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Water level, vegetation composition and plant productivity explain greenhouse gas fluxes in temperate cutover fens after inundation

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Table S1. Effect of chamber type on CH_4 emissions and factors: Mean ± Std. Error of daytime (PAR > 2 µmol m^{-2} s^{-1}) CH_4 flux rates, PAR, T_{in}, and RH_{in} by plot and chamber type (DF = opaque mixed chamber, TF = transparent mixed chamber, D = not mixed opaque chamber). Values with same letter superscript do not differ significantly at P < 0.05 (Mann–Whitney or Kruskal–Wallis test; *post–hoc* non–parametric Nemenyi test), data of *BA Phragmites–Carex II* and *GK Phragmites–Lemna II* from Minke et al. (2014).

Site, plot and date	Chamber type	N	PAR (µmol m^{-2} s^{-1})	T_{in} (°C)	RH_{in} (%)	CH_4 flux (mg CH_4–C m^{-2} h^{-1})	Methane factor
BA Eriophorum–Carex I	DF	8	685^{a} ± 208	16.6^{a} ± 1.1	90.2^{a} ± 2.6	2.30^{a} ± 0.10	TF/DF = 1.09
18 July 2012	TF	7	1145^{a} ± 224	17.1^{a} ± 1.5	78.6^{a} ± 4.1	2.49^{a} ± 0.05	
BA Carex–Equisetum III	DF	7	937^{a} ± 401	17.4^{a} ± 1.4	90.1^{a} ± 2.1	2.30^{a} ± 0.08	TF/DF = 0.99
18 July 2012	TF	6	851^{a} ± 164	17.8^{a} ± 1.5	80.2^{b} ± 3.0	2.28^{a} ± 0.08	
BA Carex–Equisetum III	D	14	482^{a} ± 85	15.4^{a} ± 0.7	79.4^{ab} ± 2.6	0.76^{a} ± 0.03	TF/D = 1.07
16 September 2012	DF	14	535^{a} ± 95	15.6^{a} ± 0.7	86.2^{a} ± 1.5	0.80^{a} ± 0.04	TF/DF = 1.02
	TF	13	584^{a} ± 95	15.3^{a} ± 0.6	75.4^{b} ± 2.3	0.81^{a} ± 0.02	
GK Typha–Hydrocharis I	DF	9	869^{a} ± 157	24.3^{a} ± 1.2	94.4^{a} ± 1.7	16.61^{a} ± 0.43	TF/DF = 1.18
12 July 2012	TF	9	868^{a} ± 149	24.9^{a} ± 0.9	88.6^{a} ± 2.7	19.52^{b} ± 1.20	
GK Typha–Hydrocharis I	DF	11	821^{a} ± 136	19.9^{a} ± 1.2	85.3^{a} ± 3.0	14.04^{a} ± 0.24	TF/DF = 1.20
13 July 2012	TF	10	1097^{a} ± 146	20.7^{a} ± 1.4	80.3^{a} ± 3.7	18.00^{b} ± 0.20	
GK Carex–Lysimachia I	DF	9	923^{a} ± 115	24.2^{a} ± 1.1	84.9^{a} ± 3.0	14.28^{a} ± 0.22	TF/DF = 1.10
12 July 2012	TF	9	749^{a} ± 111	24.8^{a} ± 1.1	82.3^{a} ± 2.9	15.76^{b} ± 0.38	
GK Carex–Lysimachia I	DF	11	1207^{a} ± 188	20.1^{a} ± 1.3	83.4^{a} ± 3.3	14.62^{a} ± 0.33	TF/DF = 1.08
13 July 2012	TF	10	1121^{a} ± 177	21.1^{a} ± 1.5	78.8^{a} ± 4.3	15.81^{b} ± 0.23	
BA Phragmites–Carex II	D	16	830^{a} ± 130	19.4^{a} ± 1.1	81.0^{a} ± 3.2	9.86^{a} ± 1.40	TF/D = 1.01
8 August 2012	DF	16	857^{a} ± 133	19.7^{a} ± 1.1	81.9^{a} ± 3.3	10.17^{a} ± 1.50	TF/DF = 0.98
	TF	16	735^{a} ± 121	19.2^{a} ± 1.2	76.5^{a} ± 3.7	9.95^{a} ± 1.51	
GK Phragmites–Lemna II	D	14	707^{a} ± 130	20.6^{a} ± 1.2	70.4^{a} ± 3.2	13.70^{a} ± 1.68	TF/D = 1.27
21 September 2011	DF	13	819^{a} ± 125	21.7^{a} ± 1.3	71.1^{a} ± 3.1	17.42^{a} ± 2.39	TF/DF = 1.00
	TF	12	893^{a} ± 125	23.1^{a} ± 1.0	66.5^{a} ±2.5	17.46^{a} ± 2.08	

Table S2. Annual fluxes of CO_2, CH_4, and N_2O with confidence intervals.

site	year	plot	R_{eco} (g CO_2–C m^{-2} yr^{-1})	GPP (g CO_2–C m^{-2} yr^{-1})	NEE (g CO_2–C m^{-2} yr^{-1})	CH_4 emissions (g CH_4–C m^{-2} yr^{-1})	N_2O emissions (mg N_2O–N m^{-2} yr^{-1})
BA *Eriophorum–Carex*	1	I	378 (359 to 398)	-496 (-514 to -478)	-118 (-132 to -104)	11 (9 to 14)	-80 (-189 to 21)
		II	358 (338 to 378)	-441 (-449 to -433)	-83 (-102 to -63)	10 (8 to 12)	-89 (-213 to 49)
		III	355 (338 to 372)	-411 (-415 to -406)	-56 (-75 to -37)	10 (8 to 13)	79 (-65 to 245)
	2	I	436 (413 to 459)	-444 (-451 to -437)	-8 (-35 to 19)	12 (10 to 14)	32 (-67 to 130)
		II	391 (367 to 414)	-413 (-421 to -406)	-23 (-51 to 6)	11 (9 to 12)	39 (-38 to 115)
		III	390 (379 to 401)	-381 (-387 to -375)	9 (-5 to 23)	11 (10 to 14)	95 (-75 to 284)
BA *Carex–Equisetum*	1	I	210 (195 to 226)	-287 (-296 to -278)	-77 (-87 to -66)	15 (13 to 18)	-40 (-148 to 71)
		II	245 (227 to 263)	-350 (-362 to -338)	-105 (-115 to -95)	19 (16 to 23)	-21 (-132 to 85)
		III	241 (226 to 255)	-322 (-334 to -310)	-82 (-88 to -76)	17 (14 to 21)	-23 (-203 to 168)
	2	I	303 (280 to 326)	-286 (-292 to -280)	17 (-9 to 43)	10 (8 to 13)	-28 (-110 to 56)
		II	353 (334 to 372)	-331 (-335 to -327)	22 (2 to 43)	14 (13 to 19)	-84 (-150 to -12)
		III	323 (300 to 347)	-290 (-295 to -284)	34 (10 to 57)	14 (12 to 16)	-113 (-296 to 79)
BA *Phragmites–Carex*	1	I	498 (473 to 522)	-967 (-999 to -935)	-469 (-517 to -421)	32 (26 to 39)	-515 (-833 to -226)
		II	693 (646 to 741)	-1555 (-1600 to -1509)	-861 (-942 to -780)	46 (34 to 57)	356 (-246 to -982)
		III	650 (594 to 705)	-902 (-921 to -884)	-253 (-318 to -188)	48 (36 to 61)	-75 (-487 to 335)
	2	I	615 (562 to 669)	-963 (-980 to -947)	-348 (-410 to -285)	30 (21 to 35)	-63 (-977 to 849)
		II	769 (691 to 848)	-1122 (-1136 to -1108)	-353 (-437 to -269)	45 (36 to 57)	-466 (-943 to 849)
		III	732 (680 to 785)	-1018 (-1052 to -984)	-286 (-360 to -212)	32 (24 to 42)	87 (-174 to 374)
GK *Typha–Hydrocharis*	1	I	877 (836 to 918)	-801 (-813 to -790)	76 (36 to 116)	59 (49 to 73)	95 (-673 to 886)
		II	923 (912 to 934)	-831 (-844 to -817)	92 (74 to 111)	59 (47 to 73)	130 (-279 to 533)
		III	963 (942 to 984)	-680 (-697 to -663)	284 (263 to 304)	61 (44 to 83)	220 (-52 to 515)
	2	I	1104 (1046 to 1161)	-1446 (-1480 to -1412)	-342 (-424 to -261)	63 (51 to 75)	151 (-124 to 449)
		II	827 (816 to 838)	-870 (-881 to -859)	-43 (-60 to -27)	65 (50 to 82)	74 (-223 to 372)
		III	988 (972 to 1005)	-943 (-967 to -919)	46 (20 to 72)	77 (59 to 103)	76 (-111 to 257)
GK *Carex–Lysimachia*	1	I	1124 (1090 to 1158)	-962 (-989 to -934)	162 (135 to 189)	86 (74 to 100)	-137 (-677 to 419)
		II	1167 (1124 to 1211)	-1065 (-1084 to -1047)	102 (60 to 144)	72 (59 to 86)	162 (-160 to 505)
		III	1024 (1005 to 1044)	-792 (-814 to -770)	233 (206 to 259)	101 (75 to 140)	-91 (-358 to 160)
	2	I	1246 (1224 to 1268)	-811 (-837 to -785)	435 (395 to 475)	84 (65 to 121)	100 (-140 to 346)
		II	1331 (1296 to 1367)	-1205 (-1248 to -1162)	126 (56 to 196)	67 (56 to 82)	-56 (-220 to 88)
		III	1233 (1219 to 1246)	-1146 (-1188 to -1104)	87 (42 to 132)	102 (76 to 162)	229 (-128 to 599)
GK *Phragmites–Lemna*	1	I	921 (892 to 949)	-1446 (-1511 to -1380)	-525 (-607 to -443)	113 (88 to 139)	58 (-524 to 684)
		II	767 (729 to 804)	-1516 (-1568 to -1465)	-750 (-827 to -673)	61 (43 to 83)	-101 (-783 to 548)
		III	1121 (1037 to 1206)	-1680 (-1737 to -1623)	-559 (-623 to -495)	112 (73 to 164)	468 (-256 to 1176)
	2	I	1170 (1122 to 1219)	-2678 (-2745 to -2611)	-1507 (-1584 to -1431)	87 (65 to 113)	99 (-652 to 872)
		II	970 (929 to 1012)	-2235 (-2362 to -2108)	-1265 (-1381 to -1149)	77 (57 to 110)	-437 (-1017 to 140)
		III	1135 (1062 to 1208)	-1887 (-1939 to -1836)	-752 (-825 to -679)	139 (86 to 202)	330 (-253 to 937)

Uncertainties of CO_2 balances on the plot level were calculated as 50% of the difference between APPROACH ONE and APPROACH TWO plus the 90% confidence intervals of APPROACH ONE. Plot level uncertainties for CH_4 represent the 90% confidence intervals of the models, but for N_2O only the 90% CI's of the measured N_2O fluxes.