

Supplements

Table S1: Average values (mean, if not marked otherwise) of CH₄ gas fluxes, surface and pore water variables, trace gas concentrations and isotopic signatures of CH₄ and DIC and absolute DNA- and cDNA-based abundances of microorganisms

Variable	Sampling campaign	Location	Mean value	Reference	Remark
CH ₄ flux	post-infl19_spr	HC1	4.9 mg m ⁻² d ⁻¹	this study	
CH ₄ flux	post-infl19_spr	HC2	7.6 mg m ⁻² d ⁻¹	this study	
CH ₄ flux	post-infl19_spr	HC3	0.6 mg m ⁻² d ⁻¹	this study	
CH ₄ flux	post-infl19_spr	HC4	1.1 mg m ⁻² d ⁻¹	this study	
CH ₄ flux	post-infl19_aut	HC1	107 mg m ⁻² d ⁻¹	this study	
CH ₄ flux	post-infl19_aut	HC2	NA	this study	
CH ₄ flux	post-infl19_aut	HC3	9.6 mg m ⁻² d ⁻¹	this study	
CH ₄ flux	post-infl19_aut	HC4	(-14.2) mg m ⁻² d ⁻¹	this study	
EC (surface water)	base14		2 mS/cm	Bohne and Bohne, 2008	
EC (surface water)	drought18	HC2	0.6 mS/cm	Ibenthal, 2020	
EC (surface water)	post-infl19_spr	HC1-4	9.3 mS/cm	this study	
EC (surface water)	post-infl19_spr	HC1	7.5 mS/cm	this study	
EC (surface water)	post-infl19_spr	HC2	8.0 mS/cm	this study	
EC (surface water)	post-infl19_spr	HC3	12.5 mS/cm	this study	
EC (surface water)	post-infl19_spr	HC4	12.1 mS/cm	this study	

EC (surface water)	post-infl19_aut	HC1-4	7.6 mS/cm	this study	
EC (surface water)	post-infl19_aut	HC1	5.3 mS/cm	this study	
EC (surface water)	post-infl19_aut	HC2	6.3 mS/cm	this study	
EC (surface water)	post-infl19_aut	HC3	8.7 mS/cm	this study	
EC (surface water)	post-infl19_aut	HC4	8.7 mS/cm	this study	
SO ₄ ²⁻ (surface water)	drought18	HC2	0.1 mM	Ibenthal, 2020	measured with IC
SO ₄ ²⁻ (surface water)	post-infl19_spr	HC2	5.6 mM	this study	measured with IC
SO ₄ ²⁻ (surface water)	post-infl19_spr	HC1-4	2.6 mM	this study	measured with ICP-OES
SO ₄ ²⁻ (surface water)	post-infl19_spr	HC1	2.7 mM	this study	measured with ICP-OES
SO ₄ ²⁻ (surface water)	post-infl19_spr	HC2	2.6 mM	this study	measured with ICP-OES
SO ₄ ²⁻ (surface water)	post-infl19_spr	HC3	1.2 mM	this study	measured with ICP-OES
SO ₄ ²⁻ (surface water)	post-infl19_spr	HC4	3.9 mM	this study	measured with ICP-OES
SO ₄ ²⁻ (surface water)	post-infl19_aut	HC2	0.63 mM	this study	measured with IC
SO ₄ ²⁻ (surface water)	post-infl19_aut	HC1-4	0.6 mM	this study	measured with ICP-OES
SO ₄ ²⁻ (surface water)	post-infl19_aut	HC1	0.2 mM	this study	measured with ICP-OES

SO ₄ ²⁻ (surface water)	post-infl19_aut	HC2	0.3 mM	this study	measured with ICP-OES
SO ₄ ²⁻ (surface water)	post-infl19_aut	HC3	0.7 mM	this study	measured with ICP-OES
SO ₄ ²⁻ (surface water)	post-infl19_aut	HC4	1.2 mM	this study	measured with ICP-OES
Cl ⁻ (surface water)	drought18	HC2	2.9 mM	Ibenthal, 2020	measured with IC
Cl ⁻ (surface water)	post-infl19_spr	HC2	55.6 mM	this study	measured with IC
Cl ⁻ (surface water)	post-infl19_spr	HC1-4	23.81 mM	this study	measured with ICP-OES
Cl ⁻ (surface water)	post-infl19_spr	HC1	22.8 mM	this study	measured with ICP-OES
Cl ⁻ (surface water)	post-infl19_spr	HC2	25.0 mM	this study	measured with ICP-OES
Cl ⁻ (surface water)	post-infl19_spr	HC3	13.4 mM	this study	measured with ICP-OES
Cl ⁻ (surface water)	post-infl19_spr	HC4	33.9 mM	this study	measured with ICP-OES
Cl ⁻ (surface water)	post-infl19_aut	HC2	60.6 mM	this study	measured with IC
Cl ⁻ (surface water)	post-infl19_aut	HC1-4	27.5 mM	this study	measured with ICP-OES
Cl ⁻ (surface water)	post-infl19_aut	HC1	12.4 mM	this study	measured with ICP-OES
Cl ⁻ (surface water)	post-infl19_aut	HC2	18.0 mM	this study	measured with ICP-OES
Cl ⁻ (surface water)	post-infl19_aut	HC3	32.4 mM	this study	measured with ICP-OES
Cl ⁻ (surface water)	post-infl19_aut	HC4	47.3 mM	this study	measured with ICP-OES
SO ₄ ²⁻ / Cl ⁻ (surface water)	drought18	HC2	0.04	Ibenthal, 2020	measured with IC
SO ₄ ²⁻ / Cl ⁻ (surface water)	post-infl19_spr	HC2	0.1	this study	measured with IC

SO ₄ ²⁻ / Cl ⁻ (surface water)	post-infl19_spr	HC1-4	0.11	this study	measured with ICP-OES
SO ₄ ²⁻ / Cl ⁻ (surface water)	post-infl19_spr	HC1	0.12	this study	measured with ICP-OES
SO ₄ ²⁻ / Cl ⁻ (surface water)	post-infl19_spr	HC2	0.1	this study	measured with ICP-OES
SO ₄ ²⁻ / Cl ⁻ (surface water)	post-infl19_spr	HC3	0.09	this study	measured with ICP-OES
SO ₄ ²⁻ / Cl ⁻ (surface water)	post-infl19_spr	HC4	0.12	this study	measured with ICP-OES
SO ₄ ²⁻ / Cl ⁻ (surface water)	post-infl19_aut	HC1-4	0.02	this study	measured with ICP-OES
SO ₄ ²⁻ / Cl ⁻ (surface water)	post-infl19_aut	HC2	0.01	this study	measured with IC
SO ₄ ²⁻ / Cl ⁻ (surface water)	post-infl19_aut	HC1	0.01	this study	measured with ICP-OES
SO ₄ ²⁻ / Cl ⁻ (surface water)	post-infl19_aut	HC2	0.02	this study	measured with ICP-OES
SO ₄ ²⁻ / Cl ⁻ (surface water)	post-infl19_aut	HC3	0.02	this study	measured with ICP-OES
SO ₄ ²⁻ / Cl ⁻ (surface water)	post-infl19_aut	HC4	0.03	this study	measured with ICP-OES
EC (pore water)	base14	HC1-4	5.1 mS/cm	Wen et al., 2018	
EC (pore water)	base14	HC1	2.2 mS/cm	Wen et al., 2018	

EC (pore water)	base14	HC2	6.3 mS/cm	Wen et al., 2018	
EC (pore water)	base14	HC3	5.8 mS/cm	Wen et al., 2018	
EC (pore water)	base14	HC4	5.0 mS/cm	Wen et al., 2018	
EC (pore water)	post-infl19_spr	HC2	7.4 mS/cm	this study	
EC (pore water)	post-infl19_aut	HC1-4	9.1 mS/cm	this study	
EC (pore water)	post-infl19_aut	HC1	5.4 mS/cm	this study	
EC (pore water)	post-infl19_aut	HC2	10.6 mS/cm	this study	
EC (pore water)	post-infl19_aut	HC3	9.2 mS/cm	this study	
EC (pore water)	post-infl19_aut	HC4	11.3 mS/cm	this study	
SO ₄ ²⁻ (pore water)	base14	HC1-4	1.1 mM	Wen et al., 2018	measured with ICP-OES
SO ₄ ²⁻ (pore water)	base14	HC1	0.01 mM	Wen et al., 2018	measured with ICP-OES
SO ₄ ²⁻ (pore water)	base14	HC2	3.5 mM	Wen et al., 2018	measured with ICP-OES
SO ₄ ²⁻ (pore water)	base14	HC3	0.02 mM	Wen et al., 2018	measured with ICP-OES
SO ₄ ²⁻ (pore water)	base14	HC4	0.158 mM	Wen et al., 2018	measured with ICP-OES
SO ₄ ²⁻ (pore water)	drought18	HC2	21.6 mM	Unger et al., 2021	measured with ICP-OES
SO ₄ ²⁻ (pore water)	post-infl19_aut	HC1-4	5.3 mM	this study	measured with ICP-OES
SO ₄ ²⁻ (pore water)	post-infl19_aut	HC1	9.9 mM	this study	measured with ICP-OES

SO ₄ ²⁻ (pore water)	post-infl19_aut	HC2	8.6 mM	this study	measured with ICP-OES
SO ₄ ²⁻ (pore water)	post-infl19_aut	HC3	0.82 mM	this study	measured with ICP-OES
SO ₄ ²⁻ (pore water)	post-infl19_aut	HC4	0.69 mM	this study	measured with ICP-OES
Cl ⁻ (pore water)	base14	HC1-4	37.8 mM	Wen et al., 2018	measured with ICP-OES
Cl ⁻ (pore water)	base14	HC1	12.42 mM	Wen et al., 2018	measured with ICP-OES
Cl ⁻ (pore water)	base14	HC2	42.9 mM	Wen et al., 2018	measured with ICP-OES
Cl ⁻ (pore water)	base14	HC3	47.4 mM	Wen et al., 2018	measured with ICP-OES
Cl ⁻ (pore water)	base14	HC4	40.5 mM	Wen et al., 2018	measured with ICP-OES
Cl ⁻ (pore water)	drought18	HC2	45.1 mM	Unger et al., 2021	measured with ICP-OES
Cl ⁻ (pore water)	post-infl19_aut	HC1-4	55.1 mM	this study	measured with ICP-OES
Cl ⁻ (pore water)	post-infl19_aut	HC1	23.5 mM	this study	measured with ICP-OES
Cl ⁻ (pore water)	post-infl19_aut	HC2	57.1 mM	this study	measured with ICP-OES
Cl ⁻ (pore water)	post-infl19_aut	HC3	68.1 mM	this study	measured with ICP-OES
Cl ⁻ (pore water)	post-infl19_aut	HC4	74.8 mM	this study	measured with ICP-OES
SO ₄ ²⁻ / Cl ⁻ (pore water)	base14	HC1-4	0.029	Wen et al., 2018	measured with ICP-OES
SO ₄ ²⁻ / Cl ⁻ (pore water)	base14	HC1	0.001	Wen et al., 2018	measured with ICP-OES
SO ₄ ²⁻ / Cl ⁻ (pore water)	base14	HC2	0.054	Wen et al., 2018	measured with ICP-OES

SO ₄ ²⁻ / Cl ⁻ (pore water)	base14	HC3	0.00006	Wen et al., 2018	measured with ICP-OES
SO ₄ ²⁻ / Cl ⁻ (pore water)	base14	HC4	0.003	Wen et al., 2018	measured with ICP-OES
SO ₄ ²⁻ / Cl ⁻ (pore water)	drought18	HC2	0.471	Unger et al., 2021	measured with ICP-OES
SO ₄ ²⁻ / Cl ⁻ (pore water)	post-infl19_aut	HC1-4	0.146	this study	measured with ICP-OES
SO ₄ ²⁻ / Cl ⁻ (pore water)	post-infl19_aut	HC1	0.4	this study	measured with ICP-OES
SO ₄ ²⁻ / Cl ⁻ (pore water)	post-infl19_aut	HC2	0.13	this study	measured with ICP-OES
SO ₄ ²⁻ / Cl ⁻ (pore water)	post-infl19_aut	HC3	0.012	this study	measured with ICP-OES
SO ₄ ²⁻ / Cl ⁻ (pore water)	post-infl19_aut	HC4	0.0095	this study	measured with ICP-OES
CH ₄ concentration	base14	HC1-4	232.6 μM	Wen et al., 2018	
CH ₄ concentration	base14	HC1	199.5 μM	Wen et al., 2018	
CH ₄ concentration	base14	HC2	297.1 μM	Wen et al., 2018	
CH ₄ concentration	base14	HC3	255.6 μM	Wen et al., 2018	
CH ₄ concentration	base14	HC4	154.0 μM	Wen et al., 2018	

CH ₄ concentration	drought18	HC2	70.9 μM	Unger et al., 2021
CH ₄ concentration	post-infl19_spr	HC2	325 μM	this study
CH ₄ concentration	post-infl19_aut	HC1-4	158.0 μM	this study
CH ₄ concentration	post-infl19_aut	HC1	1.4 μM	this study
CH ₄ concentration	post-infl19_aut	HC2	91.0 μM	this study
CH ₄ concentration	post-infl19_aut	HC3	123.8 μM	this study
CH ₄ concentration	post-infl19_aut	HC4	398.8 μM	this study
CO ₂ concentration	base14	HC1-4	9.8 mM	Wen et al., 2018
CO ₂ concentration	base14	HC1	10.2 mM	Wen et al., 2018
CO ₂ concentration	base14	HC2	16.6 mM	Wen et al., 2018
CO ₂ concentration	base14	HC3	4.9 mM	Wen et al., 2018
CO ₂ concentration	base14	HC4	7.0 mM	Wen et al., 2018
CO ₂ concentration	drought18	HC2	1.1 mM	Unger et al., 2021
CO ₂ concentration	post-infl19_spr	HC2	1.4 mM	this study
CO ₂ concentration	post-infl19_aut	HC1-4	1.8 mM	this study
CO ₂ concentration	post-infl19_aut	HC1	1.1 mM	this study
CO ₂ concentration	post-infl19_aut	HC2	2.2 mM	this study
CO ₂ concentration	post-infl19_aut	HC3	2.3 mM	this study

CO ₂ concentration	post-infl19_aut	HC4	1.5 mM	this study
δ ¹³ C-CH ₄	base14	HC1-4	(-60.6) ‰	Wen et al., 2018
δ ¹³ C-CH ₄	base14	HC1	(-63.0) ‰	Wen et al., 2018
δ ¹³ C-CH ₄	base14	HC2	(-62.0) ‰	Wen et al., 2018
δ ¹³ C-CH ₄	base14	HC3	(-58.1) ‰	Wen et al., 2018
δ ¹³ C-CH ₄	base14	HC4	(-60.1) ‰	Wen et al., 2018
δ ¹³ C-CH ₄	drought18	HC2	(-63.5) ‰	Unger et al., 2021
δ ¹³ C-CH ₄	post-infl19_spr	HC2	(-63.7) ‰	this study
δ ¹³ C-CH ₄	post-infl19_aut	HC1-4	(-64.7) ‰	this study
δ ¹³ C-CH ₄	post-infl19_aut	HC1	(-70.8) ‰	this study
δ ¹³ C-CH ₄	post-infl19_aut	HC2	(-68.0) ‰	this study
δ ¹³ C-CH ₄	post-infl19_aut	HC3	(-62.3) ‰	this study
δ ¹³ C-CH ₄	post-infl19_aut	HC4	(-61.6) ‰	this study
δ ¹³ C-CO ₂	base14	HC1-4	(-5.2) ‰	Wen et al., 2018
δ ¹³ C-CO ₂	base14	HC1	(-4.4) ‰	Wen et al., 2018
δ ¹³ C-CO ₂	base14	HC2	(-8.4) ‰	Wen et al., 2018

$\delta^{13}\text{C-CO}_2$	base14	HC3	(-5.5) ‰	Wen et al., 2018	
$\delta^{13}\text{C-CO}_2$	base14	HC4	(-1.9) ‰	Wen et al., 2018	
$\delta^{13}\text{C-CO}_2$	drought18	HC2	(-19.9) ‰	Unger et al., 2021	
$\delta^{13}\text{C-CO}_2$	post-infl19_spr	HC2	(-15.2) ‰	this study	
$\delta^{13}\text{C-CO}_2$	post-infl19_aut	HC1-4	(-20.9) ‰	this study	
$\delta^{13}\text{C-CO}_2$	post-infl19_aut	HC1	(-22.6) ‰	this study	
$\delta^{13}\text{C-CO}_2$	post-infl19_aut	HC2	(-21.5) ‰	this study	
$\delta^{13}\text{C-CO}_2$	post-infl19_aut	HC3	(-21.1) ‰	this study	
$\delta^{13}\text{C-CO}_2$	post-infl19_aut	HC4	(-18.6) ‰	this study	
16S rRNA (DNA)	base14	HC1-4	$3.25 \cdot 10^{10}$	Wen et al., 2018	averages are given as median values
16S rRNA (DNA)	base14	HC1	$2.33 \cdot 10^{10}$	Wen et al., 2018	averages are given as median values
16S rRNA (DNA)	base14	HC2	$1.68 \cdot 10^{10}$	Wen et al., 2018	averages are given as median values
16S rRNA (DNA)	base14	HC3	$4.93 \cdot 10^{14}$	Wen et al., 2018	averages are given as median values
16S rRNA (DNA)	base14	HC4	$4.57 \cdot 10^{10}$	Wen et al., 2018	averages are given as median values
16S rRNA (DNA)	drought18	HC2	$2.02 \cdot 10^{10}$	Unger et al., 2021	averages are given as median values
16S rRNA (DNA)	post-infl19_spr	HC2	$1.50 \cdot 10^{10}$	this study	averages are given as median values
16S rRNA (DNA)	post-infl19_aut	HC1-4	$3.00 \cdot 10^{10}$	this study	averages are given as median values

16S rRNA (DNA)	post-infl19_aut	HC1	2.61*10 ⁹	this study	averages are given as median values
16S rRNA (DNA)	post-infl19_aut	HC2	2.49*10 ¹⁰	this study	averages are given as median values
16S rRNA (DNA)	post-infl19_aut	HC3	3.18*10 ¹⁰	this study	averages are given as median values
16S rRNA (DNA)	post-infl19_aut	HC4	4.47*10 ¹⁰	this study	averages are given as median values
<i>mcrA</i> (DNA)	base14	HC1-4	1.14*10 ⁸	Wen et al., 2018	averages are given as median values
<i>mcrA</i> (DNA)	base14	HC1	9.77*10 ⁷	Wen et al., 2018	averages are given as median values
<i>mcrA</i> (DNA)	base14	HC2	3.53*10 ⁷	Wen et al., 2018	averages are given as median values
<i>mcrA</i> (DNA)	base14	HC3	4.58*10 ⁸	Wen et al., 2018	averages are given as median values
<i>mcrA</i> (DNA)	base14	HC4	8.71*10 ⁸	Wen et al., 2018	averages are given as median values
<i>mcrA</i> (DNA)	drought18	HC2	3.92*10 ⁸	Unger et al., 2021	averages are given as median values
<i>mcrA</i> (DNA)	post-infl19_spr	HC2	7.86*10 ⁷	this study	averages are given as median values
<i>mcrA</i> (DNA)	post-infl19_aut	HC1-4	2.21*10 ⁸	this study	averages are given as median values
<i>mcrA</i> (DNA)	post-infl19_aut	HC1	5.10*10 ⁶	this study	averages are given as median values
<i>mcrA</i> (DNA)	post-infl19_aut	HC2	2.58*10 ⁸	this study	averages are given as median values
<i>mcrA</i> (DNA)	post-infl19_aut	HC3	2.40*10 ⁸	this study	averages are given as median values
<i>mcrA</i> (DNA)	post-infl19_aut	HC4	5.81*10 ⁸	this study	averages are given as median values
<i>pmoA</i> (DNA)	base14	HC1-4	1.34*10 ⁷	Wen et al., 2018	averages are given as median values

<i>pmoA (DNA)</i>	base14	HC1	2.53*10 ⁷	Wen et al., 2018	averages are given as median values
<i>pmoA (DNA)</i>	base14	HC2	1.06*10 ⁷	Wen et al., 2018	averages are given as median values
<i>pmoA (DNA)</i>	base14	HC3	1.40*10 ⁷	Wen et al., 2018	averages are given as median values
<i>pmoA (DNA)</i>	base14	HC4	2.15*10 ⁷	Wen et al., 2018	averages are given as median values
<i>pmoA (DNA)</i>	drought18	HC2	2.30*10 ⁷	Unger et al., 2021	averages are given as median values
<i>pmoA (DNA)</i>	post-infl19_spr	HC2	6.64*10 ⁶	this study	averages are given as median values
<i>pmoA (DNA)</i>	post-infl19_aut	HC1-4	9.46*10 ⁶	this study	averages are given as median values
<i>pmoA (DNA)</i>	post-infl19_aut	HC1	2.62*10 ⁶	this study	averages are given as median values
<i>pmoA (DNA)</i>	post-infl19_aut	HC2	5.62*10 ⁶	this study	averages are given as median values
<i>pmoA (DNA)</i>	post-infl19_aut	HC3	1.01*10 ⁷	this study	averages are given as median values
<i>pmoA (DNA)</i>	post-infl19_aut	HC4	2.42*10 ⁷	this study	averages are given as median values
<i>dsrB (DNA)</i>	base14	HC1-4	8.38*10 ⁵	Wen et al., 2018	averages are given as median values
<i>dsrB (DNA)</i>	base14	HC1	NA	Wen et al., 2018	averages are given as median values
<i>dsrB (DNA)</i>	base14	HC2	9.98*10 ⁵	Wen et al., 2018	averages are given as median values
<i>dsrB (DNA)</i>	base14	HC3	9.77*10 ⁵	Wen et al., 2018	averages are given as median values
<i>dsrB (DNA)</i>	base14	HC4	7.57*10 ⁵	Wen et al., 2018	averages are given as median values

<i>dsrB (DNA)</i>	drought18	HC2	1.75*10 ⁶	Unger et al., 2021	averages are given as median values
<i>dsrB (DNA)</i>	post-infl19_spr	HC2	1.13*10 ⁸	this study	averages are given as median values
<i>dsrB (DNA)</i>	post-infl19_aut	HC1-4	4.26*10 ⁸	this study	averages are given as median values
<i>dsrB (DNA)</i>	post-infl19_aut	HC1	3.79*10 ⁷	this study	averages are given as median values
<i>dsrB (DNA)</i>	post-infl19_aut	HC2	6.38*10 ⁸	this study	averages are given as median values
<i>dsrB (DNA)</i>	post-infl19_aut	HC3	3.68*10 ⁸	this study	averages are given as median values
<i>dsrB (DNA)</i>	post-infl19_aut	HC4	5.97*10 ⁸	this study	averages are given as median values
16S rRNA (cDNA)	post-infl19_spr	HC2	3.19*10 ⁸	this study	averages are given as median values
16S rRNA (cDNA)	post-infl19_aut	HC2	8.72*10 ⁹	this study	averages are given as median values
<i>mcrA (cDNA)</i>	post-infl19_spr	HC2	686	this study	averages are given as median values
<i>mcrA (cDNA)</i>	post-infl19_aut	HC2	1625	this study	averages are given as median values
<i>pmoA (cDNA)</i>	post-infl19_spr	HC2	7	this study	averages are given as median values
<i>pmoA (cDNA)</i>	post-infl19_aut	HC2	101	this study	averages are given as median values
