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Supporting Information for

Seasonal wetlands make a relatively limited contribution to the dissolved carbon pool of a lowland headwater tropical stream

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Contents of this file

Figure S3. Comparison between the observed discharge Q and the simulated Q using SAVTAM at Manton Creek.

Figure S4. Observed and mean simulated DOC concentrations in the stream using SAVTAM between November 2017 and December 2021.

Methods S1. Chamber measurements

Additional Supporting Information (Files uploaded separately)

Table S1. Water quality parameters, dissolved carbon concentration and evasion fluxes from the stream, seasonal wetlands, riparian forest and groundwater measured in March 2021.

Table S3. Daily pCO_2 values measured in a stream-wetland-stream continuum associated with Figure 4 in the main text.

Table S4. DOC concentrations and deuterium isotopic ratio at the stream outlet.

Introduction

The supporting information includes the specific location, water quality parameters and carbon concentration and emissions of each site sampled site in March 2021. It also includes the daily pCO_2 values measured in a stream-wetland-stream continuum associated with the Figure 4 in the main text. Lastly, it includes the initial and posterior parameters, performance parameters and plots related to the application of SavTAM in Manton Creek.

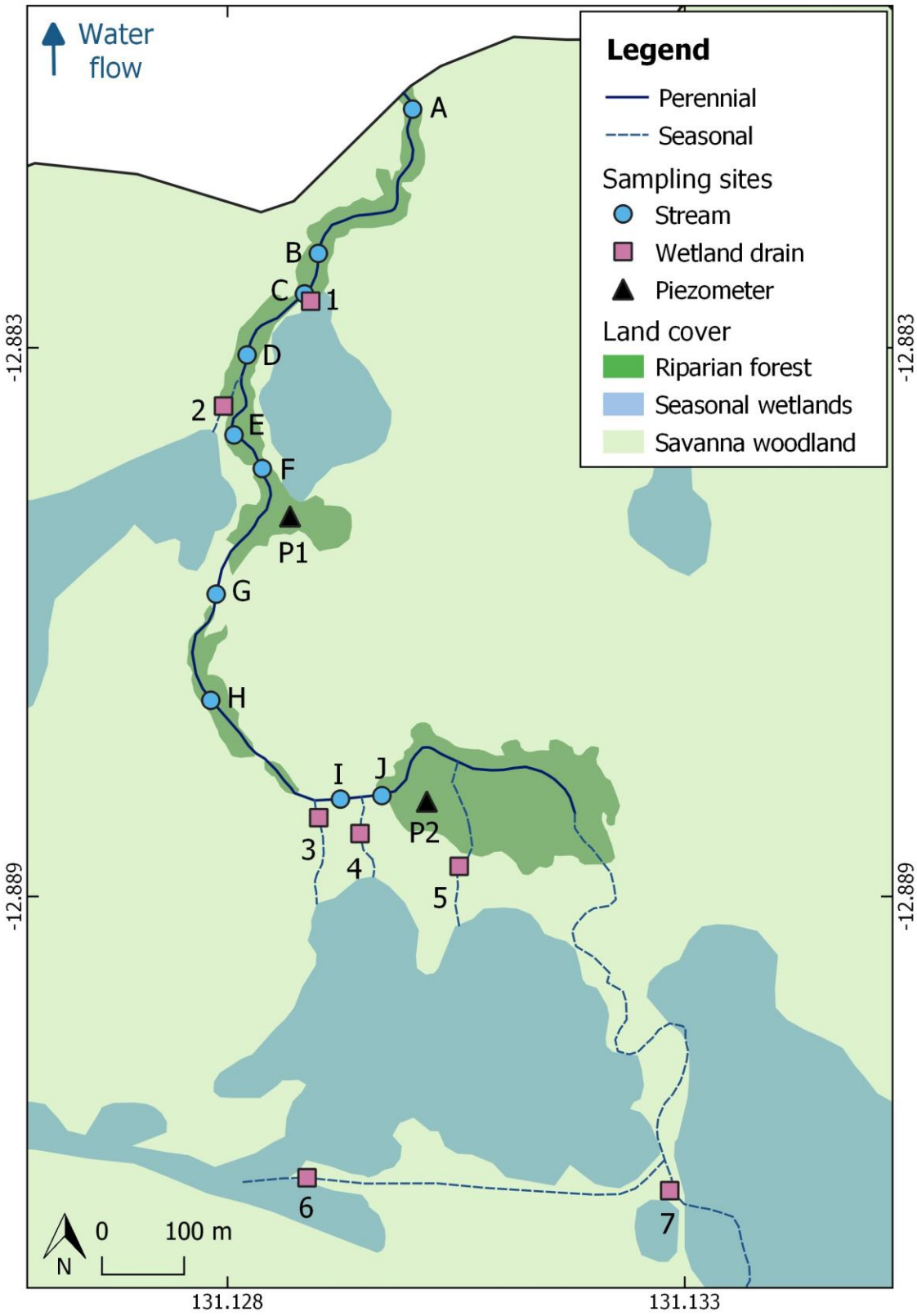

Figure S1. Location of the sites sampled during the field campaign conducted in March 2021. Measurements of water quality parameters, carbon concentrations and emissions can be found in Table S2.

Table S1. Water quality parameters, dissolved carbon concentration and evasion fluxes from the stream, seasonal wetlands, riparian forest and groundwater measured in March 2021. Uncertainties correspond to the precision reported by sensor manufacturers and laboratories. 'NA' correspond to measurements that could not be made due to crocodile risk or sensor failure. Specific site locations are shown in Figure S1.

This table is located in a separate file.

Table S2. Additional DOC and DIC concentrations obtained at the stream outlet and two piezometers. Uncertainties correspond to the analytical precision reported by the laboratories.

Site	DOC (g C m^{-3})	DIC (g C m^{-3})
Stream -Site A	5.16 ± 0.1	
Stream -Site A	4.67 ± 0.09	
Stream -Site A	2.50 ± 0.05	
Stream -Site A	17.7 ± 0.35	
Riparian Forest -P1	10.75 ± 0.21	3.60 ± 1.44
Riparian Forest -P1	13.04 ± 0.26	18.02 ± 7.21
Riparian Forest -P1	11.81 ± 0.24	
Riparian Forest -P1	18.60 ± 0.37	
Riparian Forest -P1	11.93 ± 0.24	
Riparian Forest -P1	47.74 ± 0.95	
Riparian Forest -P1	4.77 ± 0 .10	
Groundwater -P2		51.64 ± 20.66
Groundwater -P2		57.65 ± 23.06

Table S3. Daily pCO_2 values measured in a stream–wetland drain–stream continuum associated with Figure 4 in the main text.

This table is located in a separate file.

Table S4. DOC concentrations and deuterium isotopic ratio at the stream outlet.

This table is located in a separate file.

Table S5. Initial and posterior parameter ranges and performance measures shown as the 5th and 95th percentiles of the resulting 500 best simulations for SavTAM.

Module	Parameter	Unit	Initial range	Posterior range
Rainfall-runoff	a	day^{-1}	0.01, 0.2	0.08, 0.2
	b1	day^{-1}	0.1, 0.2	0.10, 0.2
	b2	day^{-1}	0.002, 0.02	0.002, 0.02
	r1	day^{-1}	0.02, 0.05	0.0498, 0.05
	r2	day^{-1}	0.01, 0.5	0.01, 0.5
	d	day^{-1}	0.002, 0.004	0.002, 0.004
	c	day^{-1}	0.01, 0.05	0.04, 0.05
	alpha	-	0.2, 0.8	0.73, 0.8
Isotope	upSd	mm	700, 1000	700, 876
	ripSd	mm	1, 20	19.7, 20
	gwSd	mm	200, 900	200, 206
	deepgwSd	mm	10, 100	10, 14
DOC	SMDmax	mm	-3000, -100	-1019, -100
	kDOCup	day^{-1}	0.01, 2	1.6, 2
	kDOCsat	day^{-1}	0.01, 3	0.015, 1.98
	Ea	-	1, 3	1.79, 3
	LQup	-	0.01, 0.95	0.012, 0.93
	LQlow	-	0.01, 0.9	0.015, 0.9
	LQsof	-	0.01, 0.9	0.012, 0.16
Performance	KGE_Q	-		0.29, 0.7
	KGE_D	-		0.46, 0.65
	KGE_DOC	-		0.34, 0.66

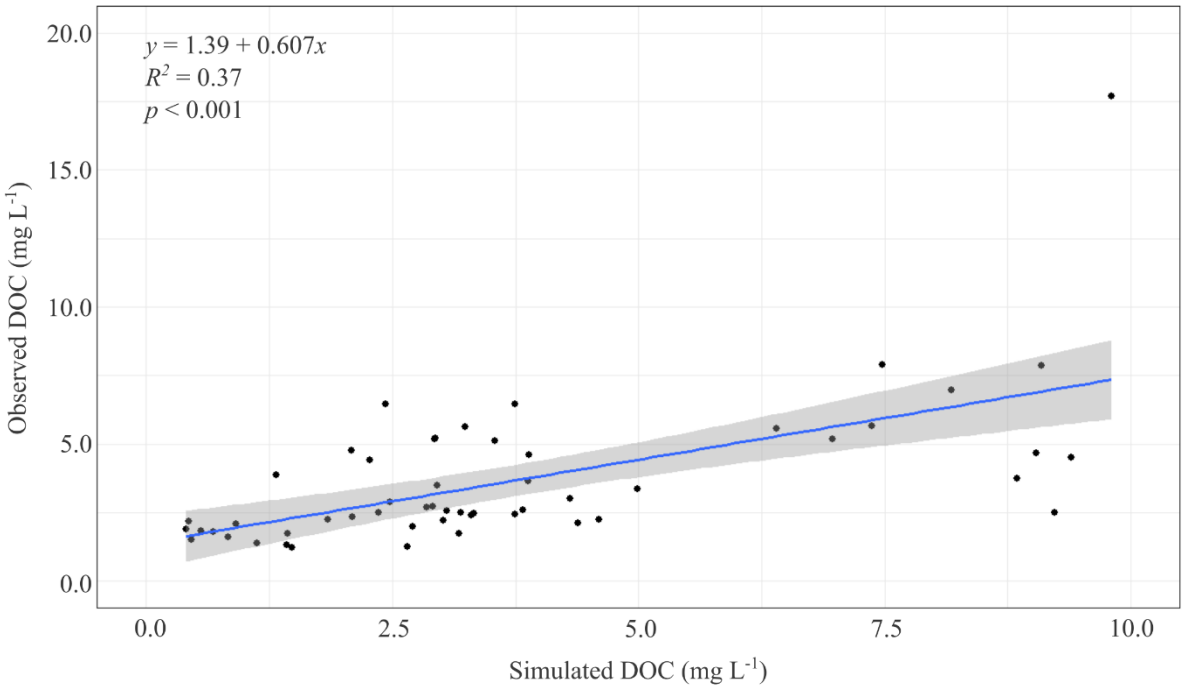

Figure S2. Comparison between the observed DOC and the simulated DOC using SAVTAM at Manton Creek.

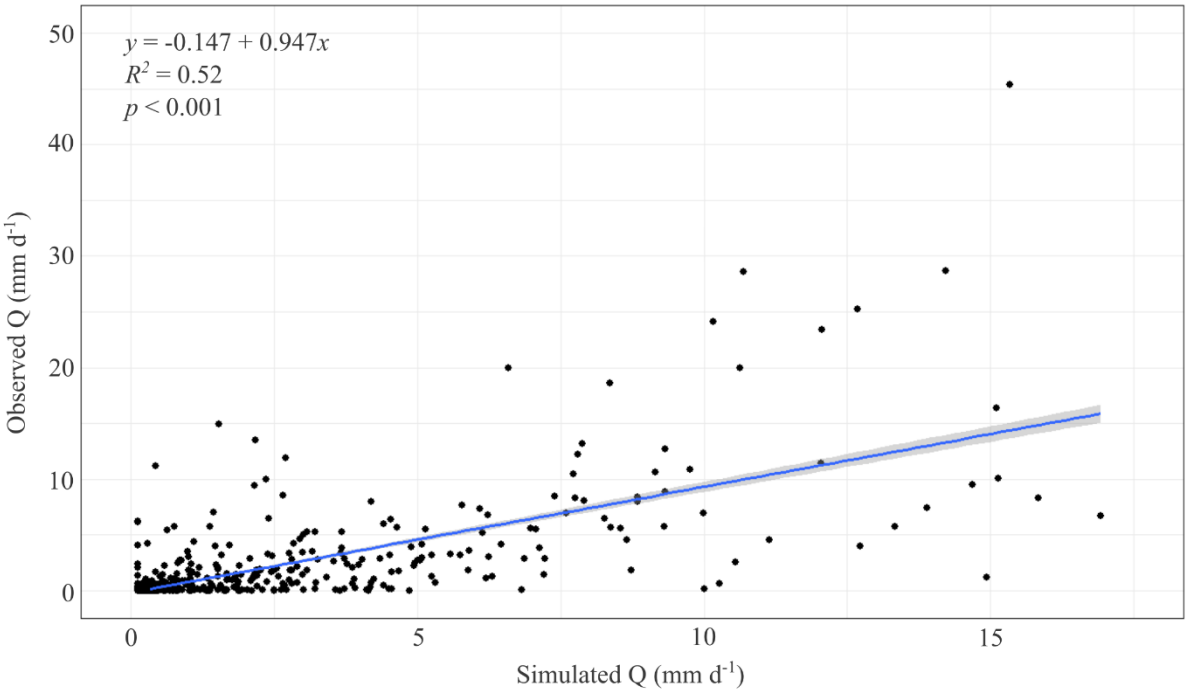

Figure S3. Comparison between the observed discharge (Q) and the simulated Q using SAVTAM at Manton Creek.

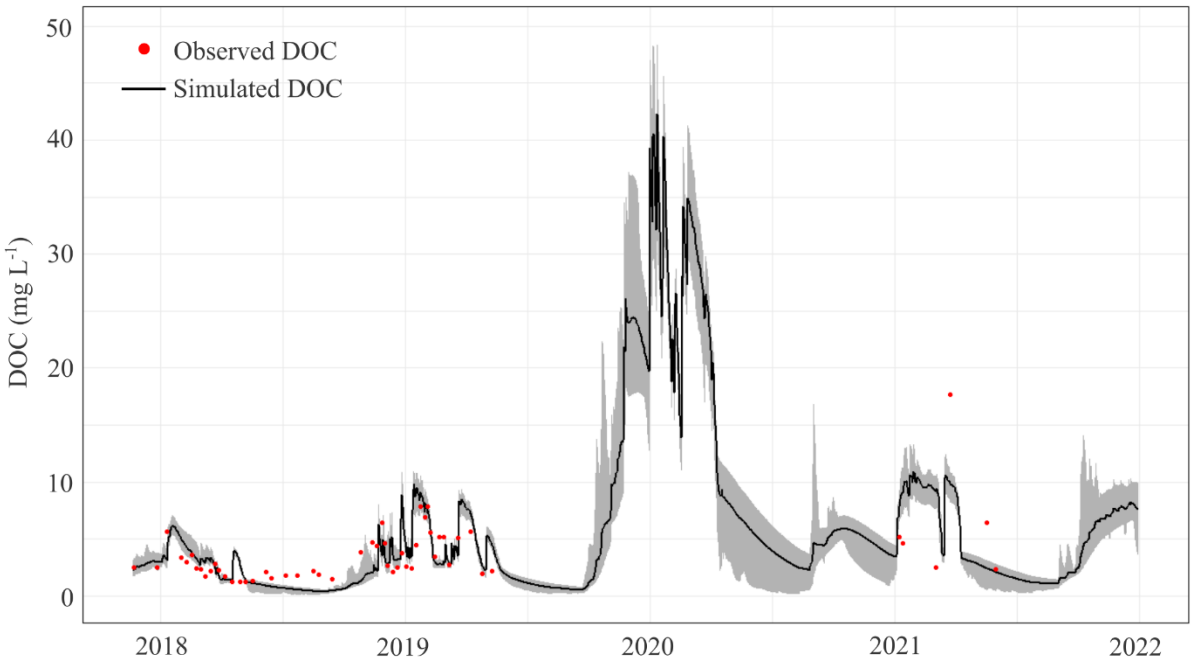

Figure S4. Observed and mean simulated DOC concentrations in the stream using SAVTAM between November 2017 and December 2021. Shaded areas indicate the 5th/95th percentiles.

Table S6. Estimated water flow and dissolved carbon loads for each landscape unit and at the catchment outlet.

	Water		DIC		DOC	
	$m^3\ s^{-1}$	%	$g\ C\ s^{-1}$	%	$g\ C\ s^{-1}$	%
Wetland contribution	0.084	24	1.24	16	0.46	15.5
Riparian contribution	0.188	53	2.03	6	2.24	74.9
Groundwater contribution	0.082	23	4.48	58	0.29	9.6
	$m^3\ s^{-1}$		$g\ C\ s^{-1}$		$g\ C\ s^{-1}$	
Catchment Inputs	0.35		7.75		2.99	
Catchment Outputs	0.35		6.39		2.66	

Methods S1. Chamber measurements

We used a customized floating chamber to estimate the CO_2 and CH_4 emissions from the stream, the wetland drains and the wetlands. The chamber consisted of an inverted plastic container with an air inlet and outlet. The container was positioned on a floating board and balanced with weights underneath to minimize turbulence. The chamber covered a surface area of 161.3 cm^2 and had a volume of 2.6 L.

The inlet and outlet were connected to a LI-7810 portable gas analyzer (LI-COR Biosciences, USA). The CO_2 and CH_4 concentrations were measure every second for 10-15 minutes per deployment. We conducted three replicates at each sampling site.

To estimate the CO_2 and CH4 evasion rates, we extracted three minutes from each dataset when both gasses followed a linear trend with an $R^2 > 0.98$ and calculated the evasion rates considering a linear flux. This method is explained in detail elsewhere (e.g. Thor et al., 2018). The mean evasion rates and their corresponding standard deviations are reported in Table S1.

Due to the small area of our chamber and the consistency between replicate measurements, it is highly unlikely that ebullition bubbles were caught in our measurements. Furthermore, upon observations, no bubbling was detected among sampling sites.

Thor, K., Kragh, T., & Sand-Jensen, K. (2018). Technical note: A simple and cost-efficient automated floating chamber for continuous measurements of carbon dioxide gas flux on lake. *Biogeosciences*, *15*. https://doi.org/10.5194/bg-15-5565-2018