

# **A lab in the field: High-frequency analysis of water quality and stable isotopes in streamwater and precipitation**

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Supplement

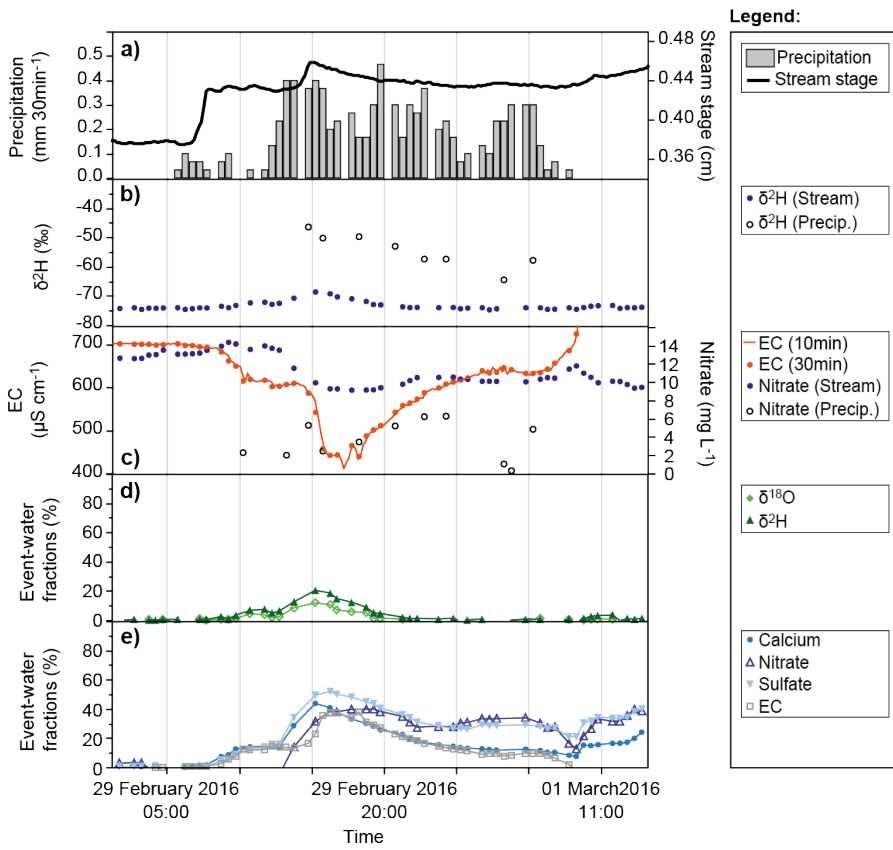


Figure S1: Precipitation Event #5 together with the hydrologic (a), isotopic (b) and chemical (c) responses in streamwater. Panels d) and e) show the fractions of event-water based on isotopic hydrograph separation (IHS) and chemical hydrograph separation (CHS), respectively, which are different for both types of tracers: While the IHS yields event-water fractions smaller than 20%, CHS based on chemical tracers estimated much larger event-water fractions of more than 40%.

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Table S 1: End-members and event-water fractions during peak flow.

Event	$\delta^{18}\text{O}$ (‰)	$\delta^2\text{H}$ (‰)	$\text{Ca}^{2+}$ (mg L <sup>-1</sup> )	$\text{NO}_3^-$ (mg L <sup>-1</sup> )	$\text{SO}_4^{2-}$ (mg L <sup>-1</sup> )	EC ( $\mu\text{S cm}^{-1}$ )
<b>Pre-event-water end member (<math>C_P</math>) <math>\pm SE_{CP}</math></b>						
#1	-10.98±0.03	-75.10±0.20	162.84±1.84	11.33±0.05	20.22±1.27	708.80±18.45
#2	-10.61±0.07	-73.36±0.29	166.66±1.58	13.85±0.12	24.18±1.49	718.40±14.39
#3	-10.71±0.03	-73.57±0.18	166.28±1.62	12.84±0.10	23.77±1.47	711.20±14.28
#4	-10.77±0.05	-73.74±0.32	158.11±1.53	11.18±0.08	21.84±1.35	667.00±13.88
#5	-10.78±0.03	-74.24±0.20	163.97±1.66	12.94±0.18	24.46±1.51	700.40±14.01
#6	-11.25±0.03	-77.30±0.21	137.90±1.86	8.05±0.10	14.23±0.92	562.20±12.61
#7	-10.93±0.03	-75.52±0.18	163.61±1.57	11.52±0.12	21.05±1.30	694.40±13.93
#8	-11.06±0.04	-76.20±0.21	166.67±1.61	11.66±0.10	22.22±1.37	696.80±14.09
<b>Event-water end member (<math>C_E</math>) <math>\pm SE_{CE}</math> at peak flow</b>						
#1	-13.00±0.26	-91.86±3.65	13.14±3.19	0.38±0.22	0.12±0.06	53.88±24.97
#2	-5.62±0.30	-55.71±2.57	15.90±2.37	1.63±0.66	1.27±0.63	15.80±20.69
#3	-8.42±0.73	-61.52±4.44	16.31±0.89	0.46±0.13	0.07±0.04	24.02±20.34
#4	-10.70±0.54	-94.29±4.36	10.05±1.69	1.84±0.30	0.05±0.04	5.91±20.07
#5	-5.92±0.09	-46.96±1.32	13.76±1.01	3.39±0.71	2.39±0.60	12.87±20.07
#6	-11.87±0.40	-86.22±2.21	6.99±3.76	0.31±0.16	0.05±0.04	10.58±20.92
#7	-14.58±1.06	-130.11±6.16	10.81±2.21	1.28±0.50	0.06±0.04	18.15±21.15
#8	-15.29±0.50	-121.41±2.76	12.15±2.56	2.72±0.45	0.17±0.15	20.24±20.98
<b>Streamwater end member (<math>C_S</math>) <math>\pm SE_{CS}</math> at peak flow</b>						
#1	-11.85±0.03	-82.19±0.17	78.00±0.78	4.16±0.03	7.12±0.46	414.00±8.28
#2	-10.27±0.03	-70.60±0.17	64.60±0.66	3.73±0.03	5.12±0.34	264.00±5.28
#3	-10.04±0.03	-69.28±0.17	89.92±0.89	6.26±0.04	10.52±0.67	346.00±6.92
#4	-12.54±0.03	-87.74±0.17	90.82±0.90	5.39±0.04	8.00±0.52	428.00±8.56
#5	-10.20±0.03	-68.66±0.17	98.23±0.96	9.94±0.04	13.56±0.85	542.00±10.84
#6	-11.58±0.03	-80.06±0.17	107.28±1.04	5.48±0.04	9.57±0.61	336.00±7.24
#7	-15.12±0.03	-106.78±0.17	91.31±0.90	4.58±0.04	7.59±0.49	366.00±7.32
#8	-12.54±0.03	-85.85±0.17	142.95±1.36	9.65±0.04	16.71±1.04	1338.00±26.76
<b>Event-water fraction <math>F_E \pm SE</math> (%) at peak flow</b>						
Event	$\delta^{18}\text{O}$	$\delta^2\text{H}$	$\text{Ca}^{2+}$	$\text{NO}_3^-$	$\text{SO}_4^{2-}$	EC
#1	42.85±5.80	42.29±9.28	56.67±1.42	65.45±1.35	65.21±3.20	45.01±2.64
#2	6.72±1.49	15.68±2.84	67.70±1.20	82.84±4.50	83.17±2.95	64.67±2.17
#3	29.21±9.43	35.61±13.23	50.92±0.85	53.15±0.75	55.93±3.92	53.15±2.11
#4	<sup>a</sup>	68.15±14.48	45.45±0.98	61.99±2.06	63.53±3.28	36.15±2.16
#5	11.79±0.85	20.44±1.30	43.77±0.94	31.43±2.69	49.40±5.35	23.04±2.32
#6	52.06±34.19	30.90±8.05	23.39±1.51	33.24±1.24	32.92±6.13	36.29±2.40
#7	114.79±33.35	57.27±6.47	47.32±1.05	67.77±3.34	64.11±3.24	48.56±2.15
#8	35.03±4.22	21.36±1.40	15.35±1.27	22.44±1.49	25.02±6.63	-94.77±6.38 <sup>b</sup>

<sup>a</sup> Unrealistic event-water fractions were obtained because the  $\delta^{18}\text{O}$  signatures in precipitation and streamwater were too similar.

<sup>b</sup> Wash-off of road salt resulted in unrealistic event-water fractions based on EC.

Table S 2: End-members and event-water fractions during maximum event-water fraction.

Event	$\delta^{18}\text{O}$ (‰)	$\delta^2\text{H}$ (‰)	$\text{Ca}^{2+}$ (mg L <sup>-1</sup> )	$\text{NO}_3^-$ (mg L <sup>-1</sup> )	$\text{SO}_4^{2-}$ (mg L <sup>-1</sup> )	EC ( $\mu\text{S cm}^{-1}$ )
<b>Pre-event-water end member (<math>C_P</math>) <math>\pm SE_{CP}</math></b>						
#1	-10.98 $\pm$ 0.03	-75.10 $\pm$ 0.20	162.84 $\pm$ 1.84	11.33 $\pm$ 0.05	20.22 $\pm$ 1.27	708.80 $\pm$ 18.45
#2	-10.61 $\pm$ 0.07	-73.36 $\pm$ 0.29	166.66 $\pm$ 1.58	13.85 $\pm$ 0.12	24.18 $\pm$ 1.49	718.40 $\pm$ 14.39
#3	-10.71 $\pm$ 0.03	-73.57 $\pm$ 0.18	166.28 $\pm$ 1.62	12.84 $\pm$ 0.10	23.77 $\pm$ 1.47	711.20 $\pm$ 14.28
#4	-10.77 $\pm$ 0.05	-73.74 $\pm$ 0.32	158.11 $\pm$ 1.53	11.18 $\pm$ 0.08	21.84 $\pm$ 1.35	667.00 $\pm$ 13.88
#5	-10.78 $\pm$ 0.03	-74.24 $\pm$ 0.20	163.97 $\pm$ 1.66	12.94 $\pm$ 0.18	24.46 $\pm$ 1.51	700.40 $\pm$ 14.01
#6	-11.25 $\pm$ 0.03	-77.30 $\pm$ 0.21	137.90 $\pm$ 1.86	8.05 $\pm$ 0.10	14.23 $\pm$ 0.92	562.20 $\pm$ 12.61
#7	-10.93 $\pm$ 0.03	-75.52 $\pm$ 0.18	163.61 $\pm$ 1.57	11.52 $\pm$ 0.12	21.05 $\pm$ 1.30	694.40 $\pm$ 13.93
#8	-11.06 $\pm$ 0.04	-76.20 $\pm$ 0.21	166.67 $\pm$ 1.61	11.66 $\pm$ 0.10	22.22 $\pm$ 1.37	696.80 $\pm$ 14.09
<b>Event-water end member (<math>C_E</math>) <math>\pm SE_{CE}</math> at maximum event-water fraction</b>						
#1	-12.95 $\pm$ 0.25	-93.36 $\pm$ 4.23	13.14 $\pm$ 3.19	0.38 $\pm$ 0.22	0.12 $\pm$ 0.06	50.64 $\pm$ 24.97
#2	-5.62 $\pm$ 0.30	-55.71 $\pm$ 2.57	15.90 $\pm$ 2.37	1.63 $\pm$ 0.66	1.27 $\pm$ 0.63	15.80 $\pm$ 20.69
#3	-7.99 $\pm$ 0.90	-58.77 $\pm$ 4.26	16.31 $\pm$ 0.89	0.46 $\pm$ 0.13	0.07 $\pm$ 0.04	24.02 $\pm$ 20.34
#4	-10.70 $\pm$ 0.54	-94.29 $\pm$ 4.36	10.05 $\pm$ 1.69	1.84 $\pm$ 0.30	0.05 $\pm$ 0.04	5.47 $\pm$ 20.06
#5	-5.92 $\pm$ 0.09	-46.96 $\pm$ 1.32	13.76 $\pm$ 1.01	3.51 $\pm$ 0.46	2.08 $\pm$ 0.56	10.58 $\pm$ 20.09
#6	-11.87 $\pm$ 0.40	-86.22 $\pm$ 2.21	6.99 $\pm$ 3.76	0.31 $\pm$ 0.16	0.05 $\pm$ 0.04	10.58 $\pm$ 20.92
#7	-14.24 $\pm$ 1.28	-129.38 $\pm$ 7.76	11.53 $\pm$ 2.41	1.49 $\pm$ 0.56	0.06 $\pm$ 0.04	18.15 $\pm$ 21.17
#8	-15.29 $\pm$ 0.50	-121.41 $\pm$ 2.76	12.07 $\pm$ 2.62	2.77 $\pm$ 0.45	0.13 $\pm$ 0.14	20.24 $\pm$ 20.98
<b>Event Streamwater end member (<math>C_S</math>) <math>\pm SE_{CS}</math> at maximum event-water fraction</b>						
#1	-12.52 $\pm$ 0.03	-85.99 $\pm$ 0.17	78.00 $\pm$ 0.78	4.16 $\pm$ 0.15	7.12 $\pm$ 0.46	343.00 $\pm$ 6.86
#2	-10.27 $\pm$ 0.03	-70.60 $\pm$ 0.17	64.60 $\pm$ 0.66	3.73 $\pm$ 0.03	5.12 $\pm$ 0.34	264.00 $\pm$ 5.28
#3	-9.57 $\pm$ 0.03	-67.26 $\pm$ 0.17	89.92 $\pm$ 0.89	5.77 $\pm$ 0.04	10.03 $\pm$ 0.67	346.00 $\pm$ 6.92
#4	-12.54 $\pm$ 0.03	-87.74 $\pm$ 0.17	90.82 $\pm$ 0.90	5.39 $\pm$ 0.04	8.00 $\pm$ 0.52	347.00 $\pm$ 6.94
#5	-10.20 $\pm$ 0.03	-68.66 $\pm$ 0.17	98.23 $\pm$ 0.96	9.13 $\pm$ 0.04	12.86 $\pm$ 0.81	425.00 $\pm$ 8.50
#6	-11.58 $\pm$ 0.03	-80.06 $\pm$ 0.17	107.28 $\pm$ 1.04	5.48 $\pm$ 0.04	9.57 $\pm$ 0.61	336.00 $\pm$ 6.72
#7	-15.48 $\pm$ 0.03	-109.94 $\pm$ 0.17	88.22 $\pm$ 0.87	4.58 $\pm$ 0.04	7.59 $\pm$ 0.49	366.00 $\pm$ 7.32
#8	-12.93 $\pm$ 0.03	-89.25 $\pm$ 0.17	130.86 $\pm$ 1.25	9.06 $\pm$ 0.04	14.83 $\pm$ 0.93	1577.00 $\pm$ 26.76
<b>Maximum event-water fraction <math>F_{E,max} \pm SE_{FE}</math> (%)</b>						
Event	$\delta^{18}\text{O}$	$\delta^2\text{H}$	$\text{Ca}^{2+}$	$\text{NO}_3^-$	$\text{SO}_4^{2-}$	EC
#1	78.17 $\pm$ 10.22	59.65 $\pm$ 13.87	56.67 $\pm$ 1.42	65.45 $\pm$ 1.92	65.21 $\pm$ 3.20	55.58 $\pm$ 2.66
#2	6.72 $\pm$ 1.49	15.68 $\pm$ 2.84	67.70 $\pm$ 1.20	82.84 $\pm$ 4.50	83.17 $\pm$ 2.95	64.67 $\pm$ 2.17
#3	41.99 $\pm$ 13.90	42.61 $\pm$ 12.33	50.92 $\pm$ 0.85	57.08 $\pm$ 0.77	57.96 $\pm$ 3.84	53.15 $\pm$ 2.11
#4	- <sup>a</sup>	68.15 $\pm$ 14.48	45.45 $\pm$ 0.98	61.99 $\pm$ 2.06	63.53 $\pm$ 3.28	48.37 $\pm$ 2.10
#5	11.79 $\pm$ 0.85	20.44 $\pm$ 1.30	43.77 $\pm$ 0.94	40.35 $\pm$ 2.31	51.83 $\pm$ 5.03	39.92 $\pm$ 2.09
#6	52.06 $\pm$ 34.19	30.90 $\pm$ 8.05	23.39 $\pm$ 1.51	33.24 $\pm$ 1.24	32.92 $\pm$ 6.13	41.01 $\pm$ 2.39
#7	137.17 $\pm$ 53.13	63.92 $\pm$ 9.22	49.57 $\pm$ 1.10	69.19 $\pm$ 3.93	64.11 $\pm$ 3.24	48.56 $\pm$ 2.15
#8	44.35 $\pm$ 5.29	28.88 $\pm$ 1.83	23.16 $\pm$ 1.20	29.26 $\pm$ 1.75	33.45 $\pm$ 5.89	-94.65 $\pm$ 6.37 <sup>b</sup>

5 <sup>a</sup> Unrealistic event-water fractions were obtained because the  $\delta^{18}\text{O}$  signatures in precipitation and streamwater were too similar.

<sup>b</sup> Wash-off of road salt resulted in unrealistic event-water fractions based on EC.