Zurbrügg, R., Suter, S., Lehmann, M. F., Wehrli, B., and Senn D. B.: Organic carbon and nitrogen export from a tropical dam-impacted floodplain system

Supplementary information

1 Sampling of additional C and N pools in the Kafue Flats

1.1 Sampling, sample preparation, and analyses

In order to constrain the sources of dissolved organic matter (DOM) and particulate organic matter (POM), the stable isotopic composition of dry deposition, plants, periphyton, soils, and sediments from the Kafue Flats was analyzed. In addition, we measured $\delta^{15}N$-TDN from the water column of ITT reservoir (Station IT1 in Kunz et al., 2011).

To measure N dry deposition, three acid-washed HDPE deposition traps, 600 cm^2 each, were installed at two locations in the dry floodplain in Lochinvar National Park (Figure 1c) and one trap on a float in the middle of the large adjacent lagoon (Figure 1c). The land-based traps were installed at 2 m above ground and all traps were exposed for 5 to 11 days in May 2010. Deposited matter was dissolved in 2M HCl, and its $\delta^{15}N$ was measured as described the main manuscript. Plant samples were taken from the first fully expanded leafs of C_3 grass *Phragmites australis* and C_4 grass *Vossia cuspidata*, two dominant species in the floodplain areas adjacent to the river channel (Ellenbroek, 1987). Plant, periphyton, soil, and sediment samples were collected along the main channel in October 2008. Plant material and soil was dried at 40°C, periphyton from submerged floodplain grasses and surface sediment samples were freeze-dried. All solid samples were homogenized and analyzed for C and N isotopic signature as described for POM in the main manuscript.

1.2 Stable isotope signatures of floodplain and reservoir C and N pools

$\delta^{13}C$ and $\delta^{15}N$ of the measured floodplain and reservoir pools are presented in Table S1. The plant samples showed the typical C_3 and C_4 isotopic signatures for ^{13}C of -26‰ and -13‰, respectively (Martinelli et al., 1991; Smith and Epstein, 1971). The other floodplain pools were found to cluster around -20‰, sediment trap and sediments at ITT displayed somewhat lower $\delta^{13}C$. For $\delta^{15}N$, dry deposition, periphyton, river sediments, reservoir sediments and sediment traps and averaged around 2‰. The C_3 grass *Phragmites australis* had a $\delta^{15}N$ of ~4‰, and soils and the C_4 grass *Vossia cuspidata*, were close to 0‰.

Table S1. Stable isotopic signatures and C:N ratios of Kafue Flats and ITT reservoir C and N pools.

	$\delta^{13}C$ (‰$_{VPDB}$)	$\delta^{15}N$ (‰$_{air}$)	C:N
	mean±SD	mean±SD	mean±SD
Kafue Flats floodplain			
Dry deposition	n.a.	2.3±0.2	n.a.
Vossia cuspidata (C_4)	-13.3±0.3	0.5±0.8	n.a.
Phragmites australis (C_3)	-25.5±0.4	3.9±0.6	n.a.
Periphyton[a]	-20.5±3.1	1.4±0.9	n.a.
Floodplain soil	-20.3±2.5	0.6±1.2	15.9±2.1
River sediment	-19.6±1.8	2.2±1.2	15.0±2.5
Itezhi-Tezhi reservoir			
Sediment traps[b]	-25.8±0.5[c]	2.5±1.5	9.7±0.5[c]
Sediments[d]	-23.8±3.5[c]	n.a.	12.1±0.6[c]
TDN[e]	n.a.	1.9±0.4	n.a.

[a] sampled from inundated stems of floodplain grasses.
[b] sampled from October 2008 to May 2009 at depths of 13 to 40 m behind the dam wall.
[c] data from Kunz et al. (2011)
[d] sampled in May 2008
[e] sampled in June 2009 behind ITT dam wall.

2 Calibration of δ^{15}N-TDN

The calibration of δ^{15}N-TDN was done using four different organic N isotopic standards. An isotope calibration curve is shown in Figure S1.

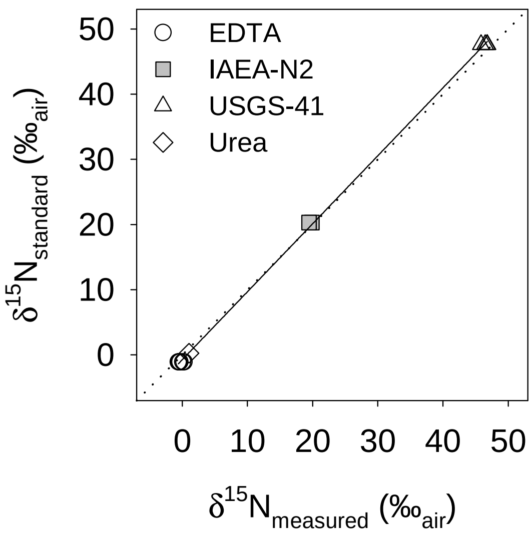

Figure S1. Calibration curve of a δ^{15}N-TDN analysis run. EDTA, USGS-41and urea are organic N isotope standards, IAEA-N2 is a $(NH_4)_2SO_4$ isotope standard. The dotted line is the 1:1 line, the solid line represents the linear regression of $\delta^{15}N_{standard} = 1.043 \times \delta^{15}N_{measured} - 0.756$ ($R^2 = 0.9997$).

3 Contributions of dissolved and particulate C and N loads to TOC and TN

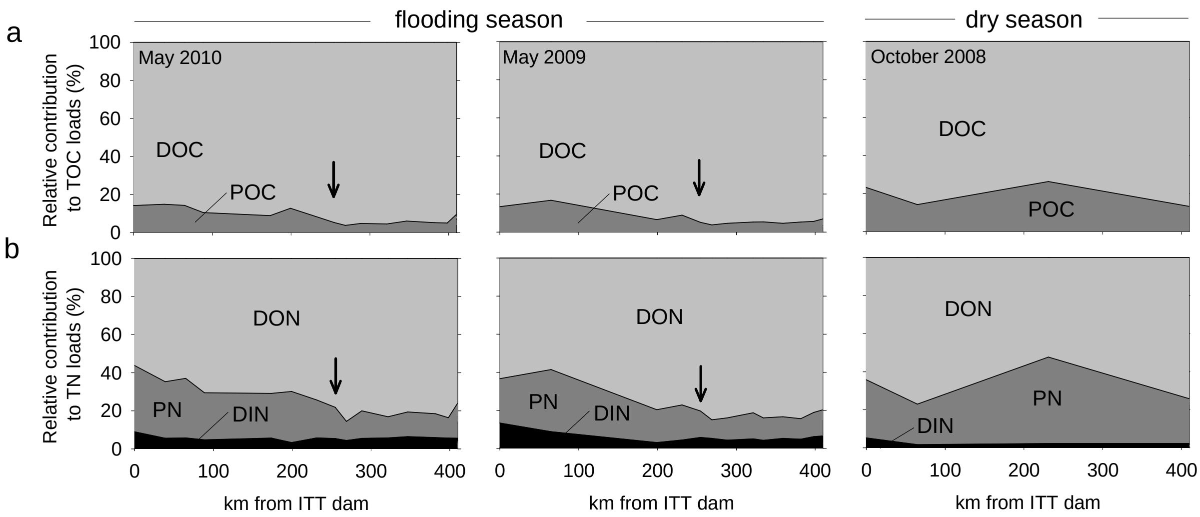

Figure S2. (a) Relative contributions of the DOC and POC loads to the total OC (TOC) loads. **(b)** Relative contributions of the DIN, PN and DON loads to the total N (TN) loads. The arrow indicates the discharge minimum during the flooding period.

4 Particulate OC and particulate N monitoring over an annual cycle

During a monitoring campaign from June 2008 to May 2009, the concentrations and stable isotopic signatures of POC and PN were measured at five selected stations (0, 88, 231, 334, and 410 km) on a bimonthly basis (Wamulume et al., 2011). Concentrations of POC and PN and POC:PN showed an overall similar course like for the higher resolution October 2008 and May 2009 campaigns. δ^{13}C-POC showed higher temporal variation after the dam than along the river, but was fairly constant at -28.5±1.2‰ at the end of the floodplain (Figure S3d). Higher δ^{13}C-POC was associated with higher POC concentrations which might be indicative of a higher contribution of plant derived POM (Figure S3e). δ^{15}N-PN was in the range of other sampled N pools (Table S1) and did not vary systematically along the river.

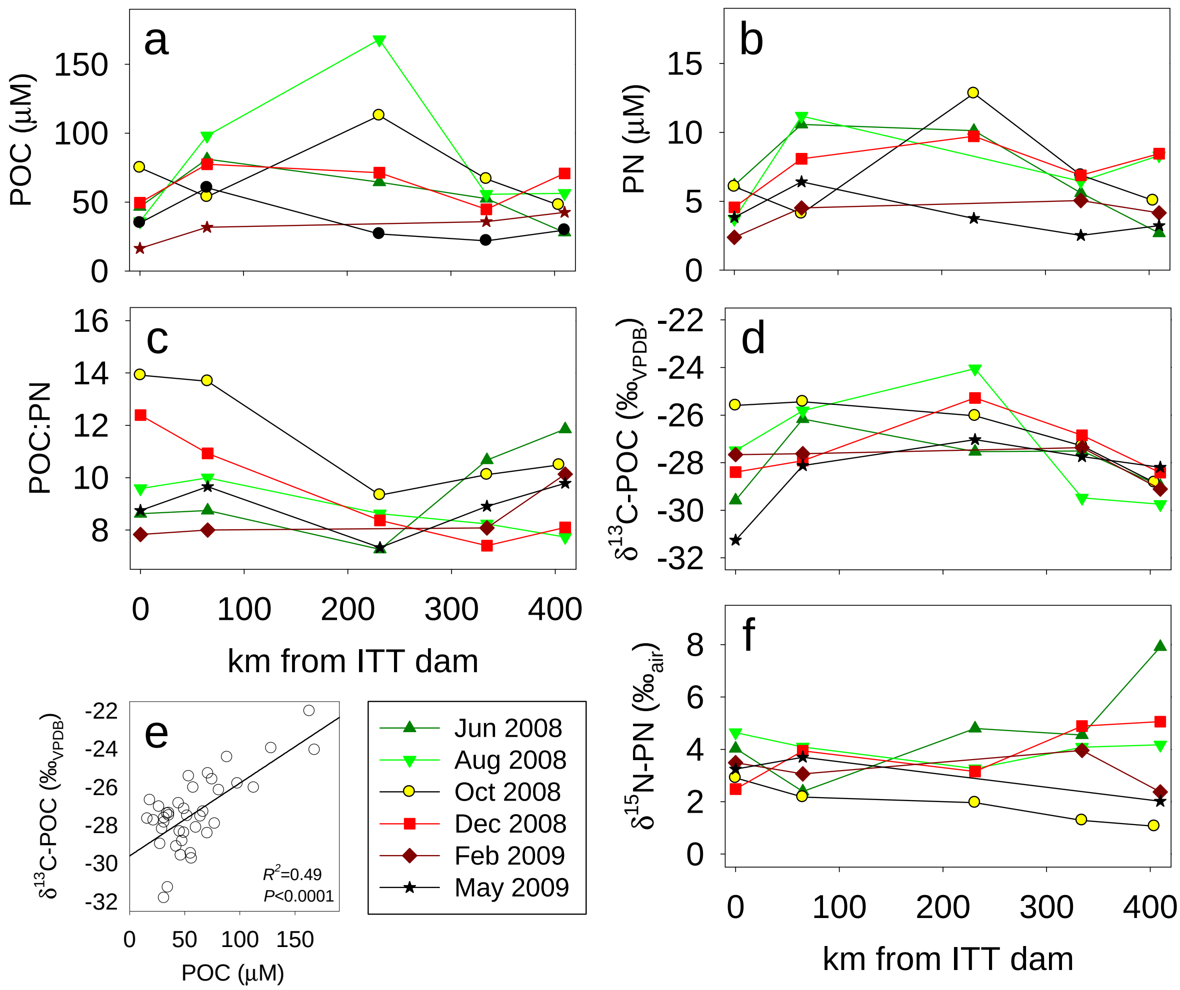

Figure S3. **(a)** POC and **(b)** PN concentrations, **(c)** POC:PN molar ratio, **(d)** δ^{13}C-POC, **(e)** correlation between concentration and δ^{13}C of POC, **(f)** δ^{15}N-PN at five stations along the Kafue River over an annual cycle from June 2008 to May 2009. Data from October 2008 and May 2009 were reprinted for consistency.

5 POC and PN profiles in Itezhi-Tezhi reservoir 2008-2009

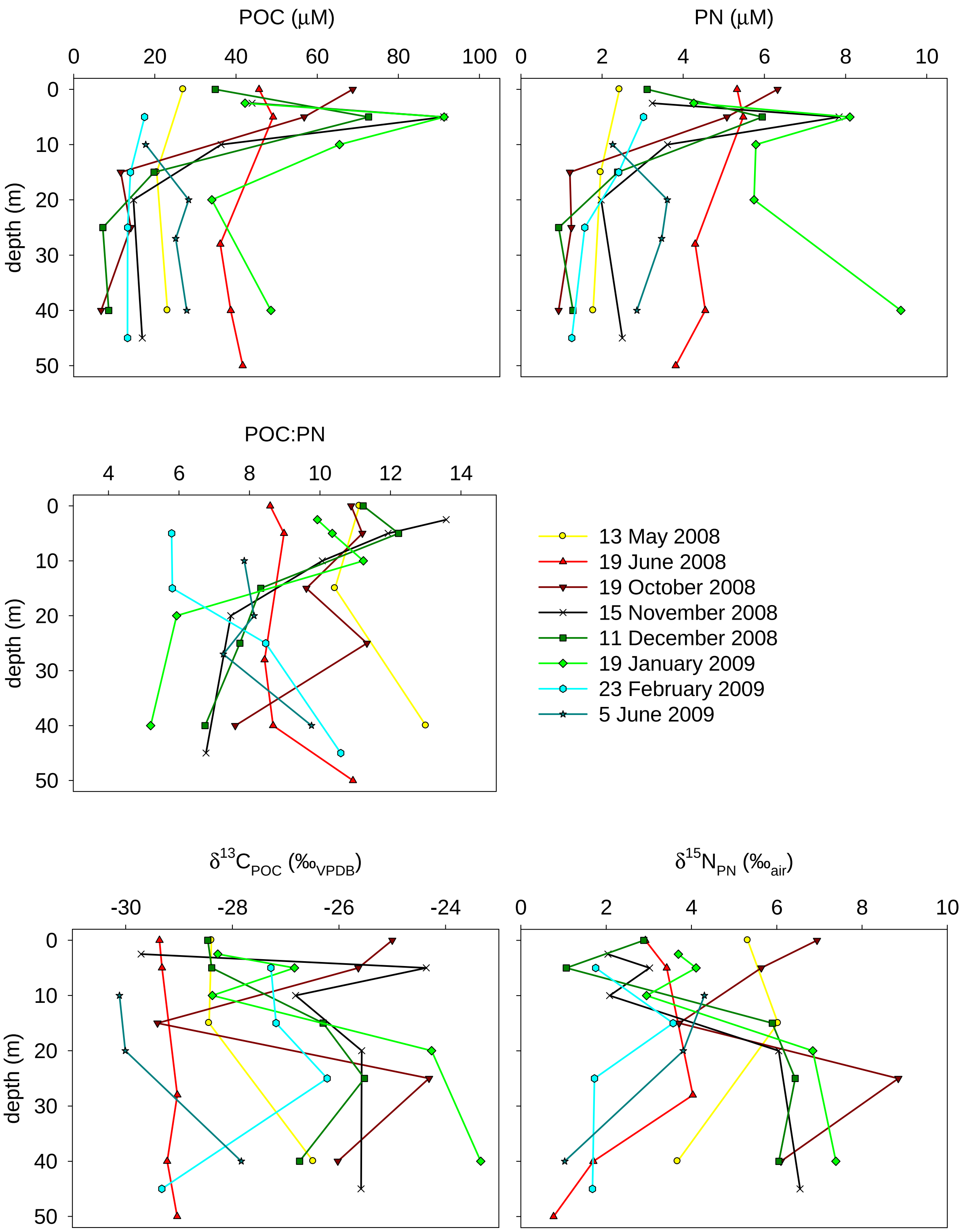

Figure S4. POC and PN concentrations, elemental ratios, and δ^{13}C-POC and δ^{15}N-PN stable isotopic signatures of water column profiles behind the dam wall of Itezhi-Tezhi reservoir (Station IT1 in Kunz et al., 2011), between May 2008 and June 2009.

6 PARAFAC modeling of excitation-emission matrices

6.1 PARAFAC model results

The comparison of different PARAFAC models with an increasing number of components resulted in a four-component model minimizing the sum of squared errors, relative to a three and five-component model (Figure S5). Higher component models were found inappropriate since they caused discontinuities in the resulting components, indicated as sharp peaks in the 5-component line in Figure S5.

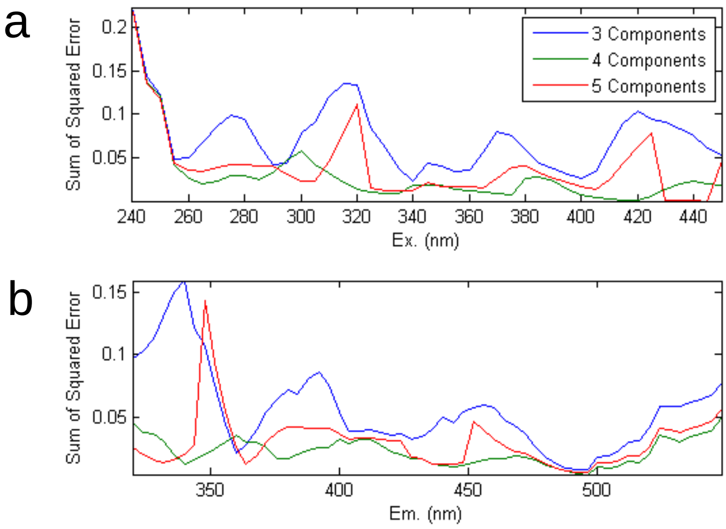

Figure S5. Sum of squared errors of 3-, 4-, and 5-component PARAFAC models for **(a)** excitation, and **(b)** emission wavelengths. Sharp peaks in the 5-component errors are caused by discontinuities in the components.

6.2 Identification of PARAFAC components

All four components resulting from the PARAFAC analysis (Figure S6) of 45 samples had been found previously in other studies (Table S2 and references therein).

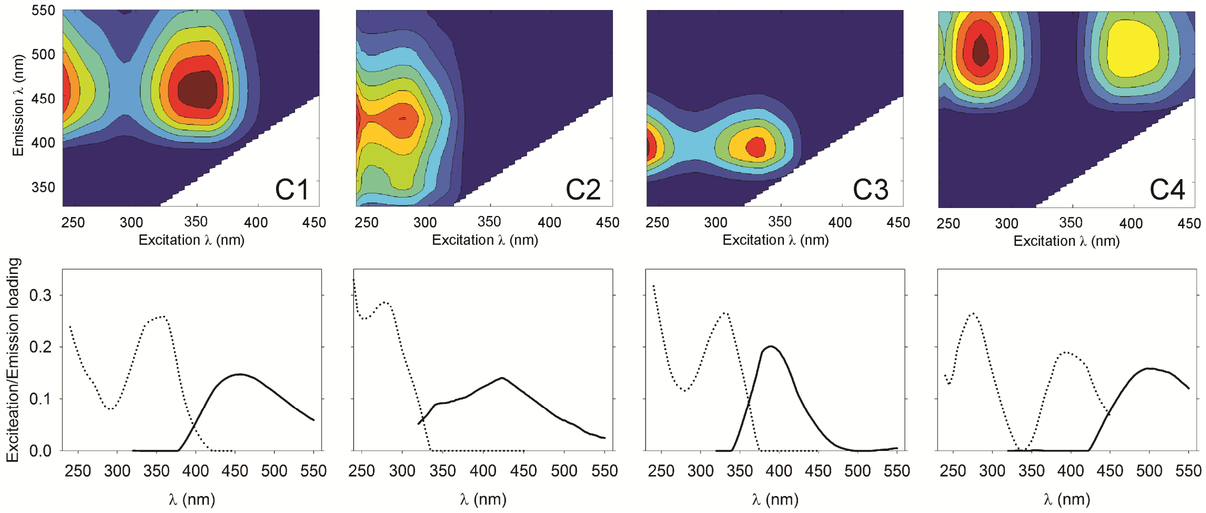

Figure S6. Components C1-C4 resulting from PARAFAC analysis. The upper panel shows the excitation-emission matrices (EEMs), the lower panel shows the excitation (dotted line) and emission (solid line) loadings of the components.

Table S2. Characteristics of the four components identified by PARAFAC analysis.

Component	C1	C2	C3	C4
Ex λ (nm)	360	280	330	275, 390
Em λ (nm)	450	420	390	500
Description	Visible humic like	UV humic like	Humic like	Humic like
Origin	Terrestrial	Terrestrial/microbial forested regions, wetlands	Terrestrial, degradation of terrestrial OM	Terrestrial/microbial degradation of terrestrial OM
Reference[a]: component name in reference	1: Peak C 3: Component 3 6: C1	1: Peak A 4: Comp. 6 / 2 (Q2) 5: Component 1 7: Component 1	1: Peak M 2: C4 3: Component 6 4: Component 3 5: Component 6 6: C4 7: Component 3	2: C3 4: Component 7 7: Component 2

[a]References: 1. Coble (1996) and Coble et al. (1998); 2. Stedmon and Markanger (2003); 3. Stedmon and Markager (2005); 4. Cory and McKnight (2005); 5. Yamashita et al. (2008); 6. Jørgensen et al. (2011); 7. Ishii & Boyer (2012).

6.3 Fluorescence intensities (F_{max}) of PARAFAC components C1-C4

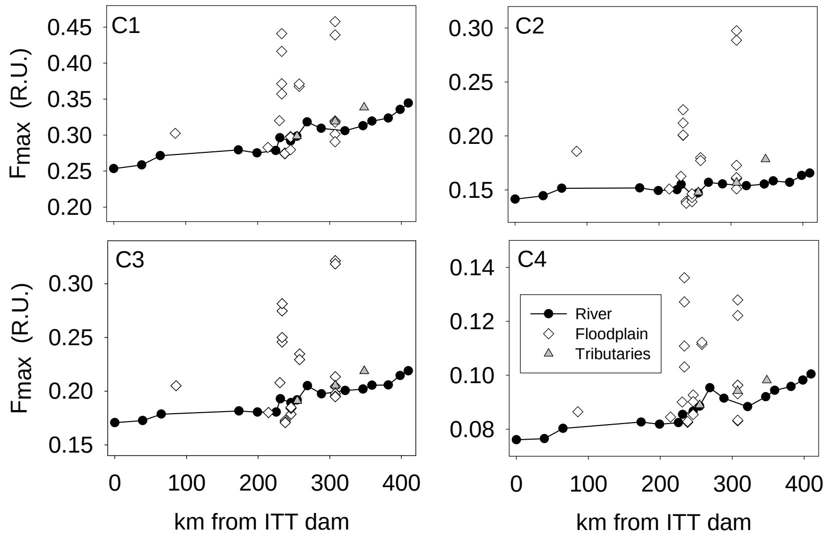

Figure S7. Fluorescence maxima (F_{max} in Raman units) for components C1-C4 along the river channel (black dots, solid line), for floodplain stations (empty diamonds) and tributaries (grey triangles).

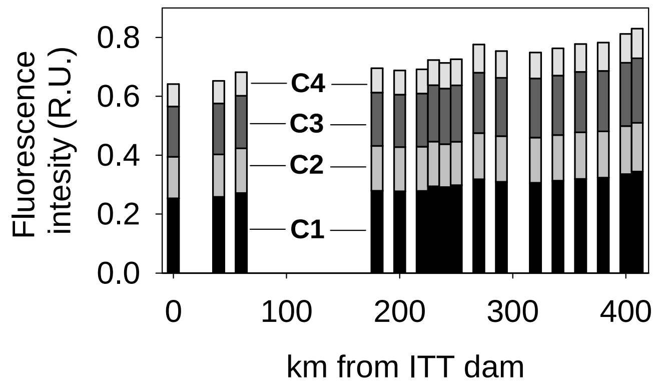

Figure S8. Contributions of components C1-C4 to the overall fluorescence (F_{max} in Raman units). C1 accounted for 40.7±0.6%, C2 for 20.9±0.8%, C3 for 26.4±0.2%, and C4 for 12.0±0.2% of the total fluorescence.

6.4 Ratios of component fluorescence relative to C3 along floodplain transects

Even though the component ratios for floodplain stations were overall statistically indifferent the river (ρ=0.097-0.872), some deviations from river stations were evident (Figure 9 in the main manuscript). Floodplain transects T1-T5 (Figure 1c) generally showed higher ratios for C1 and C4 when moving from river or shore towards the floodplain, while C2 ratio to C3 decreased.

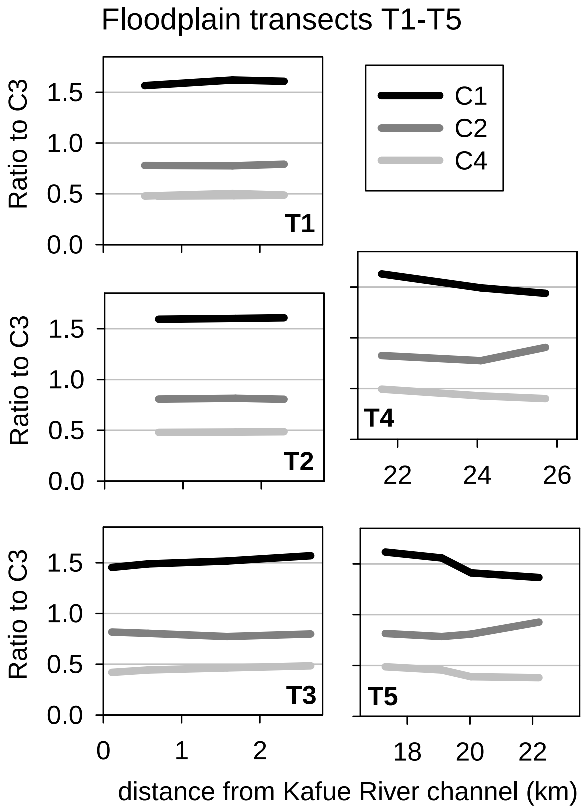

Figure S9. Ratios of the peak fluorescence F_{max} of C1, C2 and C4 relative to C3 ratios along floodplain transects T1-T3 that lead from the Kafue River into the floodplain, and T4 and T5 which lead from the floodplain to the shore (Figure 1c). Component C3 showed the highest correlation with DOC concentration (R^2=0.87).

7 Denitrification rates for N budget

Table S3. Denitrification rates from different river and floodplain systems.

System	Range of denitrification rates, units as in publication		Rates in g N m^{-2} yr^{-1}	Reference
Estimates across systems, models				
Freshwater wetlands, general	2-340 (190)	mg N m^{-2} yr^{-1}	0.002-0.34 (0.19)	(Johnston, 1991)
Rivers, global	10 000-15 000	kg N km^{-2} yr^{-1}	1-1.5	(Seitzinger et al., 2006)
Temperate streams	1-10	mg N m^{-2} h^{-1}	9-90	(Mulholland et al., 2008)
Tropical systems				
Paraná River floodplains	12-17	µmol N m^{-2} h^{-1}	1.5-2.1	(Kern et al., 1996)
Amazon floodplains (potential rates)	150-250	µmol N m^{-2} h^{-1}	18-31	(Villar et al., 1998)
African rivers	10-25	kg N ha^{-1} yr^{-1}	1.0-2.5	(Seitzinger et al., 2006)
Temperate systems				
Temperate wetlands, New Jersey, USA	<20-260	µmol N m^{-2} h^{-1}	<2.5-32	(Seitzinger, 1994)
Wetlands of the Mississippi Basin, USA	15 000	kg km^{-2} yr^{-1}	15	(Mitsch et al., 2001)
Floodplains of IJssel River, NL	15	mg N m^{-2} d^{-1}	5.5	(Olde Venterink et al., 2003)
Floodplains of IJssel and Waal River, NL	28-56	kg N ha^{-1} yr^{-1}	2.8-5.6	(Olde Venterink et al., 2006)
Riparian forest pond, MI USA – dry season	10-75	mg N m^{-2} d^{-1}	4-27	(Burgin et al., 2010)
Riparian forest pond, MI, USA – wet season	0-20	mg N m^{-2} d^{-1}	0-7.3	(Burgin et al., 2010)
Atchafalaya River sediments, USA	10-50	mg N m^{-2} d^{-1}	4-18	(Lindau et al., 2011)
First-order stream, Millbrook NY, USA	500-3000	µg N m^{-2} h^{-1}	4-26	(Burgin et al., 2012)
Riparian forest pond, MI, USA	140-280	mg N m^{-2} d^{-1}	12-23	(O'Brien et al., 2012)

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Full data set in tabular form

May 2010

Sampling station	Distance km	DOC µM	DON µM	DOC:DON -	POC µM	PN µM	POC:PN -
Kafue River							
KFS00	0	228	9.3	24.4	37.7	5.8	7.6
KFS03	39	250	14.4	17.4	43.5	6.6	7.9
KFS01	65	207	10.4	20.0	34.4	5.2	8.0
KFS27	89	250	12.5	20.1	29.4	4.4	8.0
KFS28	173	277	11.5	24.0	27.2	3.8	8.5
KFS11	199	267	15.4	17.4	39.1	5.9	7.9
ADCP07	225						
KFS12	231	288	16.0	18.0	26.8	4.3	7.5
ADCP17	246	292					
KFS14	255	295	14.0	21.0	16.3	2.9	6.5
KFS16	269	322	18.3	17.6	12.6	2.2	7.0
KFS17	288	335	16.2	20.7	16.9	2.9	6.9
KFS18	321	348	19.0	18.4	16.7	2.5	7.9
KFS21	346	359	19.3	18.6	23.1	3.1	9.0
KFS22	359	374					
KFS23	382	388	21.5	18.1	21.4	3.3	7.8
KFS24	398	405			21.4	2.8	9.0
KFS26	410	385			40.5	5.0	9.7
Floodplain							
KFP01	86	345	21.5	16.0	26.6	3.0	10.8
KFS10	230	335	10.4	32.3	20.7	2.5	9.7
KFP03	234	422					
KFP04	234						8.3
KFP05	234	455					11.0
KFP06	234	480					
KFP07	214	267					7.9
KFP08	258	409			24.6	2.9	10.1
KFP10	238	267					
KFP11	238	271					
KFP12	238	253					7.1
KFP13	246	276					
KFP14	246						10.7
KFP15	246	291					8.5
BL01	308	593	20.5	29.0			
BL02	308	385	20.4	18.8			
BL03	308	406					
BL04	308	392	16.7	23.5			9.7
BL05	308	200			14.7	2.1	8.2
BL06							
BL07	308	345	20.2	17.1			8.6
BL08	308	604					9.4
Tributaries							
KFS15	255	218					
ADCP26	308	367	13.5	27.1	41.2	5.1	9.7
KFS20	348	408					

May 2009

Sampling station	Distance km	DOC µM	DON µM	DOC:DON -	POC µM	PN µM	POC:PN -
Kafue River							
KFS00	0	228	10.4	21.8	34.8	3.8	9.1
KFS05	8	268	11.1	24.1	41.6	4.4	9.4
KFS03	39	311	12.2	25.4	41.9	4.9	8.5
KFS01	65	303	11.5	26.3	60.4	6.4	9.4
KFS27	89	279	12.3	22.7	50.7	6.0	8.5
KFS11	199	328	13.7	23.9	23.0	3.0	7.8
KFS12	231	275	15.7	17.5	26.9	3.7	7.2
KFS14	255	338	13.9	24.3	18.3	2.4	7.6
KFS16	269	373	15.3	24.4	14.6	1.8	8.3
KFS17	288	390	16.7	23.3	18.9	2.3	8.2
KFS18	321	462	18.2	25.4	25.7	3.1	8.4
KFS19	334	384	18.0	21.4	21.9	2.5	8.7
KFS22	359	475	19.5	24.3	22.8	2.7	8.6
KFS23	382	437	21.5	20.3	24.1	2.8	8.7
KFS24	398	472	18.7	25.3	27.7	2.9	9.5
KFS26	410	402	18.8	21.4	29.7	3.2	9.2
Tributaries							
KFS15	255	327	13.6	24.1			
KFS20	348	515	21.6	23.8	19.2	2.4	7.9

May 2009

Sampling station	Distance km	TSS mg L^{-1}	C content wt % C	N content wt % N
Kafue River				
KFS00	0	1.15	36.5	4.68
KFS05	8	1.66	30.2	3.75
KFS03	39	2.15	23.4	3.22
KFS01	65	3.57	20.3	2.51
KFS27	89	3.47	17.6	2.42
KFS11	199	7.48	3.7	0.55
KFS12	231	4.58	7.0	1.15
KFS14	255	2.12	10.4	1.60
KFS16	269	1.33	13.2	1.86
KFS17	288			
KFS18	321	1.64	18.9	2.61
KFS19	334	2.15	12.3	1.64
KFS22	359	2.47	11.1	1.51
KFS23	382			
KFS24	398	2.54	13.1	1.61
KFS26	410	2.84	12.5	1.59

October 2008

Sampling station	Distance km	DOC µM	DON µM	DOC:DON -	POC µM	PON µM	POC:PN -
Kafue River							
KFS00	0	248	12.8	19.4	74.9	6.1	12.4
KFS05	8	286	11.9	24.0	53.5	3.8	13.9
KFS08	23	321			76.5	7.0	10.9
KFS03	39	252	12.4	20.3	74.2	5.8	12.8
KFS02	50	324	12.7	25.6	81.3	6.4	12.7
KFS01	65	324	14.8	21.8	53.8	4.1	13.1
KFS11	199	315	35.8	8.8	74.1	7.6	9.7
KFS12	231		14.8		112.7	12.8	8.8
KFS13	238	152	13.0	11.7			
KFS14	255	313	14.0	22.3	129.3	12.2	10.6
KFS16	269	191	14.6	13.1			
KFS17	288	274	15.1	18.1	107.1	12.4	8.6
KFS18	321	376	15.1	25.0	66.8	6.9	9.7
KFS19	334	290	13.1	22.2			
KFS21	346	270	14.9	18.2	71.7	7.6	9.4
KFS22	359	264	12.7	20.8			
KFS23	382	276	15.5	17.9	68.3	8.2	8.3
KFS24	398	285	15.3	18.6			
KFS25	404	313	16.0	19.6	47.9	5.1	9.5
KFS26	410		14.2				
Floodplain							
KFS07	10	249			67.0	5.6	12.1
KFS09	20	260			64.1	4.9	13.0
KFS04	26	336	16.8	20.0	123.9	11.5	10.8
KFS10	230	510	24.8	20.5	256.9	28.8	8.9
Tributaries							
KFS20	348	759	43.2	17.6	411.9	68.8	6.0

October 2008

Sampling station	Distance km	TSS mg L^{-1}	C content wt % C	N content wt % N
Kafue River				
KFS00	0	2.12	42.4	4.00
KFS05	8	2.21	29.1	2.43
KFS08	23	5.91	15.5	1.67
KFS03	39	3.96	22.5	2.05
KFS02	50	4.84	20.2	1.85
KFS01	65	7.61	8.5	0.75
KFS11	199	14.49	6.1	0.74
KFS12	231	23.11	5.9	0.78
KFS14	255	27.74	5.6	0.62
KFS17	288	26.45	4.9	0.66
KFS18	321	8.13	9.9	1.19
KFS21	346	5.18	16.6	2.06
KFS23	382	3.82	21.5	3.02
KFS25	404	4.31	13.3	1.65

May 2010

Sampling station	Distance km	δ^{13}C-DOC ‰$_{VPDB}$	δ^{15}N-TDN ‰$_{air}$	δ^{13}C-POC ‰$_{VPDB}$	δ^{15}N-PN ‰$_{air}$
Kafue River					
KFS00	0.0	-23.9	1.9	-29.7	3.6
KFS03	38.9	-23.4		-28.9	4.6
KFS01	64.8	-23.1	2.3	-28.2	3.7
KFS27	88.5	-21.7		-27.4	3.7
KFS28	173.3	-22.5	2.3	-27.5	4.1
KFS11	199.1	-22.0		-27.1	3.5
KFS12	231.0	-22.8	2.0	-28.2	0.2
ADCP17	245.8	-22.1			
KFS14	254.6	-22.4	2.2	-27.8	2.7
KFS16	268.8	-23.0		-29.3	2.7
KFS17	288.3	-23.7	2.5	-28.4	1.9
KFS18	321.5	-23.6	2.1	-29.7	2.4
KFS21	346.5	-24.2		-28.3	2.0
KFS22	359.0	-24.1			
KFS23	381.7	-24.7	1.3	-27.7	1.6
KFS24	398.2	-23.7		-28.4	2.9
KFS26	409.6	-24.4		-27.4	2.7
Floodplain					
KFP01	85.5	-22.7		-26.7	4.0
KFS10	230.4	-23.0	1.4	-28.7	2.5
KFP03	233.5	-22.3	1.9		
KFP04	233.5			-25.2	0.7
KFP05	233.5	-22.1	2.4	-26.4	4.7
KFP06	233.5	-23.5			
KFP07	214.3	-22.5	2.1	-26.9	5.7
KFP08	257.9	-23.0		-28.8	0.3
KFP10	237.9	-22.4			
KFP11	237.9	-22.4			
KFP12	237.9	-22.3		-27.7	3.1
KFP13	245.8	-22.5			
KFP14	245.8		2.2	-23.4	0.8
KFP15	245.8	-23.0		-29.4	2.0
BL01	307.7	-21.7	2.5		
BL02	307.7	-25.0			
BL03	307.7	-24.1			
BL04	307.7	-24.4	2.0	-33.7	1.0
BL05	307.7	-25.8		-33.7	2.1
BL06	307.7	-26.6			
BL07	307.7	-24.8	1.4	-31.7	3.5
BL08	307.7	-22.3		-29.5	4.9
Tributaries					
KFS20	348.1	-23.1	2.5		
KFS15	254.7	-22.9	0.7		
ADCP26	307.7	-25.1	0.9	-29.7	2.4

May 2009

Sampling station	Distance km	δ^{13}C-DOC ‰$_{VPDB}$	δ^{15}N-TDN ‰$_{air}$	δ^{13}C-POC ‰$_{VPDB}$	δ^{15}N-PN ‰$_{air}$
Kafue River					
KFS00	0		2.0	-31.3	3.2
KFS05	8	-21.6	0.7	-30.4	4.2
KFS03	39	-21.8	1.4	-29.8	4.6
KFS01	65	-21.0	1.4	-28.1	3.7
KFS27	89	-21.8	2.1	-29.1	3.4
KFS11	199	-21.8	1.0	-29.1	0.8
KFS12	231		2.2	-27.0	
KFS14	255	-21.0	1.1	-26.8	
KFS16	269	-21.2	1.1	-27.3	
KFS17	288	-22.7	0.7	-28.6	
KFS18	321	-24.0	1.3	-28.4	
KFS19	334		1.7	-27.7	
KFS22	359	-22.9	1.3	-28.9	0.0
KFS23	382	-22.5	2.3	-27.9	1.8
KFS24	398	-23.5	0.9	-28.3	0.5
KFS26	410		1.3	-28.2	2.0
Tributaries	km				
KFS15	255	-21.8	0.7		
KFS20	348	-24.0	1.8	-30.5	-0.5

October 2008

Sampling station	Distance km	δ^{13}C-DOC ‰$_{VPDB}$	δ^{15}N-TDN ‰$_{air}$	δ^{13}C-POC ‰$_{VPDB}$	δ^{15}N-PN ‰$_{air}$
Kafue River					
KFS00	0	-23.3	1.6	-25.6	2.9
KFS05	8	-23.1	1.7	-24.8	2.8
KFS08	23	-22.9	1.8	-26.3	3.6
KFS03	39	-23.2	2.5	-26.3	3.5
KFS02	50	-22.8	2.8	-26.1	0.2
KFS01	65	-22.3	4.5	-25.4	2.2
KFS11	199	-22.0	3.1	-25.2	2.6
KFS12	231		2.6	-26.0	2.0
KFS13	238	-24.4	3.1		
KFS14	255	-21.7	2.1	-24.1	2.6
KFS16	269	-24.0	3.9		
KFS17	288	-21.5	3.5	-25.3	1.8
KFS18	321	-22.4	1.1	-27.3	1.3
KFS19	334	-21.4	2.8		
KFS21	346	-21.7	1.5	-29.0	3.2
KFS22	359	-22.1	2.3		
KFS23	382	-22.7	2.0	-29.8	3.9
KFS24	398	-22.4	2.2		
KFS25	404	-22.6	2.2	-28.8	1.1
KFS26	410		2.5		
Floodplain					
KFS07	10	-22.9		-25.8	4.0
KFS09	20	-23.0		-26.0	3.9
KFS04	26	-23.3	2.8	-30.3	1.9
KFS10	230	-23.2	3.1	-25.7	2.2
Tributaries					
KFS20	348	-21.6		-27.3	-0.7

Spectroscopic data May 2010

Sampling station	Distance km	Fluorescence Index -	$SUVA_{254}$ $l\ mg^{-1}\ m^{-1}$	PARAFAC component loading F_{max} (R.U.) C1	C2	C3	C4
Kafue River							
KFS00	0	1.45	3.50	0.253	0.141	0.171	0.076
KFS03	39	1.43	3.39	0.259	0.145	0.173	0.077
KFS01	65	1.44	4.42	0.271	0.152	0.179	0.080
KFS27	89		3.53				
KFS28	173	1.44	3.37	0.279	0.152	0.182	0.083
KFS11	199	1.43	3.49	0.278	0.150	0.178	0.082
ADCP07	225	1.44		0.279	0.150	0.181	0.083
KFS12	231	1.42	3.69	0.295	0.152	0.191	0.085
ADCP17	246	1.43	3.41	0.292	0.145	0.189	0.087
KFS14	255	1.43	3.42	0.298	0.147	0.192	0.089
KFS16	269	1.43	3.48	0.318	0.157	0.205	0.095
KFS17	288	1.44	3.18	0.310	0.156	0.197	0.092
KFS18	321	1.44	3.36	0.306	0.154	0.201	0.088
KFS21	346	1.43	3.35	0.313	0.155	0.202	0.092
KFS22	359	1.42	3.36	0.319	0.158	0.205	0.094
KFS23	382	1.43	3.26	0.324	0.157	0.206	0.096
KFS24	398	1.43	3.25	0.336	0.163	0.214	0.098
KFS26	410	1.42	3.49	0.345	0.166	0.219	0.100
Floodplain							
KFP01	86	1.44	3.05	0.303	0.186	0.205	0.087
KFP03	234	1.44	3.07	0.357	0.201	0.246	0.103
KFP04	234	1.43		0.372	0.201	0.250	0.111
KFP08	258		3.34	0.369	0.179	0.232	0.112
KFS10	230	1.42	3.55	0.320	0.163	0.208	0.090
KFP05	234	1.44	3.39	0.416	0.212	0.275	0.127
KFP06	234	1.43	3.23	0.441	0.224	0.282	0.136
KFP07	214	1.44	3.48	0.283	0.151	0.180	0.085
KFP10	238	1.43	3.37	0.275	0.139	0.173	0.083
KFP11	238	1.45	3.29	0.274	0.139	0.171	0.083
KFP12	238	1.44	3.46	0.274	0.138	0.171	0.083
KFP13	246	1.44	3.43	0.280	0.139	0.179	0.086
KFP14	246	1.42		0.298	0.143	0.184	0.093
KFP15	246	1.43	3.54	0.297	0.146	0.185	0.090
BL01	308	1.47	3.17	0.439	0.298	0.321	0.122
BL02	308	1.45	3.19	0.301	0.173	0.213	0.083
BL03	308	1.44	3.01	0.318	0.160	0.204	0.093
BL04	308	1.42	3.27	0.320	0.161	0.198	0.096
BL05	308	1.43	6.04	0.318	0.161	0.195	0.096
BL07	308	1.44	3.22	0.291	0.151	0.195	0.083
BL08	308	1.44	3.15	0.458	0.289	0.318	0.128
Tributaries							
KFS15	255	1.43		0.299	0.148	0.191	0.089
ADCP26	308	1.42	3.32	0.319	0.157	0.205	0.094
KFS20	348	1.42	3.42	0.339	0.178	0.219	0.098

Transects	km from	PARAFAC component loading F_{max} (R.U.) C1	C2	C3	C4
T4	Kafue River				
BL08	25.7	0.458	0.289	0.318	0.128
BL07	24.1	0.291	0.151	0.195	0.083
BL05	21.6	0.318	0.161	0.195	0.096
T5	Kafue River				
BL01	22.2	0.439	0.298	0.321	0.122
BL02	20.0	0.301	0.173	0.213	0.083
BL03	19.1	0.318	0.160	0.204	0.093
BL04	17.3	0.320	0.161	0.198	0.096
T1	Kafue River				
KFP13	0.5	0.280	0.139	0.179	0.086
KFP14	1.7	0.298	0.143	0.184	0.093
KFP15	2.3	0.297	0.146	0.185	0.090
T2	Kafue River				
KFP10	0.7	0.275	0.139	0.173	0.083
KFP11	1.7	0.274	0.139	0.171	0.083
KFP12	2.3	0.274	0.138	0.171	0.083
T3	Chunga Lagoon				
KFP03	0.1	0.357	0.201	0.246	0.103
KFP04	0.6	0.372	0.201	0.250	0.111
KFP05	1.6	0.416	0.212	0.275	0.127
KFP06	2.7	0.441	0.224	0.282	0.136

Sampling station	Distance km	Discharge $m^3 s^{-1}$	DOC loads $t C d^{-1}$	POC loads $t C d^{-1}$	TOC loads $t C d^{-1}$	DIN loads $t N d^{-1}$	DON loads $t N d^{-1}$	TDN loads $t N d^{-1}$	PN loads $t N d^{-1}$	TN loads $t N d^{-1}$
May 2010										
KFS00	0	530.9	125.47	20.75	146.22	0.95	6.00	6.95	3.71	10.7
KFS03	39	526.0	136.39	23.74	160.13	0.79	9.16	9.95	4.20	14.1
KFS01	65	728.0	156.61	25.98	182.59	0.84	9.15	9.99	4.54	14.5
KFS27	89	575.0	149.46	17.57	167.03	0.59	8.69	9.27	3.04	12.3
KFS28	173	572.1	164.25	16.14	180.39	0.64	7.98	8.62	2.65	11.3
KFS11	199	345.6	95.88	14.00	109.89	0.31	6.44	6.75	2.48	9.2
KFS12	231	217.3	64.88	6.05	70.93	0.33	4.21	4.54	1.13	5.7
KFS14	255	198.3	60.63	3.35	63.97	0.23	3.36	3.60	0.71	4.3
KFS16	269	229.3	76.72	2.99	79.71	0.26	5.08	5.34	0.60	5.9
KFS17	288	201.6	70.19	3.54	73.73	0.27	3.96	4.23	0.72	4.9
KFS18	321	491.6	177.67	8.51	186.18	0.78	11.29	12.07	1.50	13.6
KFS21	346	344.3	128.28	8.26	136.54	0.65	8.03	8.67	1.28	10.0
KFS23	382	521.8	210.23	11.58	221.81	0.98	13.57	14.56	2.09	16.7
KFS24	398	794.9	334.43	17.64	352.07	1.46	21.3	22.8	2.73	25.5
KFS26	410	849.0	339.19	35.70	374.89	1.57	21.5	23.1	5.15	28.2
May 2009										
KFS00	0	434.5	102.62	15.71	118.33	1.16	5.49	6.65	2.02	8.7
KFS01	65	475.5	149.27	29.81	179.08	0.98	6.61	7.59	3.68	11.3
KFS11	199	322.3	109.70	7.69	117.39	0.21	5.36	5.57	1.16	6.7
KFS12	231	244.0	69.76	6.80	76.56	0.26	4.64	4.90	1.11	6.0
KFS14	255	171.1	60.09	3.24	63.33	0.21	2.89	3.09	0.50	3.6
KFS16	269	206.3	79.83	3.12	82.95	0.24	3.82	4.06	0.44	4.5
KFS17	288	178.5	72.21	3.51	75.72	0.18	3.61	3.80	0.50	4.3
KFS18	321	491.0	235.20	13.10	248.29	0.66	10.81	11.47	1.81	13.3
KFS19	334	426.7	169.84	9.70	179.54	0.47	9.27	9.74	1.30	11.0
KFS22	359	558.0	274.80	13.22	288.02	0.83	13.20	14.03	1.79	15.8
KFS23	382	534.9	242.48	13.38	255.87	0.79	13.91	14.70	1.78	16.5
KFS24	398	642.4	314.56	18.48	333.03	1.10	14.50	15.61	2.27	17.9
KFS26	410	505.2	210.53	15.55	226.09	0.94	11.48	12.42	1.97	14.4
October 2008										
KFS00	0	214.1	55.02	16.64	71.66	0.27	3.31	3.57	1.57	5.1
KFS01	65	223.0	75.03	12.44	87.47	0.09	4.01	4.10	1.11	5.2
KFS12	231	170.4	55.75	19.94	75.68	0.13	3.04	3.18	2.64	5.8
KFS26	410	148.0	48.13	7.35	55.48	0.09	2.86	2.94	0.91	3.9

POC sampling on ITT reservoir, behind the dam wall (Station IT1)

Sampling date	Depth m	POC µM	PN µM	POC:PN -	δ^{13}C-POC ‰$_{VPDB}$	δ^{15}N-PN ‰$_{air}$
5/13/2008	0	27.0	2.4	11.1	-28.4	5.3
5/13/2008	15	20.5	2.0	10.4	-28.4	6.0
5/13/2008	25					
5/13/2008	40	23.1	1.8	13.0	-26.5	3.7
6/19/2008	0	45.7	5.3	8.6	-29.4	2.9
6/19/2008	5	49.1	5.5	9.0	-29.3	3.4
6/19/2008	28	36.1	4.3	8.4	-29.0	4.0
6/19/2008	40	38.7	4.5	8.7	-29.2	1.7
6/19/2008	50	41.7	3.8	10.9	-29.0	0.8
10/19/2008	0	68.8	6.3	10.9	-25.0	6.9
10/19/2008	5	56.8	5.1	11.2	-25.6	5.6
10/19/2008	15	11.6	1.2	9.6	-29.4	3.7
10/19/2008	25	14.1	1.2	11.3	-24.3	8.9
10/19/2008	40	6.8	0.9	7.6	-26.0	6.1
11/15/2008	2.5	44.0	3.2	13.6	-29.7	2.0
11/15/2008	5	91.2	7.8	11.9	-24.4	3.0
11/15/2008	10	36.3	3.6	10.1	-26.8	2.1
11/15/2008	20	14.8	2.0	7.5	-25.6	6.0
11/15/2008	45	16.9	2.5	6.8	-25.6	6.5
12/11/2008	0	34.9	3.1	11.2	-28.5	2.9
12/11/2008	5	72.7	5.9	12.2	-28.4	1.1
12/11/2008	15	19.8	2.4	8.3	-26.3	5.9
12/11/2008	25	7.2	0.9	7.7	-25.5	6.4
12/11/2008	40	8.6	1.3	6.7	-26.7	6.1
1/19/2009	2.5	42.2	4.3	9.9	-28.3	3.7
1/19/2009	5	91.3	8.1	10.4	-26.8	4.1
1/19/2009	10	65.5	5.8	11.2	-28.4	2.9
1/19/2009	20	34.1	5.7	5.9	-24.3	6.8
1/19/2009	40	48.6	9.4	5.2	-23.3	7.4
2/23/2009	5	17.5	3.0	5.8	-27.3	1.8
2/23/2009	15	14.0	2.4	5.8	-27.2	3.6
2/23/2009	25	13.3	1.6	8.5	-26.2	1.7
2/23/2009	45	13.3	1.3	10.6	-29.3	1.7
6/5/2009	10	17.8	2.3	7.9	-30.1	4.3
6/5/2009	20	28.3	3.6	8.1	-30.0	3.8
6/5/2009	27	25.2	3.5	7.3		
6/5/2009	40	27.9	2.9	9.8	-27.8	1.0