8
	75	6.09±0.51	1.7±0.19	0.99±0.11	2.15±0.13	10.46±0.33	8
		3.03±1.82	0.91±0.46	0.46±0.36	1.9±0.21	7.92±2.05	40
R7	15	2.56±0.2	0.74±0.06	0.46±0.16	1.82±0.14	7.1±0.57	8
	30	1.96±0.17	0.66±0.03	0.33±0.07	1.81±0.09	9.08±0.46	8
	45	2.71±0.29	0.94±0.12	0.3±0.05	2±0.12	11.03±0.85	8
	60	3.78±0.29	1.27±0.07	0.26±0.05	2.15±0.11	13.49±0.51	8
	75	3.56±0.11	1.33±0.03	0.34±0.12	2.23±0.07	13.32±0.67	7
		2.91±0.71	0.99±0.28	0.34±0.12	2±0.2	10.8±2.56	39
R9	15	0.4±0.08	0.56±0.11	0.16±0.08	1.39±0.14	4.19±0.24	4
	30	0.94±0.03	0.54±0.02	0.12±0.08	1.36±0.05	4.26±0.7	3
	45	3.12±1.03	1.52±0.5	0.68±0.37	1.88±0.14	5.81±0.57	7
	60	3.31±0.68	1.59±0.31	0.71±0.33	1.83±0.15	5.75±0.6	7
	75	4.62±0.58	2.35±0.3	0.76±0.19	2.4±0.28	9.89±1.21	3
		2.48±1.55	1.31±0.67	0.48±0.37	1.77±0.35	5.98±1.82	24
R10	15	2.34±0.57	0.64±0.13	1.18±0.29	1.62±0.17	6.98±0.47	8
	30	2.51±0.55	0.81±0.22	0.76±0.17	1.66±0.31	7.32±0.71	8
	45	2.46±0.53	0.9±0.19	0.97±0.23	2.01±0.17	6.83±0.47	8
	60	2.4±0.34	0.92±0.12	1.01±0.2	1.97±0.1	6.74±0.31	8
	75	3.19±0.7	1.12±0.22	1.26±0.17	1.9±0.15	5.93±0.41	8
		2.58±0.61	0.88±0.23	1.03±0.27	1.83±0.24	6.76±0.66	40
R4	15	-	-	-	-	-	0
	30	1.24±0.03	0.25±0.03	0.11±0.07	1.36±0.06	5.97±0.23	3
	45	1.6±0.35	0.53±0.09	0.25±0.1	1.71±0.06	5.78±0.34	6
	60	1.89±0.23	0.64±0.08	0.35±0.11	1.85±0.03	6.41±0.1	3
	75	2.37±0.17	0.75±0.05	0.37±0.17	2.01±0.11	6.13±0.39	7
		1.78±0.49	0.54±0.18	0.27±0.15	1.73±0.24	6.07±0.37	19
R1	15	1.68±0.26	0.76±0.14	0.2±0.13	1.72±0.48	4.72±0.58	5
	30	2.53±0.64	1.06±0.26	0.52±0.07	2.26±0.21	7.21±0.45	5
	45	2.66±0.22	1.07±0.08	0.51±0.1	2.09±0.16	7.52±0.44	5
	60	2.9±0.41	1.18±0.15	0.71±0.1	2.37±0.08	7.97±0.44	7
	75	3.58±0.25	1.34±0.06	0.87±0.07	2.58±0.16	7.75±0.46	7
		2.67±0.72	1.08±0.24	0.56±0.24	2.2±0.37	7.03±1.23	29
R2	15	3.93±0.76	0.99±0.15	0.32±0.08	1.72±0.08	7.95±0.55	4
	30	3.47±0.28	0.94±0.06	0.32±0.22	1.87±0.27	9.56±0.44	8
	45	4.19±0.27	1.21±0.07	0.39±0.26	1.87±0.18	10.16±0.44	7
	60	4.12±0.43	1.2±0.09	0.36±0.22	1.91±0.24	9.2±0.59	8
	75	4.39±0.45	1.26±0.11	0.32±0.09	1.83±0.12	8.75±0.54	8
		4.02±0.53	1.12±0.16	0.34±0.18	1.84±0.2	9.12±0.82	35
R15	15	2.1±0.29	0.72±0.08	0.22±0.2	1.65±0.24	5.33±0.6	8
	30	2.74±0.52	0.99±0.19	0.49±0.09	1.6±0.09	5.76±0.36	8
	45	2.19±0.29	0.78±0.12	0.55±0.09	1.74±0.11	6.8±0.23	3
	60	2.47±0.35	0.84±0.12	0.54±0.1	1.79±0.16	6.6±0.9	8
	75	1.99±0.19	0.73±0.06	0.42±0.08	1.73±0.1	6.58±0.84	7
		2.3±0.44	0.81±0.16	0.45±0.17	1.7±0.16	6.21±0.86	34
R11	15	12.32±1.01	3.98±0.35	1.65±0.12	3.22±0.16	13.37±0.71	8
	30	14.25±1.68	4.93±0.52	2.71±0.25	4.19±0.16	16.33±0.36	8
	45	10.83±0.34	3.73±0.12	2.49±0.15	4.05±0.13	15.05±0.28	8
	60	11.4±0.43	4.05±0.16	2.8±0.09	4.05±0.1	14.04±0.26	8
	75	10.05±0.45	3.42±0.16	2.81±0.1	3.99±0.06	14.39±0.26	8
		11.77±1.71	4.02±0.59	2.49±0.46	3.9±0.37	14.64±1.09	40
R12	15	2.34±0.4	0.9±0.12	0.8±0.15	2.95±0.26	6.76±0.41	8
	30	3.39±0.26	1.02±0.11	0.37±0.08	2.97±0.24	7.49±0.33	8
	45	3.62±0.16	1.06±0.05	0.63±0.05	2.88±0.09	7.97±0.25	8
	60	3.65±0.19	1.1±0.04	0.69±0.09	2.92±0.11	8.55±0.32	8
	75	4.06±0.11	1.26±0.03	1.02±0.1	2.91±0.05	8.92±0.32	8
		3.41±0.63	1.07±0.14	0.7±0.23	2.93±0.17	7.94±0.84	40
R14	15	7.94±0.78	2.76±0.26	1.98±0.22	3.19±0.15	10.14±0.36	7
	30	8.03±0.71	2.41±0.19	2.16±0.21	3.19±0.18	9.88±0.46	8
	45	8.34±0.98	2.37±0.26	2.6±0.2	3.12±0.17	9.14±0.29	7
	60	7.52±0.75	2.2±0.2	2.68±0.18	3.14±0.11	9.65±0.19	8
	75	6.98±0.65	2.08±0.17	2.45±0.16	2.87±0.12	8.87±0.16	8
		7.76±0.88	2.36±0.31	2.37±0.32	3.1±0.19	9.53±0.56	38

Coefficients of determinations (R^2) (columns 2 to 6) and slopes (columns 7 to 11) of the concentration-discharge relationship for each stream site at Krycklan during 2008 and 2009. All coefficients were statistically significant at level p<0.01 except values in italics. Data for K in site C3 were not available.

Site	Ca	Mg	K	Na	Si	Ca	Mg	K	Na	Si
C4	0.79	0.72	*0.03*	0.80	0.83	-0.43	-0.41	-0.04	-0.21	-0.25
C2	0.13	0.18	*0.10*	0.73	0.81	-0.05	-0.07	-0.06	-0.14	-0.17
C7	0.54	0.58	*0.12*	0.85	0.92	-0.13	-0.16	-0.09	-0.15	-0.20
C5	0.39	0.29	0.40	0.26	0.18	-0.09	-0.09	0.12	-0.05	-0.05
C6	0.55	0.56	*0.14*	0.71	0.89	-0.14	-0.15	-0.10	-0.16	-0.21
C9	0.72	0.70	0.28	0.80	0.84	-0.17	-0.20	-0.14	-0.17	-0.18
C13	0.46	0.47	*0.03*	0.84	0.81	-0.12	-0.13	-0.05	-0.18	-0.19
C3	0.34	0.23	-	0.67	0.87	-0.20	-0.19	-	-0.19	-0.34
C10	0.62	0.63	*0.11*	0.88	0.91	-0.20	-0.20	-0.09	-0.21	-0.26
C1	0.41	0.36	*0.02*	0.68	0.75	-0.07	-0.07	-0.02	-0.11	-0.12
C12	0.55	0.56	0.14	0.87	0.89	-0.14	-0.15	-0.10	-0.18	-0.21
C14	0.70	0.70	*0.01*	0.83	0.75	-0.14	-0.13	0.02	-0.15	-0.15
C15	0.60	0.61	*0.04*	0.53	0.62	-0.11	-0.13	-0.03	-0.13	-0.13
C16	0.87	0.87	0.44	0.89	0.87	-0.20	-0.21	-0.15	-0.19	-0.18

Mineralogical content of some riparian soil samples corresponding to the ROK[(1)] sites. Only depths that are shown were analysed. Note that R3 and R13 are included here. These sites were flooded and could not be used for soil water chemistry but their mineralogy is important because support the homogeneity in all sites except in site R9. An error of ca. 10 % weight in the sum of the minerals and organic intrusions explain that some sites do not sum 100 %.

Site	Depth	Quart (%)	Muscovite (%)	Chlorite (%)	Plagioclase (%)	K-feldspar (%)	Amphibolites (%)	Total (%)
R3	62.5	32	2	1	20	21	9	85
R4	17.5	36	4	4	20	19	17	100
R4	32.5	35	2	2	21	33	7	100
R4	42.5	38	3	3	25	16	14	99
R4	62.5	42	5	2	24	19	8	100
R6	42.5	40	4	1	23	25	7	100
R9	32.5	9	7	21	14	43	0	94
R9	47.5	10	10	5	16	14	32	87
R9	62.5	15	3	18	16	39	0	91
R12	17.5	36	3	2	24	18	21	104
R12	32.5	43	2	1	20	23	11	100
R12	47.5	38	2	3	21	19	11	94
R13	17.5	41	5	2	25	21	6	100
R13	32.5	36	8	2	24	21	9	100
R14	2.5	32	14	3	25	19	7	100
R14	7.5	31	16	3	23	18	9	100
R15	17.5	36	7	2	21	23	11	100
R15	32.5	38	4	2	24	18	14	100
R15	42.5	41	3	3	24	20	9	100
R15	62.5	36	7	2	24	21	10	100

Flow-weighted concentrations from streams and riparian sites including scenario SU1(2): stream sites (italics), flow-weighted concentrations using average campaign concentrations (normal format), flow-weighted concentrations using maximum and minimum campaign concentrations (within brackets), average of all riparian sites (bold). Data for K in site C3 were not available. The table is ordered in stretches and sorted from small headwaters to larger subcatchments downstream.

Stretch	Stream site	Riparian site	Stream order	Ca ($mg\ L^{-1}$)		Mg ($mg\ L^{-1}$)		K ($mg\ L^{-1}$)		Na ($mg\ L^{-1}$)		Si ($mg\ L^{-1}$)	
I	C4	R8	1	*0.90*	0.98 (0.92–1.03)	*0.31*	0.45 (0.42–0.46)	*0.30*	0.07 (0.03–0.20)	*0.74*	0.89 (0.77–1.01)	*2.22*	4.09 (3.68–4.65)
II	C2	R5	1	*1.70*	1.91 (1.58–2.19)	*0.63*	0.72 (0.62–0.83)	*0.32*	0.65 (0.49–0.97)	*1.57*	1.95 (1.70–2.13)	*5.29*	6.89 (5.98–8.34)
		R6			1.60 (1.14–2.24)		0.58 (0.44–0.78)		0.51 (0.25–0.96)		1.74 (1.54–1.98)		5.74 (5.21–6.57)
		R7			2.76 (2.40–3.07)		0.92 (0.80–0.99)		0.35 (0.26–0.52)		1.95 (1.78–2.12)		10.1 (9.17–10.9)
I–II	C7	R9	2	*1.64*	2.51 (1.91–3.58)	*0.55*	1.26 (1.00–1.77)	*0.32*	0.51 (0.22–0.91)	*1.24*	1.73(1.55–1.89)	*4.18*	5.50 (4.80–6.36)
		R10			2.42 (1.61–3.18)		0.74 (0.51–0.99)		0.98 (0.55–1.25)		1.67 (1.39–2.08)		7.12 (6.23–8.06)
III	C5		1	*1.14*		*0.33*		*0.27*		*0.75*		*2.58*	
	C6	R4	1	*1.60*	1.83 (1.53–2.17)	*0.50*	0.60 (0.52–0.69)	*0.34*	0.31 (0.22–0.49)	*1.05*	1.81 (1.74–1.87)	*3.58*	6.12 (5.80–6.42)
I–III	C9		3	*2.15*		*0.67*		*0.38*		*1.35*		*4.67*	
IV	C8	R1	2		2.75 (2.32–3.30)		1.11 (0.95–1.33)		0.59 (0.51–0.74)		2.24 (2.10–2.50)		7.52 (7.02–8.11)
		R2			3.87 (3.19–4.82)		0.98(0.85–1.18)		0.32 (0.21–0.47)		1.75 (1.67–1.93)		8.24 (7.75–8.90)
I–IV	C13	R15	3	*2.25*	2.27 (1.77–2.66)	*0.72*	0.80(0.64–0.94)	*0.43*	0.44 (0.32–0.66)	*1.38*	1.70(1.51–1.94)	*4.64*	6.20 (5.07–6.85)
V	C3		1	*0.55*		*0.20*		-		*0.52*		*1.91*	
	C10	R11	2	*1.65*	12.4 (10.9–13.9)	*0.48*	4.00 (3.64–4.57)	*0.35*	1.67 (1.48–1.91)	*1.12*	3.24(3.03–3.44)	*3.95*	13.4 (12.7–14.9)
VI	C1	R12	2	*2.16*	3.68 (3.42–3.91)	*0.82*	1.11 (1.04–1.20)	*0.40*	0.70 (0.59–0.82)	*1.70*	2.92(2.75–3.11)	*5.83*	8.27 (7.81–8.69)
V-VI	C12		3	*1.95*		*0.59*		*0.37*		*1.30*		*4.55*	
VII	C14	R14	3	*2.81*	7.95 (6.64–8.77)	*0.86*	2.63(2.25–2.93)	*0.69*	2.09 (1.75–2.40)	*1.51*	3.17(2.98–3.40)	*4.67*	9.97 (9.36–10.4)
VIII	C15		4	*2.52*		*0.72*		*0.54*		*1.38*		*4.18*	
I–VIII	C16		4	*3.10*	**3.61 (3.03-4.22)**	*0.99*	**1.22 (1.05-1.43)**	*0.84*	**0.71 (0.53-0.95)**	*1.61*	**2.06 (1.88-2.26)**	*4.95*	**7.63 (6.96-8.40)**

Scenario SU2. Variation (%) in the minimum, average, and maximum flow-weighted concentrations per site after assess the sensitivity of BC flow-weighted concentrations to uncertainties in groundwater table levels by allowing z_{Gw}^{mod} to vary between ± 1.96 standard deviations of the modelled estimates with respect to the observations at each site.

Site	Ca Min	Ca Avg	Ca Max	Mg Min	Mg Avg	Mg Max	K Min	K Avg	K Max	Na Min	Na Avg	Na Max	Si Min	Si Avg	Si Max
+1.96Stdev															
R8	2.2	1.4	1.1	1.8	1.3	1.0	0.0	1.1	1.3	-0.6	-1.7	-2.7	-1.6	-1.4	-1.5
R5	-4.8	-6.1	-7.4	-2.8	-4.2	-4.0	-6.6	-4.2	-2.9	-2.0	-1.5	-2.2	-0.3	-1.1	-0.5
R6	-0.1	0.0	1.7	0.6	1.0	2.2	12.4	6.5	1.6	-0.1	-0.2	-1.3	-2.0	-2.0	-0.9
R7	-7.5	-6.3	-6.5	-8.8	-8.2	-8.0	3.2	4.3	4.5	-2.9	-2.5	-1.8	-7.6	-7.0	-6.5
R9	-26.4	-27.5	-26.9	-19.7	-21.6	-21.1	-34.0	-26.7	-24.8	-6.6	-7.5	-8.2	-8.8	-9.4	-10.6
R10	-2.1	-0.9	-0.5	-1.9	-3.8	-5.5	1.4	5.2	4.4	0.2	-1.3	-1.4	0.7	-0.4	-1.3
R4	-7.3	-5.8	-4.0	-8.7	-7.5	-6.9	-10.8	-8.9	-8.8	-3.2	-3.3	-3.2	-1.2	-1.1	-0.7
R1	-5.8	-4.8	-3.9	-5.7	-3.8	-2.7	-10.5	-8.9	-6.6	-4.0	-2.7	-0.3	-3.7	-3.4	-3.3
R2	0.1	0.8	1.9	-0.6	0.2	1.0	2.7	-0.3	-6.8	-0.2	-0.7	-2.7	-1.7	-1.8	-1.9
R15	0.5	1.8	3.1	0.0	1.5	2.5	-3.1	-1.8	0.8	-1.8	-0.9	-0.5	0.6	-2.0	-2.9
R11	-0.1	-0.2	-0.2	-0.2	-0.3	-0.2	-0.7	-0.7	-0.7	-0.4	-0.3	-0.3	-0.3	-0.2	-0.1
R12	-6.1	-4.2	-2.9	-5.1	-3.3	-1.4	-8.8	-6.9	-4.9	-1.1	0.2	1.5	-2.6	-2.9	-2.3
R14	0.0	0.0	-0.1	0.6	0.5	0.5	-0.9	-0.6	-0.5	0.1	0.0	0.0	0.1	0.2	0.1
-1.96Stdev															
R8	-10.3	-6.8	-5.2	-8.3	-6.0	-4.6	0.0	-4.7	-6.0	2.9	8.0	12.5	7.5	6.5	7.1
R5	9.1	11.5	13.9	5.3	7.9	7.6	12.4	8.0	5.3	3.7	2.9	4.1	0.8	2.1	0.9
R6	1.8	1.0	-2.4	-0.1	-1.2	-3.6	-21.6	-11.5	-3.1	0.4	0.4	2.2	4.0	3.9	1.9
R7	11.1	8.2	8.0	14.8	12.3	11.4	-4.2	-7.2	-6.0	5.1	3.9	2.5	13.0	11.7	10.7
R9	27.1	26.5	21.7	23.6	24.2	19.5	48.5	25.5	19.3	6.8	9.1	9.5	13.8	13.8	13.6
R10	2.1	0.8	0.4	2.5	4.2	5.3	-0.3	-4.3	-3.2	0.9	1.9	1.4	-0.7	0.1	0.7
R4	8.8	6.0	3.3	8.0	6.1	5.4	7.8	6.9	8.6	2.3	2.7	3.0	0.7	0.9	0.6
R1	5.5	4.3	2.4	5.2	3.2	1.0	8.8	7.7	6.1	2.5	2.1	0.5	1.8	1.9	1.9
R2	0.0	-2.0	-4.7	1.9	-0.1	-2.4	-6.7	1.0	17.9	0.5	1.9	6.8	4.6	4.7	5.0
R15	1.0	-0.6	-2.5	0.6	0.7	-0.2	14.1	8.1	-2.6	3.8	0.7	-2.0	2.1	3.5	4.1
R11	0.4	0.7	0.8	0.7	1.1	1.0	3.0	2.9	2.8	1.5	1.4	1.3	1.1	1.0	0.6
R12	4.3	2.9	1.8	4.3	3.1	1.2	12.4	11.2	8.9	1.0	-0.2	-1.7	1.9	2.4	1.9
R14	-0.1	0.0	0.4	-1.5	-1.4	-1.3	2.3	1.5	1.2	-0.3	-0.1	-0.1	-0.4	-0.5	-0.2

Days (and percentage of the total lateral water flow) with modelled groundwater tables above the surface for the two-year period 2008-2009. Within brackets the corresponding days (or percentage) during spring flood. Also, standard deviations of the modelled estimates with respect to the observations at each site.

Site	Overland flow (days)	Overland flow (%)	Stdev (mm)
R8	81 (41)	19.7 (13.4)	41
R5	13 (12)	5.4 (4.9)	27
R6	34 (26)	13.6 (11.4)	29
R7	23 (19)	7.9 (6.9)	70
R9	0	0	48
R10	0	0	20
R4	0	0	24
R1	0	0	28
R2	46 (31)	16.1 (12.8)	38
R15	8 (7)	1.8 (1.7)	88
R11	70 (38)	18.3 (13.3)	24
R12	0	0	40
R14	0	0	22

(1)ROK: Riparian Observatory in Krycklan

(2)Scenario SU1: we estimate the potential magnitude of variations of flow-weighted concentrations for each element and ROK site based on z_{Gw}^{mod} by using maximum and minimum campaign concentrations.