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*Supplement of*

## **Dynamic C and N stocks – key factors controlling the C gas exchange of maize in heterogenous peatland**

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## Supplement Tables

**Table S1.** Overview of the cultivated grain maize varieties and the field operations (tillage, sowing, harvesting, etc.) conducted during the study period (05/2007–04/2011) by site.

Study year	Site	Maize variety	Date [dd/mm/yy]			
			Tillage/sowing	Harvesting	Mulching	Ploughing
2007/08 <sup>†</sup>	HS/AR	Nerissa	19/03/07	18/10/07	22/10/07	15/11/07
	GL	Nerissa	19/03/07	18/10/07	29/01/08	20/02/08
2008/09 <sup>†</sup>	HS/AR	Larc	29/04/08	14/10/08	21/10/08	15/11/08
	GL	Larc	29/04/08	14/10/08	15/01/09	20/04/09
2009/10 <sup>†</sup>	HS/AR	Logo	22/04/09	05/10/09	21/10/09	23/10/09
	GL	Logo	22/04/09	05/10/09	27/01/10	31/03/10
2010/11 <sup>†</sup>	HS/AR	DKC 3399	26/04/10	25/10/10	07/01/11	n.a. <sup>‡</sup>
	GL	DKC 3399	26/04/10	25/10/10	07/01/11	n.a. <sup>‡</sup>

<sup>†</sup> 2007/08: 01/05/07-30/04/08; 2008/09: 01/05/08-30/04/09; 2009/10: 01/05/09-30/04/10; 2010/11: 01/05/10-30/04/11

<sup>‡</sup> Data not available.

**Table S2.** Mean annual values ( $\pm 1$  SD) of site-specific environmental control parameters: air and soil temperature, GWL, as well as SOC<sub>dyn</sub> and N<sub>dyn</sub> stocks by study year and average over the entire study

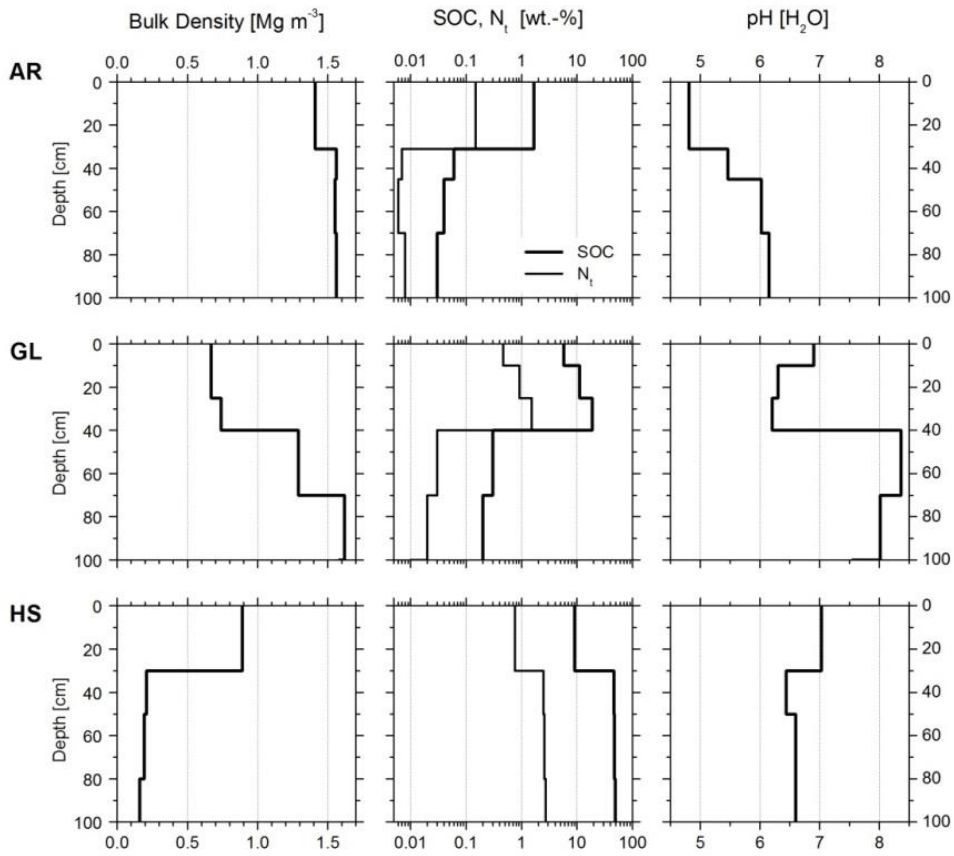
Site	Environmental control parameter	Study year				Study period
		2007/08	2008/09	2009/10	2010/11	2007/08-2010/11
AR	Biomass [kg DM m <sup>-2</sup> ]	1.86 (0.30)	2.18 (0.32)	1.95 (0.29)	1.57 (0.74)	1.89 (0.41)
	Air temperature [°C]	11.4 (8.8)	12.3 (7.5)	9.7 (8.4)	10.0 (8.2)	10.8 (8.1)
	Soil temperature [°C]	11.8 (6.7)	12.3 (6.7)	12.0 (7.9)	11.0 (8.0)	11.8 (7.4)
	GWL [m]	-1.2 (0.3)	-1.6 (0.2)	-1.5 (0.2)	-1.4 (0.3)	-1.4 (0.3)
	SOC <sub>dyn</sub> (kg C m <sup>-2</sup> )	8.0 (0.0)	8.0 (0.0)	8.0 (0.0)	8.0 (0.0)	8.0 (0.0)
	N <sub>dyn</sub> (kg N m <sup>-2</sup> )	0.7 (0.0)	0.7 (0.0)	0.7 (0.0)	0.7 (0.0)	0.7 (0.0)
GL	Biomass [kg DM m <sup>-2</sup> ]	0.57 n.a. <sup>‡</sup>	2.48 (0.24)	2.75 (0.43)	1.95 (0.19)	1.94 (0.29)
	Air temperature [°C]	10.8 (7.5)	9.7 (8.2)	8.9 (7.8)	10.8 (8.1)	10.0 (8.0)
	Soil temperature [°C]	12.0 (7.0)	10.9 (7.3)	9.9 (7.7)	11.3 (7.4)	11.0 (7.4)
	GWL [m]	-0.6 (0.2)	-0.9 (0.2)	-0.9 (0.3)	-0.6 (0.3)	-0.8 (0.3)
	SOC <sub>dyn</sub> (kg C m <sup>-2</sup> )	34.1 (5.6)	37.4 (0.5)	37.3 (0.6)	32.7 (8.1)	35.4 (5.3)
	N <sub>dyn</sub> (kg N m <sup>-2</sup> )	2.8 (0.5)	3.1 (0.1)	3.1 (0.1)	2.7 (0.7)	2.9 (0.5)
HS	Biomass [kg DM m <sup>-2</sup> ]	0.26 (0.10)	3.12 (0.39)	2.79 (0.35)	2.46 (0.15)	2.16 (0.24)
	Air temperature [°C]	11.4 (8.3)	11.1 (7.8)	9.1 (7.9)	8.7 (9.2)	10.1 (8.4)
	Soil temperature [°C]	12.3 (7.7)	11.6 (6.7)	10.6 (7.4)	9.1 (8.8)	10.9 (7.8)
	GWL [m]	-0.3 (0.3)	-0.7 (0.2)	-0.6 (0.2)	-0.5 (0.3)	-0.5 (0.3)
	SOC <sub>dyn</sub> (kg C m <sup>-2</sup> )	24.4 (19.8)	58.0 (16.3)	55.6 (18.5)	43.4 (22.1)	45.4 (23.5)
	N <sub>dyn</sub> (kg N m <sup>-2</sup> )	1.8 (1.3)	3.9 (0.8)	3.7 (1.0)	3.0 (1.3)	3.1 (1.4)

<sup>‡</sup> Data not available

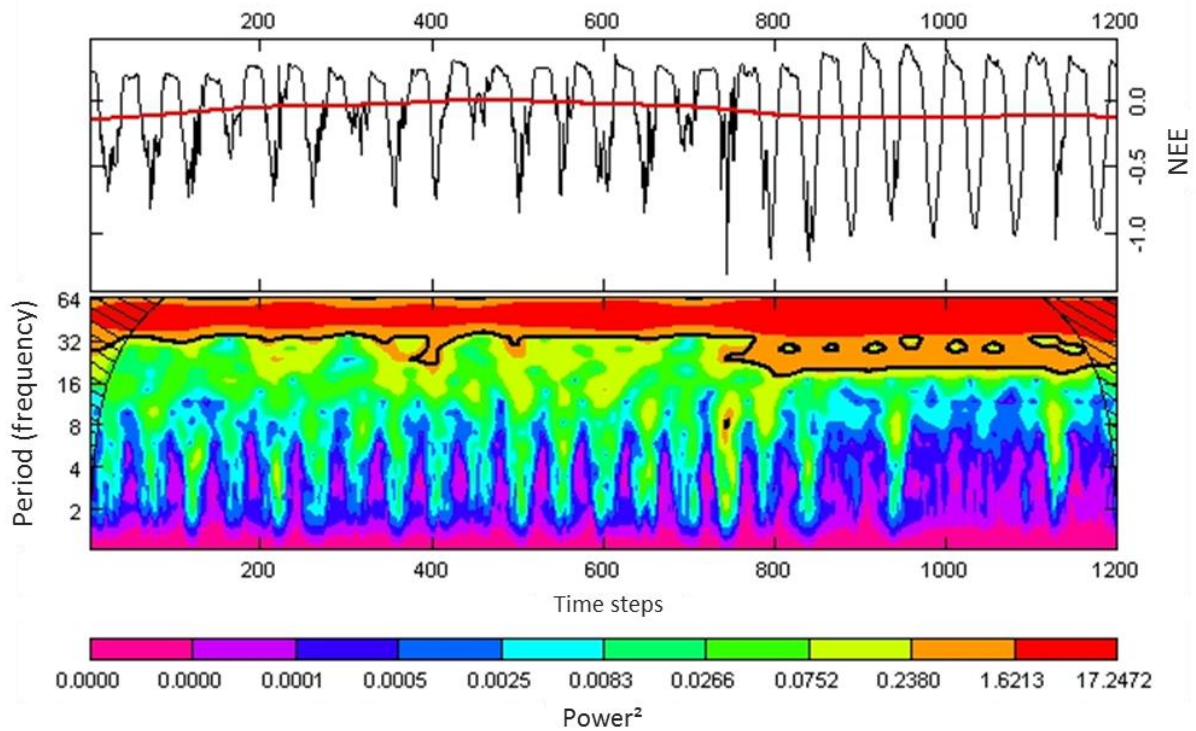
**Table S3.** Model evaluation statistics for the site-specific  $R_{\text{eco}}$  and NEE models: mean absolute error (MAE), RMSE-observations standard deviation ratio (RSR), coefficient of determination ( $R^2$ ), modified index of agreement (md), percent BIAS (PBIAS) and Nash-Sutcliffs model efficiency (NSE).

Model value	Statistical threshold	HS	GL	AR
$R_{\text{eco}}$	MAE [g CO <sub>2</sub> -C m <sup>-2</sup> y <sup>-1</sup> ]	0.04	0.04	0.03
	RSR	0.37	0.42	0.41
	$R^2$	0.86	0.83	0.84
	md	0.87	0.83	0.88
	PBIAS [%]	-2.6	-5.5	-1.4
	NSE	0.86	0.83	0.84
NEE	MAE [g CO <sub>2</sub> -C m <sup>-2</sup> y <sup>-1</sup> ]	0.19	0.12	0.12
	RSR	0.62	0.48	0.53
	$R^2$	0.65	0.78	0.73
	md	0.74	0.83	0.82
	PBIAS [%]	-16.5	-4.9	1.4
	NSE	0.61	0.77	0.72

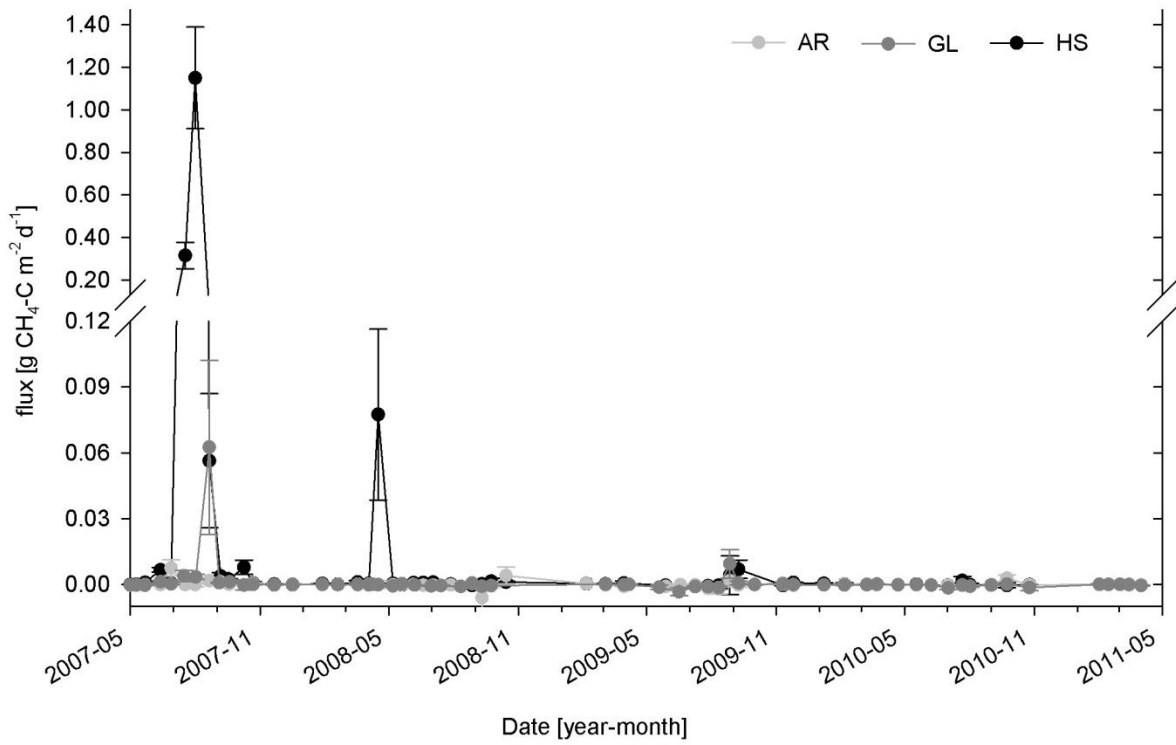
## Supplement Figures



**Figure S1.** Site-specific depth profiles of bulk density, SOC and  $\text{N}_t$  concentration (weight %), and pH (in  $\text{H}_2\text{O}$ ) up to a soil depth of 1 m.



**Figure S2.** Diurnal variability as detected by wavelet analysis of modelled half-hour NEE data (range from 07/07/2008 to 31/07/2008). The upper graph displays modelled NEE time series and corresponding smoothing spline (solid red line). The lower graph shows the continuous wavelet transform and cone of influence (hatched area) within the respective time frequency domain. The wavelet power spectrum is thereby defined as the squared absolute-value of the wavelet coefficients (correlation between wavelet and data array).



**Figure S3.** Measured average daily  $\text{CH}_4\text{-C}$  fluxes (points) by site for the study period. Error bars indicate  $\pm 1$  SD ( $n = 3$ ). Sites AR and GL measured until 01/04/2011; HS until 02/10/2010.