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Supplement of

Hydrodynamics of a high Alpine catchment characterized by four natural tracers

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Supplementary Material

Summary:

This document contains pictures of the Vallon de Nant catchment (Figure S1 and Figure S2) and gauging station at the outlet (Figure S3). Next the Figure S4 shows the hypsometric curve of the Vallon de Nant. The Figure S5 presents three streamflow measurements along the stream, and the Figure S6 the location of all springs in the catchment. The Figure S7 presents a comparison of the electric conductivity of water samples when they were measured in the field and in the lab months later. Figure S8 combines time series of water table depth and temperature at PZ1 and PZ2. Figure S9 is an illustration of the 7-day moving average and Figure S10 is a dual-isotope plot of all samples.
Table S1 gives the location of the measurement points. Table S2 summarizes the start and end dates of each hydrological period and characteristic flow conditions and the Table S3 gives the start and end dates of each snowcover period at the soil temperature points.

Figure S1: Pictures of the Vallon de Nant taken during different the field work seasons

Figure S2: Comparison of vegetation cover between a historical picture (1912 or before, on top) and an actual picture (2017, on bottom). Credit for the top picture: Robert di Salvo

Figure S3: River stage measure at the outlet. The streamflow is here measured between 0.96 and 1.13 $m^3.s^{-1}$.

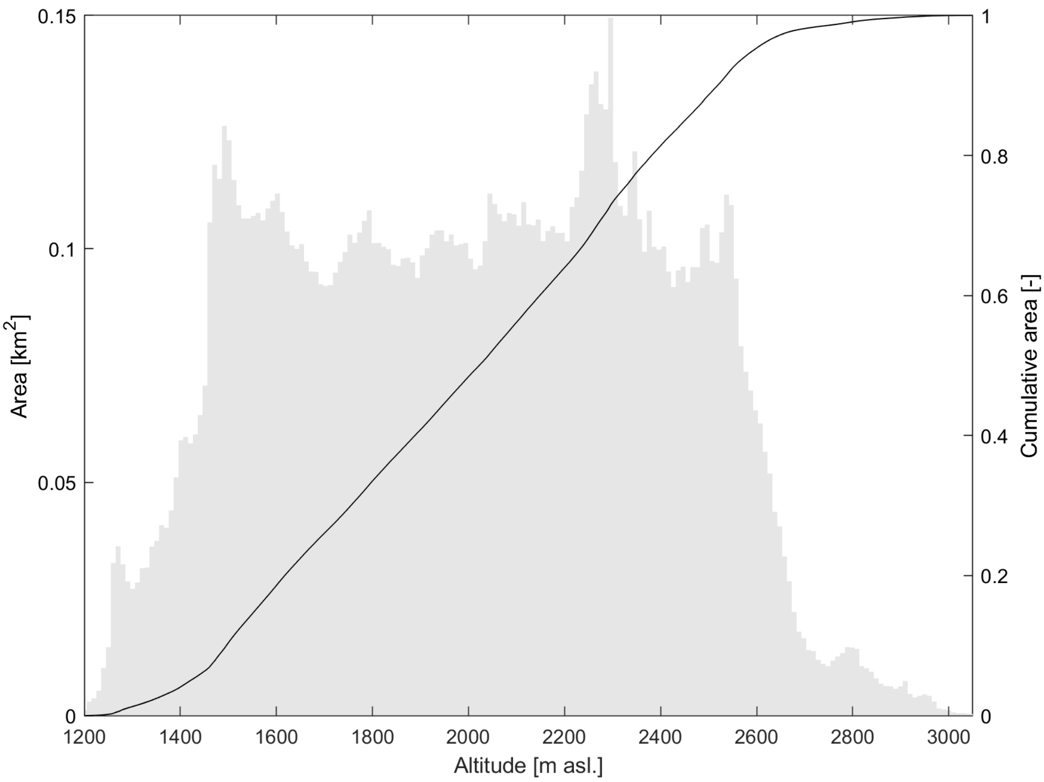

Figure S4: Hypsometric curve of the Vallon de Nant.

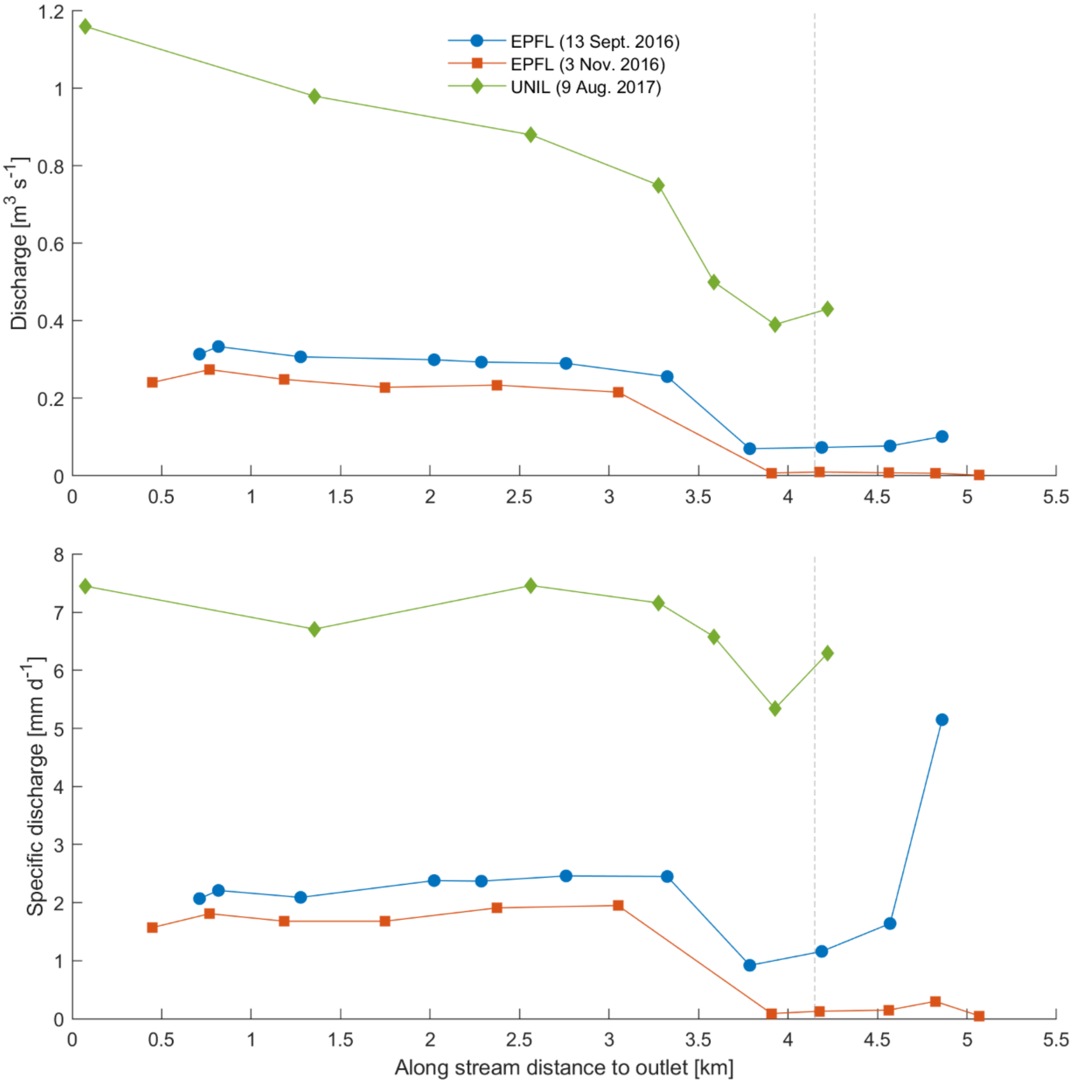

Figure S5: Discharge (top) and specific discharge (bottom) along the main stream measured by the Stream Biofilm and Ecosystem Research Laboratory group (EPFL) and the Catchment hydrology group (UNIL). The mean specific discharge measured at the outlet during the measures was 2.2 mm d^{-1} (1.7 to 2.8 mm d^{-1}) on 13 Sept. 2016, 2.0 mm d^{-1} (1.5 to 2.5 mm d^{-1}) on 3 Nov. 2016, and 3.6 mm d^{-1} (2.9 to 4.4 mm d^{-1}) on 9 Aug. 2017. The vertical line at 4.15 km shows the stream network node beyond which the followed path diverges between the main stream (3 Nov. 2016) and an affluent (13 Sept. 2016 and 9 Aug. 2017).

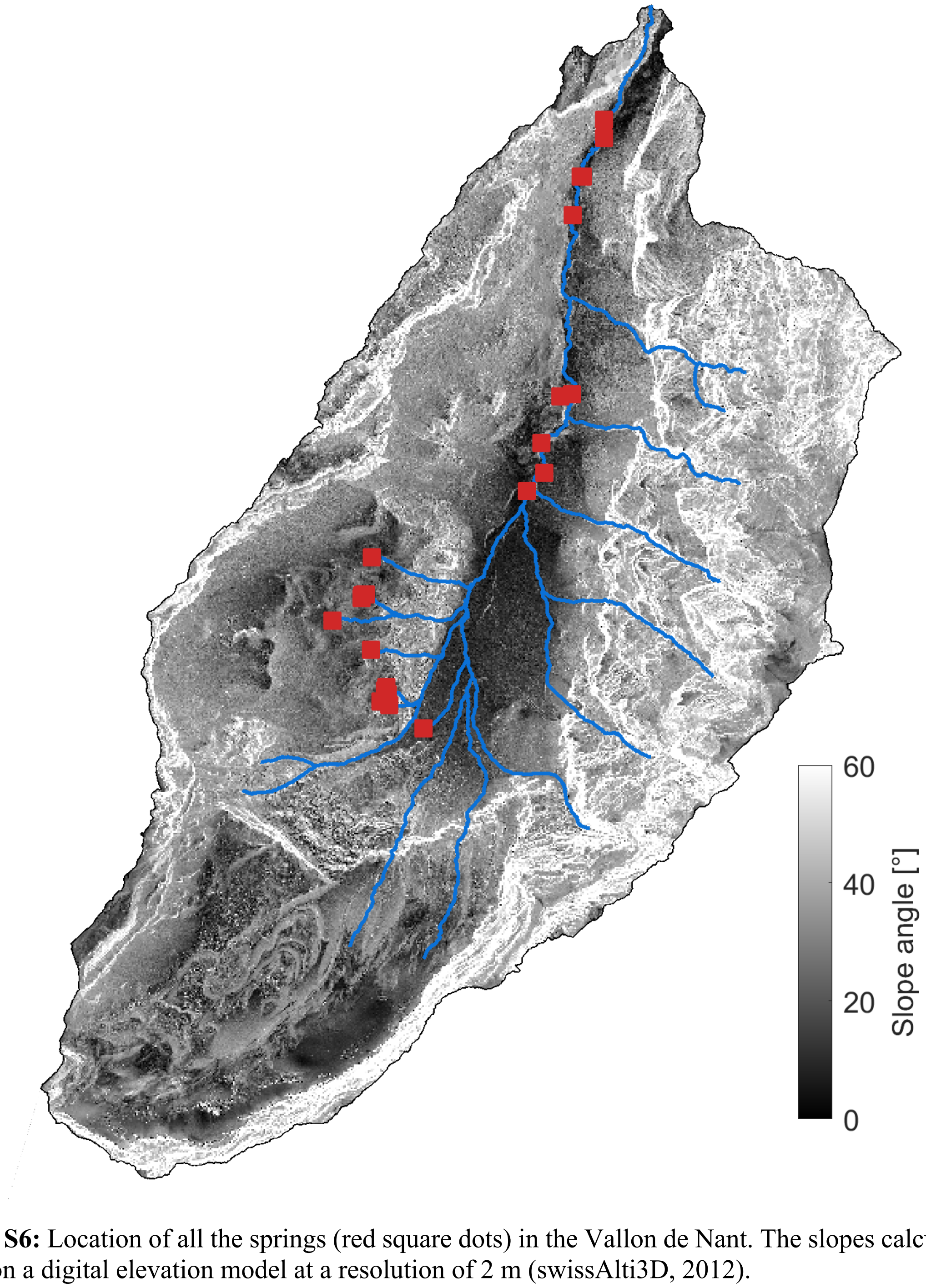

Figure S6: Location of all the springs (red square dots) in the Vallon de Nant. The slopes calculation is based on a digital elevation model at a resolution of 2 m (swissAlti3D, 2012).

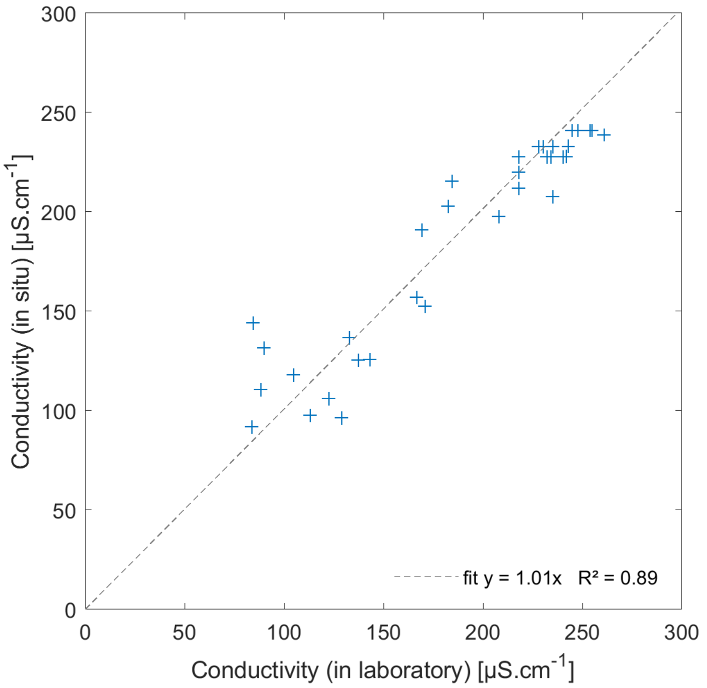

Figure S7: Comparison of 38 samples conductivity measured on the field using a WTW Multi 3510 IDS with a WTW TetraCon 925 probe (Xylem Analytics Germany Sales GmbH & Co, Weilheim, Germany) or later in the laboratory directly within the 12 mL amber silicate vials using a JENWAY 4510 conductivity meter with a 6 mm glass probe (Stone, UK).

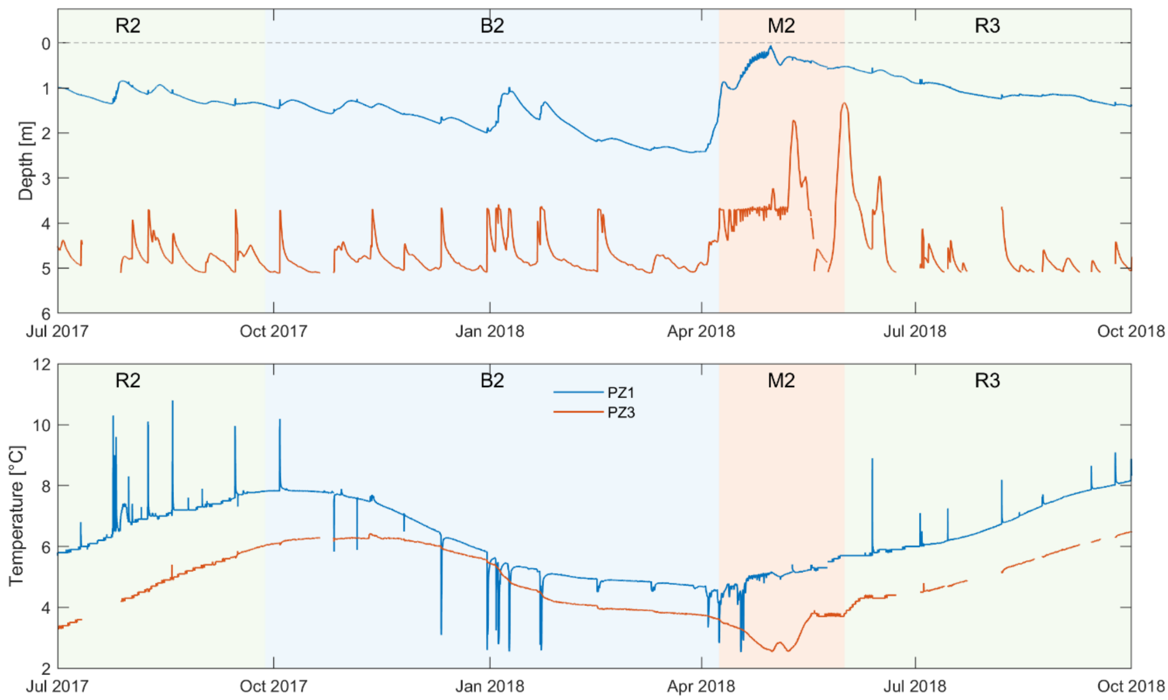

Figure S8: Water table depth (top) and temperature (bottom) at PZ1 and PZ2 from 1 July 2017 to 1 October 2018. Water table depth and temperature data are from Thornton et al. (2021).

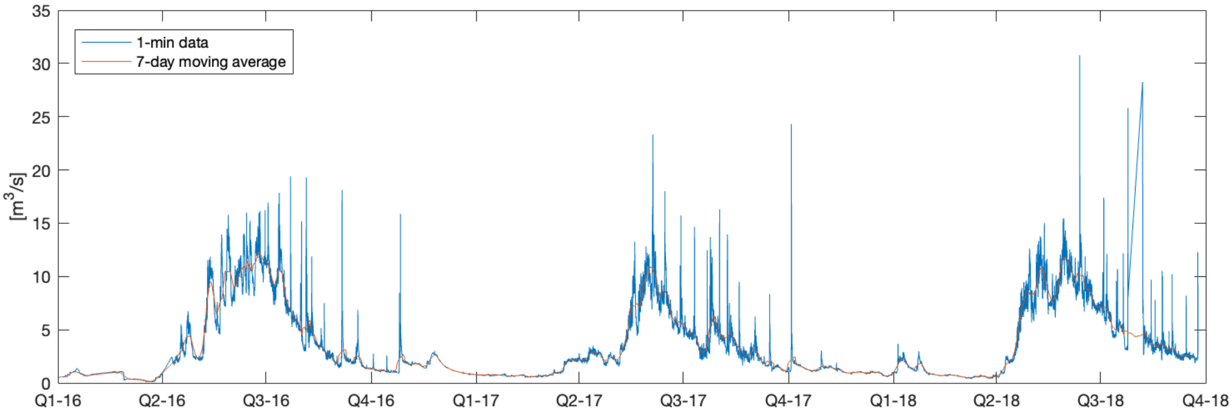

Figure S9: Illustration regarding the effect of a seven-day moving average on discharge measurements.

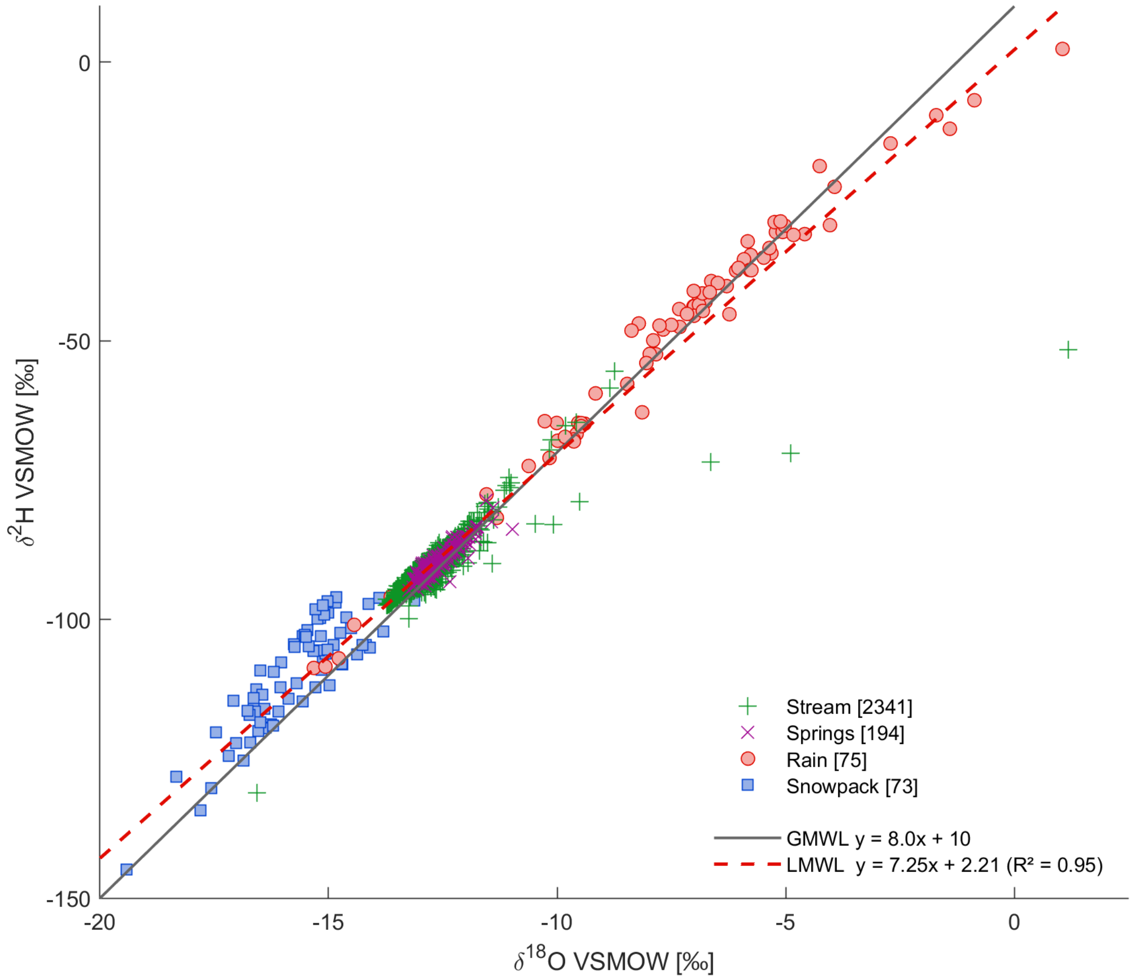

Figure S10: Dual isotope plot showing the strong correlation of δ^2H and $\delta^{18}O$ for samples from surface water (stream), springs, and snowpack. Number in brackets indicates number of samples of each type. The global meteoric water line and the local meteoric water line determined from all sampled precipitation are shown along with their equations (in the legend).

Table S1: Summary of all measurement locations

Name	Type	Latitude (°)	Longitude (°)	Elevation (masl)
PZ1	Piezometer	46.231050	7.101070	1472
PZ2	Piezometer	46.229640	7.101550	1482
PZ3	Piezometer	46.227030	7.099260	1505
S1	Soil temperature	46.252600	7.108400	1240
S2	Soil temperature	46.225300	7.099900	1530
S3	Soil temperature	46.209200	7.071500	2640
AUBG	Spring	46.251653	7.110543	1253
GRAS	Spring	46.247227	7.106434	1351
ROCK	Spring	46.235328	7.104408	1436
BRDG	Spring	46.231520	7.101856	1464
ICEC	Spring	46.221380	7.091970	1737
HyS1	Streamflow	46.253233	7.109155	1200
HyS2	Streamflow	46.231520	7.101856	1469
Auberge	Weather station	46.251653	7.110543	1253
Chalet	Weather station	46.229892	7.104117	1517
Glacier	Weather station	46.207722	7.089613	2109

Table S2: Table showing characteristic flow conditions for each period, corresponding start and end dates. Q_m is the median of raw data over the period. Q_{m7} is the median of daily values of average 7-day moving average data. Q_{r7} is the range of 7 day moving average data possible in one day. HH:MM is the median time of peak streamflow in a day. Q_b is the median baseflow, calculated as the lowest of the 7-day moving average streamflow in a ten-day window (based on method in Mächler et al., 2021). Q_f is the median of daily streamflow percentiles. ΔQ_{m7} is the change in streamflow according to a 7-day window around 1 day.

Period	**Start Date**	**End Date**	**Q_m [m³/s]**	**Q_{m7} [m³/s]**	**Q_{r7} [m³/s]**	**HH:MM**	**Q_b [m³/s]**	**Q_f [%]**	**ΔQ_{m7} [m³/s/d]**
B0	01.Jan.16	31.Mar.16	0.59	0.75	0.02	09:08	0.64	15	0.01
E0	31.Mar.16	06.May.16	2.44	2.56	0.11	22:47	2.20	58	0.10
M0	06.May.16	24.Jun.16	9.72	10.08	0.37	15:43	8.94	93	0.11
R1	24.Jun.16	27.Sep.16	3.87	4.62	0.15	06:57	3.57	74	-0.12
B1	27.Sep.16	18.Mar.17	1.05	1.01	0.02	20:59	0.89	27	-0.01
E1	18.Mar.17	06.May.17	2.23	2.23	0.06	00:07	2.10	52	0.02
M1	06.May.17	02.Jun.17	6.84	7.26	0.33	18:20	5.91	84	0.31
R2	02.Jun.17	27.Sep.17	4.04	4.22	0.15	13:45	3.10	70	-0.08
B2	27.Sep.17	08.Apr.18	1.01	0.99	0.02	04:06	0.94	26	-0.01
M2	08.Apr.18	31.May.18	7.85	8.32	0.31	12:28	7.55	87	0.19
R3	31.May.18	01.Jan.19	4.59	4.64	0.09	13:20	4.47	74	-0.06

Table S3: Start and end dates of each snowcover period at the soil temperature points.

Soil temperature site	**Start date**	**End date**
1240 m asl.	3/2/2016	16/3/2016
	4/1/2017	13/3/2017
	25/11/2017	7/4/2018
1530 m asl.	1/1/2016	14/5/2016
	4/1/2017	9/5/2017
	5/11/2017	29/5/2018
2640 m asl.	1/1/2016	9/7/2016
	4/10/2016	25/11/2016
	4/1/2017	13/6/2017
	22/10/2017	6/6/2018

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