



Supplement of

Hydrological connectivity controls dissolved organic carbon exports in a peatland-dominated boreal catchment stream

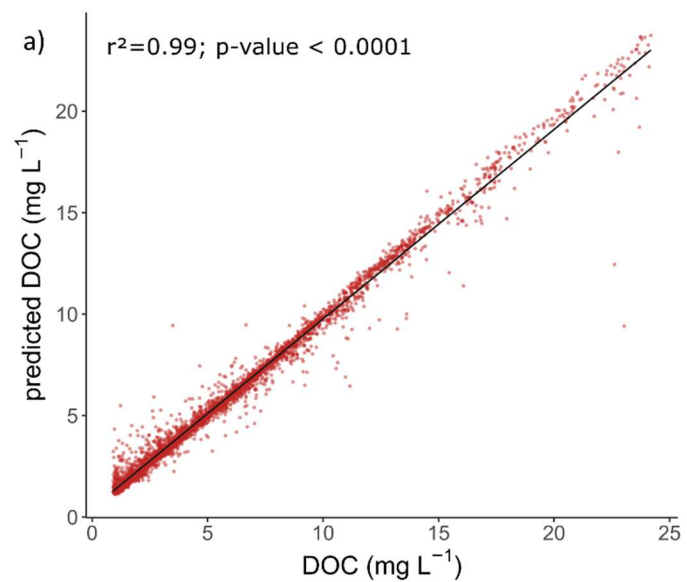
Antonin Prijac et al.

Correspondence to: Antonin Prijac (antonin.prijac@gmail.com) and Laure Gandois (laure.gandois@cnrs.fr)

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Table S1. Models of fDOM captor calibration for DOC concentrations

Model reference	Sonde	Covered period	Model	<i>n</i>	R ²	p-value
Calibration Model I	EXO2-A	June 2018-August 2018	[DOC] = 0.2489 * fDOMcor - 1.2088	20	0.94	< 0.0001
Calibration Model II.1	EXO2-B	August 2018-July 2019	[DOC] = 0.4074 * fDOMcor - 0.8373	29	0.82	< 0.0001
Calibration Model II.2	EXO2-A	July 2019-August 2019	[DOC] = 4.3114 * fDOMcor + 0.9833	10	0.98	< 0.0001
Calibration Model II.3	EXO2-B	August 2019-May 2020	[DOC] = 8.3384 * fDOMcor + 3.1014	10	0.80	< 0.0001



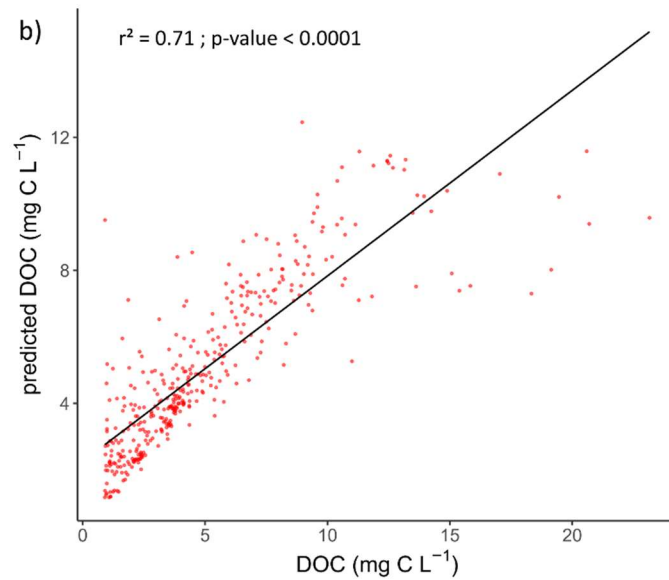


Figure S1. Relation between observed DOC concentrations and DOC predicted by random forest model on the training dataset for a) the growing season data set and b) the daily-interval data set.

Table S2. Importance of variables in the random forest model of DOC concentrations (%MeanDecreaseAccuracy) and correlation between DOC concentrations and hydrological and physicochemical variables for the data set from the growing season.

DOC ~	Variable importance (%MeanDecreaseAccuracy)	Correlations					
		Complete Time Serie		Growing season		High flow Events	
		Rho	p-value	Rho	p-value	Rho	p-value
WTD	24.47	0.43	<0.0001	0.43	<0.0001	0.22	<0.0001
Porewater T°	16.52	n.a.	n.a.	-0.06	0.0007	-0.23	<0.0001
Q	16.33	0.41	<0.0001	0.39	<0.0001	0.42	<0.0001
SPC	12.04	-0.12	<0.0001	-0.26	<0.0001	-0.23	<0.0001
pH	7.97	-0.05	<0.0001	-0.10	<0.0001	-0.19	<0.0001
DO (%sat)	5.94	0.19	<0.0001	-0.06	0.0003	0.00	0.9271
Water T°	3.25	0.30	<0.0001	-0.05	0.0039	0.09	0.0013
Air T°	2.75	n.a.	n.a.	-0.01	0.7322	0.12	<0.0001
DO (mg L ⁻¹)	NA	-0.02	0.085	-0.02	0.3245	-0.05	0.06

Table S3. Summary of variables for each flood events. Variables includes the duration of events, the initial, maximal and delta (Δ) for the stream discharge, the WTD and the DOC concentration. The hysteretic index (HI), flushing index (FI) and β are indices which characterize the storm events. Precipitation variables are composed by total precipitation during events (PP event), antecedent precipitation 48h (AP48) and 14 days (AP14) prior to the beginning of an event and Total PP correspond to the sum of AP14 and PP event. The PQ lag time correspond to the duration between a precipitation event and the beginning of the increase of the discharge. The Q lag time correspond to the duration between the beginning of the discharge increase and the discharge peak. The DOC lag time correspond to the duration between the discharge peak and the DOC peak. DOC90 correspond to the period when 90% of the maximum DOC concentration was exceeded.

Event name	Aa	Ab	Ac	Ad	Ae	Af	Ba	Bb	Bc	Bd	Be	Bf
Cluster	CLUSTER 3	CLUSTER 1	CLUSTER 1	CLUSTER 1	CLUSTER 1	CLUSTER 1	CLUSTER 2	CLUSTER 3	CLUSTER 1	CLUSTER 1	CLUSTER 2	CLUSTER 2
Event Beginning	2018-06-17	2018-07-05	2018-08-22	2018-09-17	2018-09-21	2018-09-26	2019-06-16	2019-08-09	2019-08-29	2019-09-04	2019-09-07	2019-09-26
Event End	2018-06-28	2018-07-09	2018-08-24	2018-09-21	2018-09-25	2018-10-02	2019-06-21	2019-08-13	2019-09-02	2019-09-07	2019-09-11	2019-10-03
Duration (day)	10	4	2	4.4	3.7	6.4	5.2	4.5	3.7	3.3	3.7	6.6
Stream T°C min (°C)	5.9	9.3	12.4	5.5	2.5	2.4	7.1	9.9	7.5	6.7	7.4	2.4
Stream T°C max (°C)	19.5	20.4	16.9	12.6	12.3	12.9	19.5	19.6	19.0	15.0	13.9	12.2
Stream T°C average (°C)	11.3	14.4	14.9	8.6	7.8	7.8	10.9	14.4	13.5	11.0	9.8	7.8
Porewater T°C min (°C)	6.3	10.1	13.7	10.8	9.6	9.1	7.5	14.3	13.7	12.0	10.8	9.0
Porewater T°C max (°C)	8.0	10.6	13.8	12.3	10.8	9.7	8.3	14.9	14.6	13.2	12.2	10.3
Porewater T°C average (°C)	7.3	10.5	13.8	11.3	10.3	9.4	7.7	14.7	14.4	12.7	11.3	9.7
Q initial (m ³ h ⁻¹)	102.1	79.4	24.8	68.9	63.4	76.5	73.8	30.6	24.8	51.2	100.9	48.3
Q max (m ³ h ⁻¹)	245.7	172.8	92.8	119.6	178.4	129.3	323.0	333.8	167.7	216.1	360.8	240.6
Δ Q (m ³ h ⁻¹)	143.7	93.5	68.1	50.8	115.1	52.8	249.3	303.3	142.9	164.9	260.0	192.3
WTD initial (m)	-0.25	-0.28	-0.34	-0.33	-0.26	-0.23	-0.17	-0.36	-0.39	-0.25	-0.23	-0.23
WTD max (m)	-0.11	-0.15	-0.17	-0.17	-0.13	-0.14	-0.09	-0.11	-0.14	-0.15	-0.13	-0.14
Δ WTD (m)	0.14	0.13	0.17	0.06	0.13	0.09	0.08	0.25	0.24	0.10	0.10	0.09
DOC initial (mg L ⁻¹)	7.0	3.2	3.5	1.1	3.0	6.7	4.1	0.3	2.4	4.6	8.1	4.5
DOC max (mg L ⁻¹)	14.6	9.2	5.5	4.8	11.5	10.8	8.0	22.7	13.5	16.5	20.2	10.3
Δ DOC (mg L ⁻¹)	7.5	6.0	2.0	3.7	8.5	4.1	3.9	22.5	11.1	11.9	12.1	5.8
HI	-0.37	-0.54	-0.17	-0.47	-0.56	-0.44	0.05	-0.31	-0.44	-0.47	-0.20	-0.16
β	0.66	0.88	0.21	0.46	0.46	0.60	0.30	0.97	0.70	0.64	0.41	0.82

FI	0.62	0.41	0.53	0.29	0.25	0.02	0.64	0.98	0.59	0.80	0.67	0.64
PP event (mm)	NA	NA	18	6	21	13	19	34	33	8	13	17
AP48 (mm)	NA	NA	4	16	1	1	12	20	12	15	6	18
AP14 (mm)	NA	NA	10	41	30	43	29	42	25	66	71	26
Total PP(mm)	NA	NA	28	47	51	57	49	76	58	74	84	42
PQ lagtime (hour)	NA	NA	3	4	3	3	2	5	7	7	3	5
Q lagtime (hour)	31	19	15	27	17	22	23	26	39	27	27	28
DOC lagtime (hour)	14	32	7	36	32	35	11	8	11	16	8	13
DOC ₉₀ (hour)	12	9	2	9	17	13	12	11	12	6	4	5
DOC load (kg)	433.02	73.35	15.34	25.71	89.33	103.14	108.75	307.09	106.17	84.83	274.21	101.26
DOC load (kg h ⁻¹)	1.75	0.82	0.32	0.24	1.02	0.68	0.84	2.50	1.19	1.10	3.26	0.64

Table S4. Results of v.test represent the contribution of variables to each three clusters and the comparison of average in the cluster and the overall average of the variable. Only variables which significantly influenced at least one cluster were represented.

CLUSTER	Variable	v.test	Mean in category	Overall mean	p-value
#1	HI	-2.26	-0.44	-0.34	0.0241
	DOC load	-2.35	71.13	143.52	0.0187
	Q _{max}	-2.85	153.81	215.05	0.0043
#2	HI	2.56	-0.10	-0.34	0.0106
	Q _{max}	2.11	308.13	215.05	0.0346
#3	DOC load	2.78	370.06	143.52	0.0054

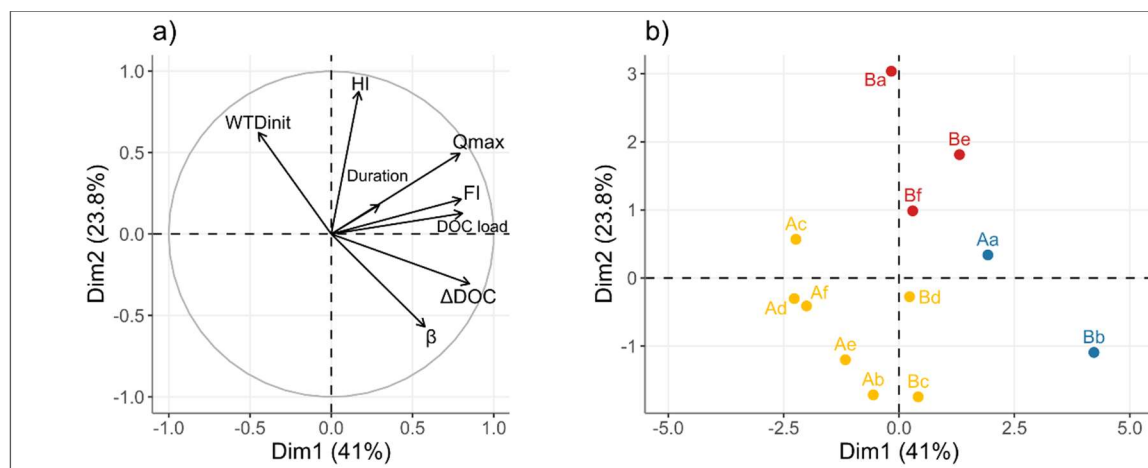


Figure S2 Representation of the two first axis of principal component analyses (PCA) of a) variables used for the clustering and b) storm events as individuals. Variables considered in the events clustering are the DOC load, the DOC lag time, the DOC increase and the minimum DOC concentrations, the Q lag time, the maximum and the minimum WTD and the HI index. The two first dimensions explained 63.8% of the total variance. The major contributors of the first axis were the Δ DOC (22%), the DOC load (19.8%), the flushing index (FI; 19.4%), the Q_{max} (19%) and the β index (10.1%). The major contributors of the second axis were the HI (40.1%), the WTD init (20.3%), the β index (17%) and the Q_{max} (12.8%). Other variables contribute less than 10% to the first two axis.

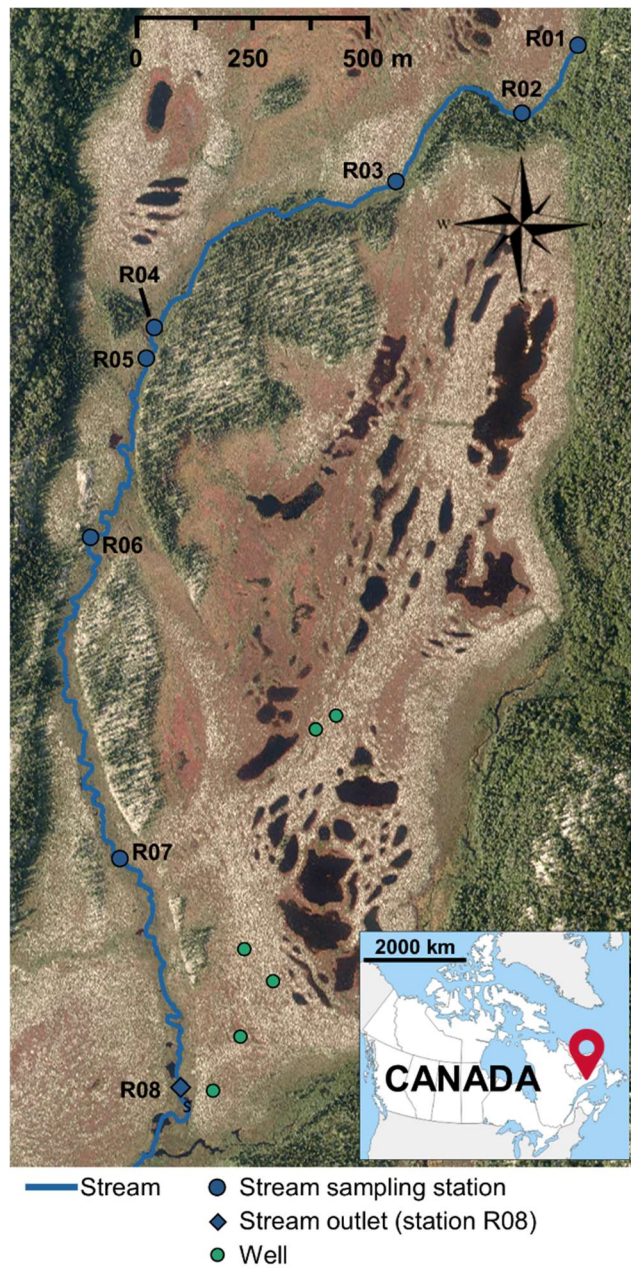


Figure S3. Aerial photo of the Bouleau peatland with the location of wells where water-level data loggers have been installed (green dots), sampling sites along the stream (blue dots) and the outlet of the peatland drainage stream (the aerial photo is provided by Hydro-Quebec).

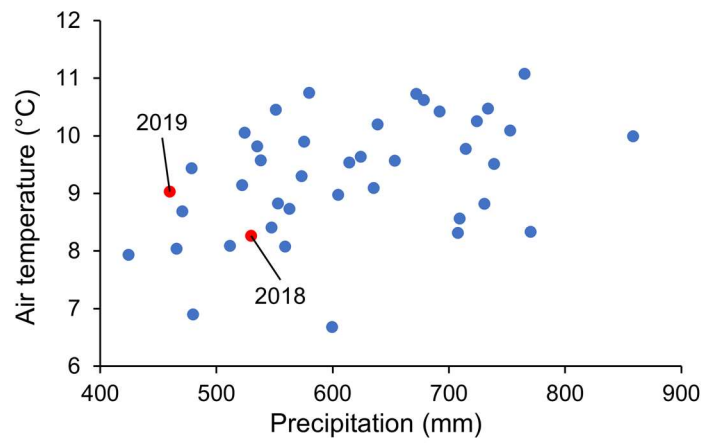


Figure S4. Precipitation (mm) and air temperature (°C) from May to October at Havre-Saint-Pierre airport (Havre-Saint-Pierre meteorological station, mean 1979–2019, Environment of Canada). Each points represent a individual year from 1979 to 2019. Studied years (i.e., 2018 and 2019) are represented in red.