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SUPPLEMENTARY MATERIAL

Higher late summer methane emission from central than northern European lakes

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Supplementary Tab. 1. Coordinates, geographical classification (B=boreal lakes, CE=central European lakes), and morphological characteristics of the studied lakes. Lakes sampled in 2010 and 2011 are included in the studies by Schilder *et al*. (2013) and Rinta *et al*. (2015).

Abbreviation	Lake	Region	Sampling year	Longitude Decimal °E	Latitude Decimalm °N	Altitude (m asl)	Area (ha)	Max. depth (m)	Relative volume of hypoxic water layer (%)
LOV	Lovojärvi	B	2011	25.03	61.08	108	5	18	65
NIM	Nimetön	B	2011	25.19	61.23	152	0.4	13	73
VAL	Valkea-Kotinen	B	2011	25.06	61.24	156	4	8	28
MEK	Mekkojärvi	B	2011	25.14	61.23	136	0.3	4	72
SYR	Syrjänalunen	B	2011	25.14	61.19	138	1	9	3
JYV	Jyväsjärvi	B	2011	25.77	62.24	78	303	25	1
ERS	Erssjön	B	2010	12.16	58.37	75	6	5	0
SKO	Skottenesjön	B	2010	12.14	58.35	51	26	6	0
SGL	Skärgölen	B	2010	16.23	58.76	72	16	13	4
LIL	Lillsjön	B	2010	16.14	58.66	84	3	8	10
GRI	Grissjön	B	2010	15.14	58.77	139	23	16	0
MRN	Mårn	B	2010	15.87	58.59	27	62	15	8
KIS	Kisasjön north	B	2010	15.65	58.01	99	96	9	6
GLI	Glimmingen	B	2010	15.57	57.93	145	167	32	0
HAR	Hargsjön	B	2010	15.24	58.27	108	99	6	0
ILR	Illersjön	B	2010	14.99	58.58	96	7	12	24
STV	Stora Vänstern	B	2010	15.15	58.62	102	113	21	0
HZ	Holzsee	CE	2011	10.18	54.16	25	19	7	21
SCO	Schöhsee	CE	2011	10.44	54.17	22	75	29	8
PLU	Plusssee	CE	2011	10.44	54.18	25	14	29	45
WAY	De Waay	CE	2011	5.15	51.93	0	4	15	69
HIJK	Hijkermeer	CE	2011	6.49	52.89	14	2	2	0
GER	Gerzensee	CE	2011	7.55	46.83	603	24	11	49
LAU	Lauenensee	CE	2011	7.33	46.40	1381	9	4	0
SCW	Schwarzsee	CE	2011	7.28	46.67	1046	45	9	29
BUR	Burgäschisee	CE	2011	7.67	47.17	434	20	30	70
ROT	Rotsee	CE	2011	8.31	47.07	403	44	16	49
HIN	Hinterburgsee	CE	2011	8.07	46.72	1516	5	11	22
SEE	Seealpsee	CE	2011	9.40	47.27	1141	13	15	44
HAS	Hasensee east	CE	2011	8.83	47.61	434	7	6	8
HUT	Hüttwilersee	CE	2011	8.84	47.61	434	34	16	31
NUS	Nussbaumersee middle	CE	2011	8.82	47.62	434	25	8	2
INK	Inkwilersee	CE	2012	7.66	47.20	461	10	5	5
DER	Lac de Derborence	CE	2012	7.22	46.28	1449	4	2	0
RET	Lac de Retaud	CE	2012	7.20	46.36	1685	1	5	1
HUS	Husemersee	CE	2012	8.70	47.62	409	7	14	19
TUR	Türlersee	CE	2012	8.50	47.27	643	48	25	16
NOI	Lac Noir	CE	2012	7.08	46.33	1715	1	11	20
BRE	Lac de Bretaye	CE	2012	7.07	46.33	1780	4	9	17
CHA	Lac des Chavonnes	CE	2012	7.09	46.33	1692	5	28	24
EGE	Egelsee	CE	2012	8.36	47.40	667	2	11	15
SWE	Schwendisee	CE	2012	9.33	47.19	1159	3	10	25
AI	Lac d'Aï	CE	2012	7.01	46.36	1895	1	2	7
SEB	Seelisbergsee	CE	2012	8.57	46.96	738	17	38	3
GAN	Gantrischseeli	CE	2012	7.44	46.71	1578	1	1	0
UBE	Uebeschisee	CE	2012	7.57	46.73	641	14	15	58
SEG	Seebergsee	CE	2012	7.44	46.58	1831	6	15	17

Supplementary Tab. 2. Water chemistry of the studied lakes. Conductivity, pH, absorbance, and nutrient concentrations in the surface water for lakes sampled in 2010 and 2011 from Rinta *et al.* (2015).

Abbreviation	Temperature surface water °C	Conductivity surface water µS cm^{-1}	pH surface water	Absorbance surface water at 420 nm	TP surface water µg L^{-1}	Average TP water column µg L^{-1}	TN surface water µg L^{-1}	Average TN water column µg L^{-1}
LOV	17.9	123	7.1	0.039	27	2247	840	6549
NIM	16.9	68	5.6	0.059	10	336	480	3282
VAL	17.6	24	5.9	0.042	11	16	565	744
MEK	16.0	44	5.4	0.104	11	259	610	2315
SYR	15.2	59	6.1	0.006	3	5	200	250
JYV	18.2	75	6.1	0.026	25	27	620	783
ERS	16.9	55	6.3	0.092	18	19	663	693
SKO	17.2	139	6.9	0.051	38	29	647	545
SGL	18.1	48	7.8	0.014	12	12	348	348
LIL	16.8	41	7.0	0.088	18	17	606	580
GRI	16.5	27	6.5	0.040	11	11	389	414
MRN	16.4	132	7.7	0.055	27	35	1050	1256
KIS	16.9	127	7.7	0.019	18	18	490	562
GLI	16.5	57	6.9	0.012	8	8	328	338
HAR	14.9	214	6.7	0.051	45	46	1172	1111
ILR	14.1	311	7.6	0.036	25	53	479	1232
STV	15.6	78	5.7	0.026	9	10	462	457
HZ	21.4	328	8.2	0.022	36	118	860	1057
SCO	20.3	247	8.2	0.009	17	41	570	764
PLU	21.2	228	7.8	0.121	35	639	990	3591
WAY	19.7	368	8.0	0.026	120	985	2300	3115
HIJK	20.8	54	7.8	0.051*	150	155	1900	1950
GER	23.0	289	7.0	0.011	16	48	680	2409
LAU	17.5	462	6.6	0.012	7	9	530	510
SCW	17.2	386	6.9	0.018	15	17	420	492
BUR	21.4	275	8.6	0.004	14	70	1200	1409
ROT	21.7	183	8.8	0.006	34	76	810	2076
HIN	14.3	137	8.9	0.003	11	14	800	844
SEE	11.4	150	8.7	0.003	10	9	550	511
HAS	22.7	329	7.7	0.008	36	38	1200	1200
HUT	19.6	316	8.5	0.004	15	20	1100	1413
NUS	19.6	346	8.1	0.005	24	25	1200	1219
INK	22.5	423	7.9	0.028	260	262	2900	2881
DER	11.4	175	8.5	0.014	10	9	460	403
RET	20.1	270	8.4	0.016	13	22	480	554
HUS	25.2	444	8.3	0.017	7	27	2400	3258

Abbreviation	Temperature surface water °C	Conductivity surface water µS cm^{-1}	pH surface water	Absorbance surface water at 420 nm	TP surface water µg L^{-1}	Average TP water column µg L^{-1}	TN surface water µg L^{-1}	Average TN water column µg L^{-1}
TUR	24.5	325	8.7	0.017	9	55	670	1121
NOI	18.9	182	8.8	0.006	7	28	290	3341
BRE	18.9	229	8.9	0.012	29	203	540	900
CHA	18.8	137	8.8	0.009	13	19	340	815
EGE	24.3	362	8.3	0.012	12	26	460	2863
SWE	23.0	252	8.1	0.023	16	55	390	4137
AI	16.6	61	9.3	0.033	65	65	1100	1100
SEB	22.0	175	8.6	0.023	9	10	530	719
GAN	16.1	105	9.2	0.023	39	39	1100	1100
UBE	23.4	289	8.2	0.027	16	134	1300	3147
SEG	15.1	148	9.1	0.018	12	63	400	844

*Absorbance for bottom water sample.

Supplementary Tab. 3. Zone-weighted whole-lake average total, diffusive, and ebullitive CH_4 flux as well as the CH_4 accumulation in the hypoxic water layer of the studied lakes. "x" indicates the shallow and pelagic zones where it was possible to separate diffusive and ebullitive flux based on the chamber measurements. If separation was not possible, the method for estimating the zone-weighted average diffusive and ebullitive flux for the lake is given in the last column.

Abbreviation	Total flux	Diffusive flux	Ebullition	Accumulation hypoxic water layer	Separation of diffusive flux and ebullition		Method for estimating diffusive flux if separation of diffusive and ebullitive flux not possible
	mmol m^{-2} d^{-1}	mmol m^{-2} d^{-1}	mmol m^{-2} d^{-1}	mmol m^{-2}	Shallow	Pelagic	
LOV	1.12	0.31	0.81	11,912		x	1
NIM	0.29	0.04	0.25	6065		x	1
VAL	0.15	0.02	0.12	89	x	x	
MEK	0.62	0.41	0.21	1321	No chambers	x	
SYR	0.67	0.54	0.13	20	x	x	
JYV	0.30	0.18	0.12	1	x	x	
ERS	1.00	1.30	0.00	0	x	No chambers	
SKO	2.03	0.27	1.76	0	x	No chambers	
SGL	0.23	0.18	0.05	0	x	x	
LIL	0.08	0.06	0.02	0	x	x	
GRI	0.09	0.08	0.01	0	x	x	
MRN	0.04	0.04	0.00	4	x	x	
KIS	0.44	0.46	0.03	8	x	x	
GLI	0.13	0.15	0.00	0	x	x	
HAR	1.87	0.16	1.71	0	x	No chambers	
ILR	0.25	0.09	0.16	301	No chambers	x	
STV	0.15	0.16	0.00	0	x	x	
HZ	3.74	0.72	3.03	80	x	x	
SCO	2.75	0.98	1.77	43	x	x	
PLU	5.08	0.55	4.53	3476		x	1
WAY	1.38	0.67	0.72	1738	x	x	
HIJK	22.28	0.73	21.55	0		No chambers	2
GER	10.82	4.06	6.81	1281	x	x	
LAU	2.64	2.28	0.36	0	x	No chambers	

Abbreviation	Total flux	Diffusive flux	Ebullition	Accumulation hypoxic water layer	Separation of diffusive flux and ebullition		Method for estimating diffusive flux if separation of diffusive and ebullitive flux not possible
	mmol m^{-2} d^{-1}	mmol m^{-2} d^{-1}	mmol m^{-2} d^{-1}	mmol m^{-2}	Shallow	Pelagic	
SCW	0.68	0.70	0.00	6	x	x	
BUR	3.70	1.14	2.62	1511		x	1
ROT	5.83	0.40	5.43	1618	x	x	
HIN	4.28	2.82	1.50	0	x	x	
SEE	0.27	0.27	0.00	0	x	x	
HAS	17.72	8.52	9.20	2	x		3
HUT	1.25	0.60	0.65	917	x	x	
NUS	12.15	0.22	11.92	4	x		3
INK	15.89	0.66	15.23	17	x		3
DER	0.65	0.16	0.50	0			2
RET	48.31	2.92	45.39	0		x	1
HUS	5.31	2.91	2.41	126	x	x	
TUR	1.35	1.33	0.06	350	x	x	
NOI	7.54	4.38	3.25	1364	x	x	
BRE	2.54	1.66	0.88	414		x	1
CHA	0.10	0.06	0.04	330		x	1
EGE	6.80	3.17	3.64	496	x	x	
SWE	2.85	2.69	0.16	1840	x	x	
AI	16.91	6.14	10.77	0	x	No chambers	
SEB	1.08	0.73	0.38	0		x	1
GAN	3.13	0.47	2.65	0		x	1
UBE	7.85	4.75	3.16	1731	x	x	
SEG	5.89	6.46	0.00	264	x	x	

1, Same diffusive flux assumed in the shallow zone as in the pelagic zone; 2, diffusive flux estimated based on wind speed and CH_4 concentration in the surface water; 3, same diffusive flux assumed in the pelagic zone as in the shallow zone.