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Continuous In-Stream Assimilatory Nitrate Uptake from High Frequency Sensor Measurements

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Number of pages: 7

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SUPPLEMENT MATERIAL

Sampling and analytical methods of nutrients

Filtered (0.45 µm) water samples from the stream sites at gauge station Meisdorf and Hausneindorf were collected approximately every two weeks throughout the duration of the study. All samples were filtered preserved with sulphoric acid in the field. stored at 4 °C and analyzed within 24 hours at UFZ in Magdeburg. Nitrite (NO_2^-) and nitrate (NO_3^-) were photometrically determined using the segmented flow technique (DIN EN ISO 13395. 1996). Total (TP) and reactive phosphorus (SRP) were measured using the ammonium molybdate spectrometric method (DIN EN ISO 6878. 2004). Determination of dissolved NH_4^+ was conducted using ion chromatography method (DIN EN ISO 14911. 1999). Suspended sediments were determined gravimetrically according (DIN 38409 H2. 1987).

References

DIN EN ISO 13395 (1996) Water quality- determination of nitrite nitrogen and nitrate nitrogen and the sum of both by flow analysis (CFA and FIA) and spectrometric detection. Beuth. Berlin.

DIN EN ISO 14911 (1999) Water quality- determination of dissolved Li^+. Na^+. NH^{4+}. K^+. Mn^{2+}. Ca^{2+}.Mg^{2+}. Sr^{2+} and Ba^{2+} using ion chromatography-method for water and waste water. Beuth. Berlin.

DIN EN ISO 6878 (2004) Water quality determination of Phosphorus-ammonium molybdate spectrometric method. Beuth. Berlin.

DIN 38409 (1987) Determination of suspended particulate matter. Beuth. Berlin.

S2

Table S1: Geomorphic characteristics of the Selke river network derived from the 75m resolution river network

Stream order	Mean area (km^2)	Stream length (km)	Mean length (km)	Mean direct drainage (km^2)	Numbers	Direct Drain to Order (Proportion)
1	0.95	168	0.74	0.95	226	0.50
2	5.22	114	1.99	1.48	57	0.19
3	23.9	41.4	2.96	2.71	14	0.09
4	224	68.4	34.2	42.8	2	0.20
5	446	3.15	3.15	6.76	1	0.02

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Table S2: Land use and discharge of the Selke watershed

Watershed	Size	Land use (%)				Mean areal discharge
	km^2	arable	grassland	forest	urban	$l\ s^{-1}\ km^{-2}$
Forest dominated subwatershed	184	9.20	17.2	70.9	2.32	8.3
Agricultural dominated subwatershed	272	70.7	10.2	10.2	6.77	0.76
Total watershed	456	45.8	13.1	34.9	4.97	3.8

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Table S3: Gross primary production and associated nitrate uptake rates and velocities for the forest and agricultural reaches of the Selke river in 2011 and 2012

Stream type and year	GPP	ER	NO_3-N	U_a	V_f
	$g\ O_2 m^{-2} y^{-1}$	$g\ O_2 m^{-2} y^{-1}$	$mg\ L^{-1}$	$mg\ N\ m^{-2} d^{-1}$	$m\ d^{-1}$
Forest					
2011	173	-1081	1.32 (1.04)	12.6 (21.8)	0.016 (0.029)
2012	135	-1522	1.62 (1.18)	8.98 (14.3)	0.009 (0.014)
Agricultural					
2011	670	-1228	4.22 (0.46)	77.3 (67.1)	0.018 (0.028)
2012	804	-1395	2.90 (0.64)	85.4 (67.4)	0.034 (0.015)

GPP and ER is yearly sum, NO_3-N is mean concentration, U_a is mean daily N uptake rate and V_f is mean daily N uptake velocity, standard deviations are in brackets

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Figure S2: Geographical location and digital elevation model of the Selke watershed

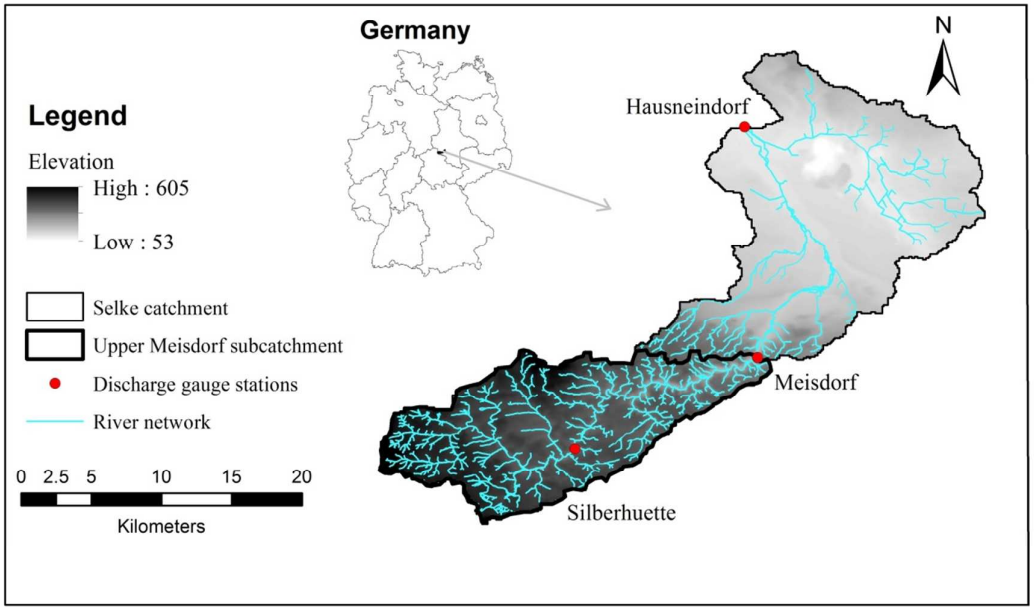

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Figure S3: Seasonal variability of selected constituents in the forest stream reach of the Selke River (station Meisdorf) from 01.01.2011 to 31.12.2012: a) discharge; b) NO3-N.; c) dissolved oxygen d) pH.

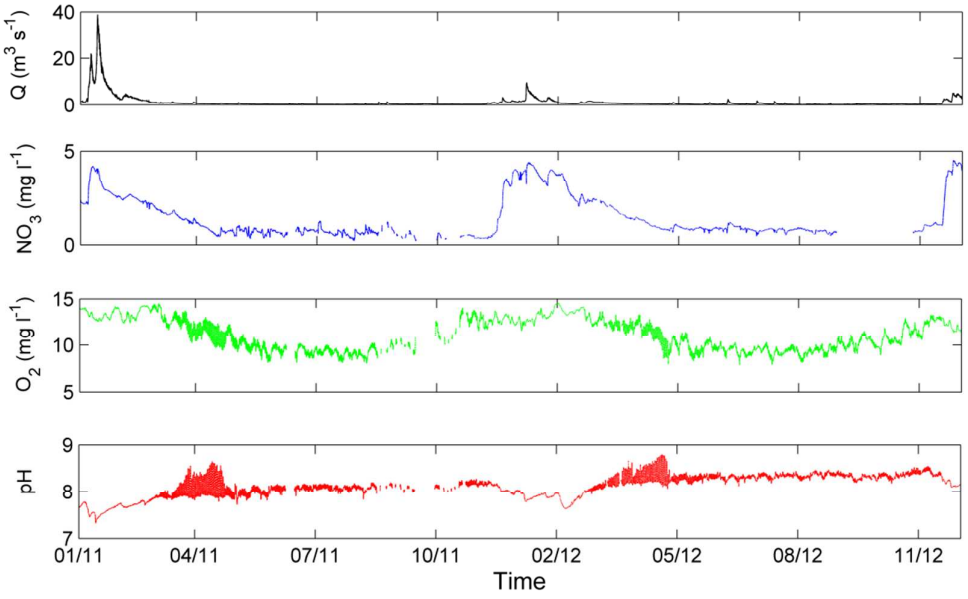

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Figure S4: Daily rates of (a) gross primary production (GPP: black line) and b) ecosystem respiration (ER: negative values red line) measured in upper Selke river (Station Hausneindorf) from 1 January 2011 to 31 December 2012