

Supporting Information

Temperature-induced diurnal redox potential in soil

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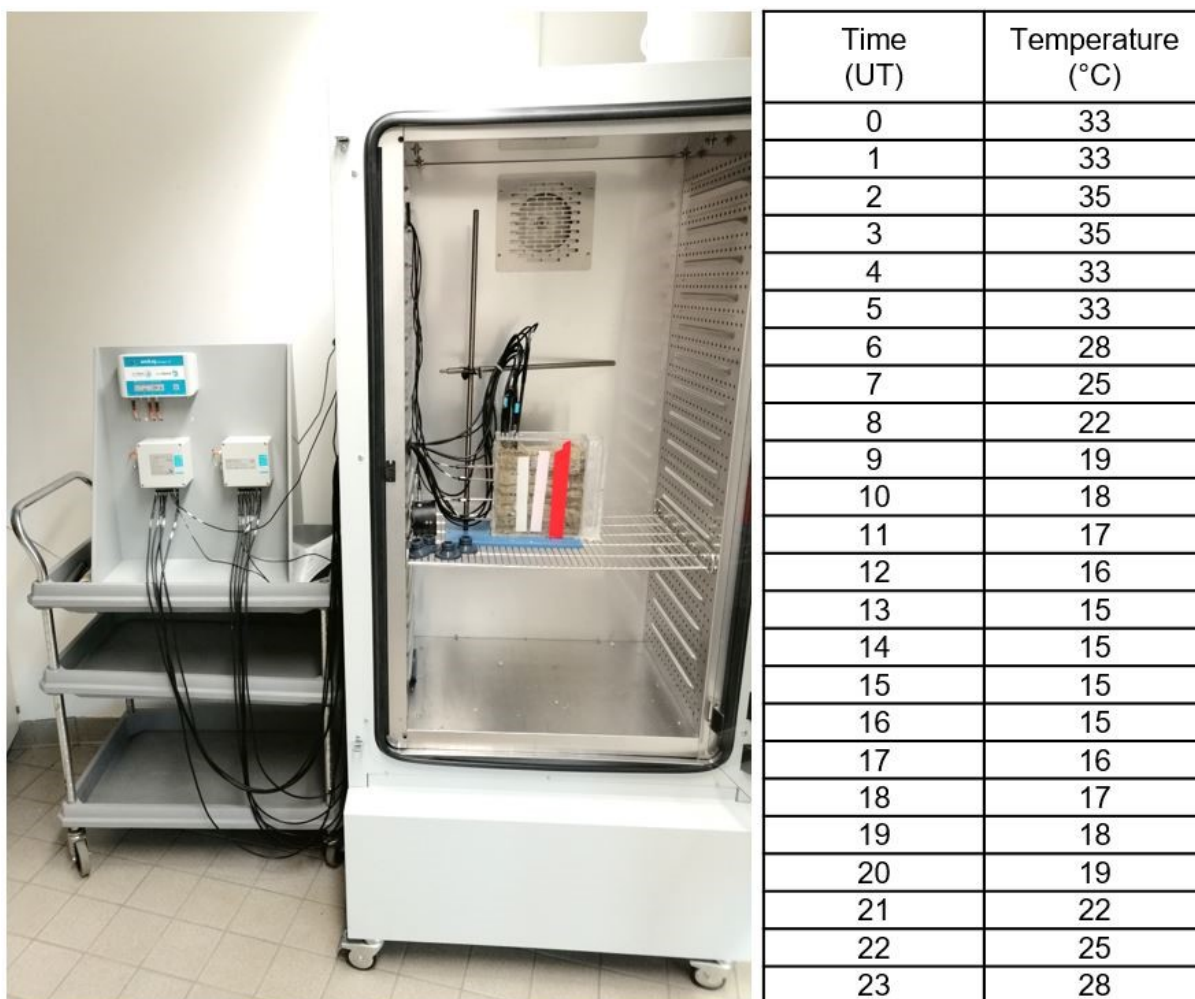


Figure S1 Image of the soil monolith (20 × 20 × 5 cm; h × w × d) inserted in a climate chamber and of Pt electrodes installed in depths of 2.5, 7.5, 12.5, and 17.5 cm. The reference electrode (Ag–AgCl, 3 M KCl L⁻¹ internal electrolyte) is identical to the ones employed for the other field and lab experiments. The climate chamber was programmed with a daily temperature amplitude that ranged from 15 to 35 °C with an anticyclical pattern, i.e., the highest soil temperatures occurred during the nighttime. The soil was excavated from study site Speicherkoog and the soil properties are equal to the data found in Table S1 for “Lab E”.

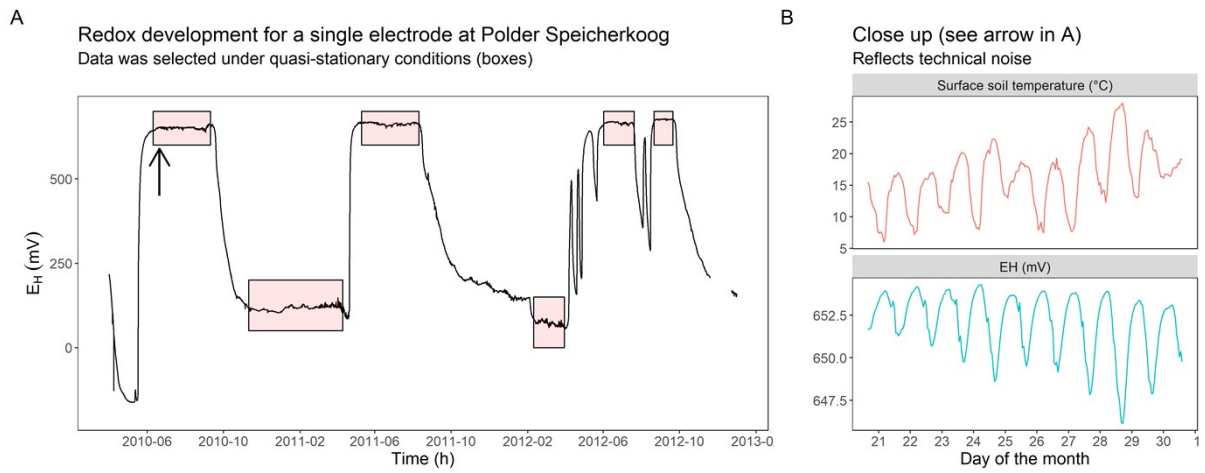


Figure S2 Only quasi-stationary redox potentials (E_H) were employed for the statistical analysis, which resemble the red boxes in the example above for an electrode in 60 cm depth at Polder Speicherkoog (A). The selection for these stable phases served to delineate spatiotemporal trends in ΔE_H (e.g., as shown in B).

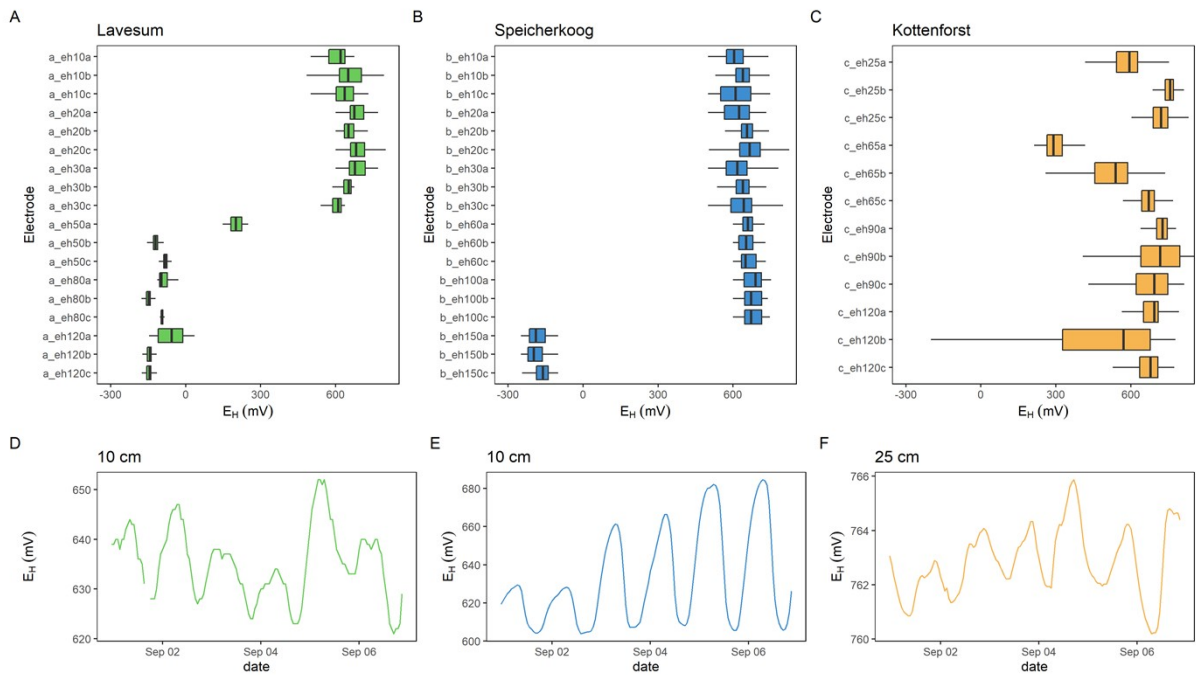


Figure S3 Boxplot diagram of data from redox potentials (E_H) under quasi-stationary conditions for all electrodes (triplicate per depth) for the sites Lavesum (A), Speicherkoog (B), and Kottenforst (C). The data was used to calculate daily ΔE_H . The close-up for the distinct soil depth reflects a 7-d period in September (2006, D; 2010, E; 2014, F), and highlights the presence of diel E_H pattern for each site. Note the variable scaling of the y-axis.

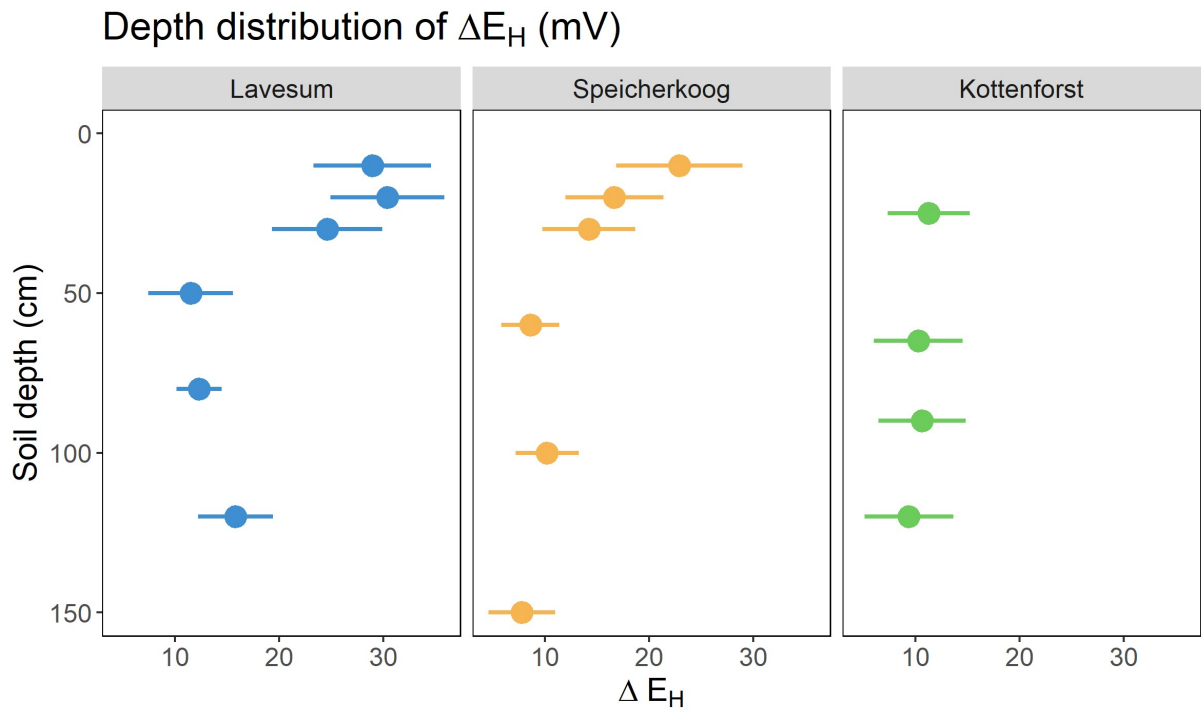


Figure S4 Depth-dependent delta redox potential (ΔE_H ; calculated as the difference between daily $E_{H-max} - E_{H-min}$ value) for the study sites Lavesum, Speicherkoog and Kottenforst. The data accounts for the mean with the standard error of the mean for electrodes in triplicate per depth.

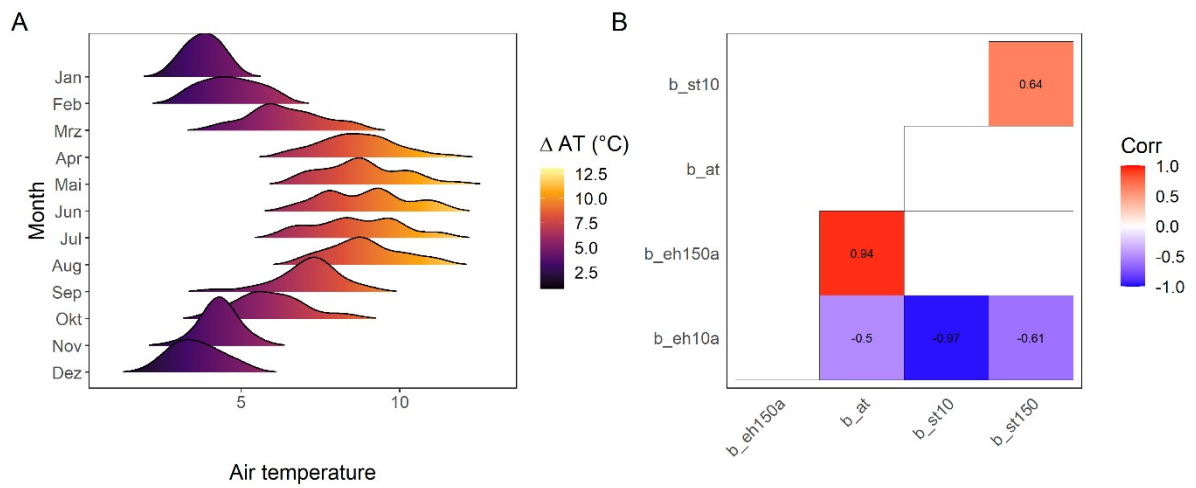


Figure S5 Data density distribution visualized by ridgeline plots of delta air temperature (ΔAT ; A). Spearman coefficients for variables shown in Figure 3C to G are plotted within a correlation matrix (B). Only the $p < 0.05$ coefficients have a background color.



Figure S6 Image of a reference electrode installed at site Speicherkoog embedded within a salt bridge to close the electrical circuit with the soil. Please note, the salt bridge was removed from the soil on the right image for maintenance.

Table S1 Soil properties for the field and lab monitoring campaigns							
	Depth	Reference (DOI)	pH	OC [§]	Sand	Silt	Clay
	(cm)		(0.01 M CaCl ₂)	(g kg ⁻¹)	(g kg ⁻¹)	(g kg ⁻¹)	(g kg ⁻¹)
Lavesum	10	10.2134/jeq2012.0225	4.7	73.9	22	58	20
	20		5.5	15.7	21	58	21
	30		6.2	22.3	42	39	19
	50		6.2	22.3	44	41	15
	80		4.7	1.7	54	30	16
	120		4.7	1.7	94	4	2
Speicherkoog	10		10.1002/jpln.201600060	7.1	28.6	230	520
	20	7.3		17.5	131	669	210
	30	7.4		9.7	192	603	220
	60	7.4		4.6	520	360	110
	100	7.6		2.6	721	224	60
	150	7.6		2.0	773	187	50
Kottenforst	25	10.1016/j.catena.2020.104528		4.5	3.8	68	809
	65+90		4.9	2.2	50	675	276
	120		5.1	1.8	148	570	283
Lab A [†]		10.1007/s11368-017-1812-3	5.8	85.3	415	435	150
Lab B [†]			7.5	1.98	20	780	200
Lab C [†]		10.1111/ejss.12717	7.2	5.61	880	77	43
Lab D [‡]			6.7	27.1	223	557	217
Lab E [‡]			7.6	2.0	773	187	50

† Disturbed sample

‡ Undisturbed sample

§ Organic carbon