
This is the **accepted version** of the article:

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Table 1. Site locations and climatic temperatures.

Site	Longitude	Latitude	Distance	July	December	MAT	Climatic type
	(E)	(N)	(km)	(°C)	(°C)	(°C)	
DD	123°11'	39°47'	39	31.5	-2.2	9.0	Temperate
TS	118°42'	39°30'	82	32.3	5.2	12.5	Temperate
WF	119°10'	37°32'	50	33.6	2.1	12.3	Temperate
QD	121°24'	36°37'	35	26.8	3.5	12.7	Temperate
DF	120°10'	34°09'	32	27.3	8.4	14.1	Temperate
SH	121°52'	31°08'	15	32.4	10.6	17.6	Subtropical
WZ	121°19'	27°58'	29	36.6	14.7	18.0	Subtropical
FZ	119°28'	25°35'	32	36.8	19.3	19.3	Subtropical
ST	115°42'	23°07'	20	33.2	23.8	21.3	Subtropical
ZH	113°05'	21°48'	34	32.3	22.6	22.5	Subtropical
BH	108°35'	21°52'	11	31.6	26.1	22.9	Subtropical

DD, TS, WF, QD, DF, SH, WZ, FZ, ST, ZH and BH are abbreviations for the cities of Dandong, Tangshan, Weifang, Qingdao, Dafeng, Shanghai, Wenzhou, Fuzhou, Shantou, Zhuhai and Beihai, respectively. Distance, the spatial distance of sampling site to city. MAT, mean annual temperature.

Table 2. Soil Abiotic and Biotic Characteristics of the Marshes at the Sites.

	DD		TS		WF		QD		DF		SH		WZ		FZ		ST		ZH		BH	
	Jul.	Dec.																				
SD (g cm ⁻³)	1.30	1.20	1.23	1.15	1.15	1.28	1.28	1.19	1.20	1.17	1.22	1.30	1.16	1.14	1.22	1.41	1.27	1.24	1.13	1.19	1.39	1.30
SWC (%)	58.8	55.9	59.8	58.9	54.7	54.0	50.3	52.8	56.5	64.9	69.2	67.4	57.7	65.2	63.8	65.6	56.4	62.6	57.1	63.4	58.8	70.8
pH	7.76	7.72	7.94	7.92	8.00	8.07	7.84	7.90	7.91	8.05	7.89	7.82	8.01	7.87	7.87	7.75	8.00	7.96	7.70	7.83	7.90	7.80
Eh (mV)	-83	-61	-101	-54	-64	-32	-58	-43	-115	-89	-157	-108	-139	-87	-150	-110	-120	-81	-158	-109	-122	-120
Salinity (‰)	11.8	13.6	23.1	24.7	25.7	27.9	21.2	24.2	14.8	13.3	7.5	12.4	19.7	17.8	6.3	12.9	23.6	27.4	16.7	19.3	19.3	22.3
TOC (mg g ⁻¹)	2.93	3.41	3.14	2.62	1.09	1.34	2.00	1.84	6.09	5.04	7.04	7.97	5.25	6.24	10.2	9.43	8.00	4.00	8.00	8.61	7.89	7.94
DOC (mg g ⁻¹) ¹⁾	0.31	0.31	0.35	0.29	0.14	0.11	0.26	0.18	0.70	0.67	0.66	0.79	0.66	0.56	0.76	0.67	0.65	0.21	0.75	0.81	0.64	0.93
TN (mg g ⁻¹)	0.24	0.36	0.25	0.29	0.14	0.15	0.28	0.23	0.57	0.57	0.73	0.66	0.82	0.77	1.15	1.02	0.40	0.31	0.39	0.33	0.48	0.52
MBC (µg g ⁻¹)	60.6	49.6	50.5	43.3	16.8	25.3	29.4	19.8	22.1	11.7	84.3	60.8	87.9	49.6	113	81.6	105	61.3	94	71.0	113	40.7
MBN (µg g ⁻¹)	6.10	5.37	3.93	3.07	6.0	4.37	2.77	2.27	5.07	6.10	17.5	11.8	13.6	8.1	17.3	14.2	11.8	8.9	9.37	10.8	6.10	6.17
C/N	12.2	9.38	12.7	9.14	7.76	9.16	7.06	8.13	10.6	8.9	9.6	12.1	6.4	8.1	8.8	9.3	20.2	12.9	20.7	25.8	16.4	15.3
NH ₄ ⁺ -N (µg g ⁻¹)	5.81	6.38	8.14	6.98	5.23	3.24	1.53	2.12	5.73	5.25	7.24	6.34	9.9	12.0	12.1	10.2	6.10	8.11	5.05	5.15	5.24	8.25
NO _x ⁻ -N (µg g ⁻¹)	1.08	1.53	1.53	1.23	1.25	1.03	0.73	0.61	1.07	1.25	1.42	1.04	1.33	1.21	2.13	1.38	0.85	0.82	1.63	1.13	1.62	1.03
SO ₄ ²⁻ (mg g ⁻¹) ¹⁾	0.22	0.51	0.51	0.78	0.30	0.61	0.42	0.96	0.21	0.75	0.11	0.31	0.46	0.56	0.31	0.62	0.45	0.87	0.60	0.41	0.39	0.49
δ ¹³ C (‰)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	26.1	25.1	24.4	24.2	22.3	21.6	23.2	22.3	23.2	25.3	20.4	24.2	23.3	20.3	24.1	20.9	22.4	23.6	23.5	22.2	21.3	21.0
δ ¹⁵ N (‰)	6.44	7.15	6.40	6.19	5.57	5.25	5.12	4.93	5.54	6.13	5.60	5.23	6.22	6.24	5.23	4.57	5.44	6.27	4.35	5.12	5.21	6.25
BA (×10 ⁹)	3.7	4.1	5.2	5.2	7.0	2.9	4.3	2.6	4.0	1.3	3.8	6.4	9.0	11.3	5.7	5.4	4.1	6.7	7.2	1.1	3.9	6.4

SD, soil density; SWC, soil-water content; Eh, redox potential; TOC, total organic carbon; DOC, dissolved organic carbon; TN, total nitrogen; NO_x⁻, NO₃⁻ plus NO₂⁻; BA, bacterial abundance (copies g⁻¹). Values are means of three replicates. See Table 1 for the site abbreviations.

Table 3. Emissions (means \pm standard errors ($n = 3$)) of CH₄, N₂O and CO₂ in the Marshes.

Site	CH ₄ ($\mu\text{g m}^{-2} \text{h}^{-1}$)		N ₂ O ($\mu\text{g m}^{-2} \text{h}^{-1}$)		CO ₂ ($\text{mg m}^{-2} \text{h}^{-1}$)	
	December	July	December	July	December	July
DD	23.6 \pm 1.5	59.6 \pm 5.3	2.0 \pm 0.6	5.1 \pm 0.3	71.9 \pm 7.3	93.1 \pm 12.2
TS	38.1 \pm 6.3	96.2 \pm 9.8	4.1 \pm 0.8	3.9 \pm 0.3	15.9 \pm 1.7	59.0 \pm 6.0
WF	29.6 \pm 2.8	29.0 \pm 4.6	5.4 \pm 0.4	10.4 \pm 1.2	9.9 \pm 1.2	51.4 \pm 0.9
QD	27.9 \pm 0.9	63.0 \pm 8.7	3.4 \pm 0.2	22.0 \pm 1.9	37.4 \pm 3.6	69.4 \pm 4.5
DF	48.3 \pm 5.9	60.7 \pm 3.6	4.7 \pm 1.3	6.6 \pm 0.7	14.1 \pm 2.5	50.9 \pm 5.3
SH	118 \pm 10.3	345 \pm 37.9	6.3 \pm 1.0	8.2 \pm 0.2	74.5 \pm 8.7	116 \pm 2.5
WZ	94.2 \pm 4.4	206 \pm 18.2	15.4 \pm 3.6	21.9 \pm 3.3	91.9 \pm 8.9	153 \pm 7.1
FZ	183 \pm 7.5	793 \pm 51.5	27.7 \pm 4.4	85.1 \pm 10.5	121 \pm 7.8	71.9 \pm 7.3
ST	115 \pm 5.2	274 \pm 30.9	103 \pm 9.6	30.7 \pm 3.4	258 \pm 28.1	115 \pm 16.3
ZH	126 \pm 9.4	482 \pm 36.0	25.0 \pm 2.9	56.4 \pm 1.7	310 \pm 22.4	151 \pm 9.0
BH	211 \pm 7.5	986 \pm 70.1	65.0 \pm 3.1	110 \pm 6.6	145 \pm 12.2	138 \pm 3.2

See Table 1 for the site abbreviations.

Table 4. Summary of the two-way ANOVA of the effects of site, season and their interaction on CH₄, N₂O and CO₂ emissions.

	CH ₄					N ₂ O					CO ₂							
	Sum squares	of	df	Mean square	F	P	Sum squares	of	df	Mean square	F	P	Sum squares	of	df	Mean square	F	P
Intercept	2651579.224	1	2651579.224	4760.2	0.000	52754.038	1	52754.038	3507.524	0.000	722945.433	1	722945.433	5756.536	0.000			
Site	2238343.925	10	223834.393	401.8	0.000	52932.993	10	5293.299	351.942	0.000	262718.368	10	26271.837	209.193	0.000			
Season	771578.138	1	771578.138	1385.2	0.000	1328.991	1	1328.991	88.362	0.000	0.676	1	0.676	0.005	0.942			
Site × Season	1018280.938	10	101828.094	182.8	0.000	16527.877	10	1652.788	109.891	0.000	88500.993	10	8850.099	70.470	0.000			
Residuals	24509.414	44	557.032			661.771	44	15.040			5525.823	44	125.587					

Table 5. Direct and partial (controlling for both air temperature and mean annual temperature) correlation analysis (Pearson's r) comparing the effects of the abiotic and biotic factors on the CH₄, N₂O and CO₂ emissions ($n = 22$).

	CH ₄				N ₂ O				CO ₂					
	Direct		Partial		Direct		Partial		Direct		Partial			
	r	P		r	P		r	P		r	P		r	P
Abiotic factor														
SD	0.31	0.164	0.31	0.184	0.29	0.192	0.26	0.271	0.19	0.401	0.08	0.733		
SWC	0.42	0.052	0.19	0.433	0.24	0.274	-0.35	0.134	0.31	0.164	0.05	0.828		
pH	-0.20	0.378	-0.27	0.246	-0.11	0.638	-0.06	0.809	-0.46	0.030	-0.60	0.005		
Eh	-0.87	0.000	-0.60	0.006	-0.54	0.009	0.54	0.015	-0.58	0.004	0.01	0.958		
Salinity	-0.37	0.089	-0.63	0.003	0.04	0.866	0.22	0.354	-0.16	0.488	-0.13	0.580		
TOC	0.81	0.000	0.56	0.010	0.59	0.004	-0.31	0.184	0.55	0.008	0.04	0.858		
DOC	0.69	0.000	0.32	0.171	0.44	0.041	-0.51	0.022	0.45	0.037	-0.06	0.801		
TN	0.58	0.005	0.52	0.019	0.34	0.117	-0.05	0.836	0.25	0.272	-0.08	0.755		
NH ₄ ⁺	0.43	0.047	0.24	0.301	0.31	0.157	-0.02	0.939	0.32	0.147	0.08	0.724		
NO _x ⁻	0.52	0.013	0.66	0.001	0.21	0.356	0.01	0.969	0.09	0.708	-0.16	0.492		
SO ₄ ²⁻	-0.32	0.145	-0.26	0.267	-0.04	0.845	0.32	0.166	-0.27	0.224	-0.13	0.600		
$\delta^{13}\text{C}$	0.29	0.191	-0.12	0.604	0.34	0.123	-0.09	0.721	0.22	0.323	-0.09	0.712		
$\delta^{15}\text{N}$	-0.37	0.092	-0.09	0.717	-0.36	0.096	-0.04	0.882	-0.09	0.693	0.29	0.210		
C/N	0.42	0.050	-0.19	0.433	0.41	0.059	-0.31	0.189	0.53	0.011	0.23	0.324		
Biotic factor														
MBC	0.88	0.000	0.76	0.000	0.62	0.002	0.004	0.988	0.61	0.003	0.19	0.414		
MBN	0.67	0.001	0.39	0.088	0.42	0.049	-0.26	0.276	0.49	0.020	0.11	0.645		
BA	0.29	0.193	-0.32	0.167	0.40	0.051	-0.002	0.995	0.64	0.001	0.49	0.029		

SD, soil density; SWC, soil-water content; Eh, redox potential; TOC, total organic carbon; DOC, dissolved organic carbon; TN, total nitrogen; NO_x⁻, NO₃⁻ plus NO₂⁻; BA, bacterial abundance.

Table 6. Estimates of the Increases in the Emissions of the Greenhouse Gases in Response to the Scenarios of Global Climate Change (2 and 4 °C) and Associated Increases in the Amplitudes of the Greenhouse-Gas Emissions from the Temperate and Subtropical Marshes.

Gas	Increased emission		Temperate marshes			Subtropical marshes		
	2 °C scenario	4 °C scenario	Current emission	2 °C increase (%)	4 °C increase (%)	Current emission	2 °C increase (%)	4 °C increase (%)
	CH ₄	2.2	5.43	47.6	4.62	11.4	328	0.67
N ₂ O	1.86	4.78	6.77	27.5	70.6	46.2	4.03	10.3
CO ₂	4.32	6.1	47.3	9.13	12.9	145	2.98	4.21

Units: $\mu\text{g m}^{-2} \text{y}^{-1}$ for CH₄ and N₂O; $\text{mg m}^{-2} \text{y}^{-1}$ for CO₂.