Table S1: Soil organic carbon (SOC), C/N ratio, and $\delta^{13}C$ of mineral soils (0-100 cm) in the control and warmed plots (mean ± SE) from the soil cores collected in May 2013, 9.5 years after the onset of soil warming experiment.

	Control		**Warmed**	
Depth [cm]	**SOC [mg g^{-1} soil]**	**$\delta^{13}C$ [‰ VPDB]**	**SOC [mg g^{-1} soil]**	**$\delta^{13}C$ [‰ VPDB]**
0-10	43.4 ± 4.7	-25.6 ± 0.2	42.9 ± 2.9	-25.6 ± 0.5
10-20	33.7 ± 6.5	-25.4 ± 0.2	46.7 ± 10.4	-25.6 ± 0.3
20-30	25.1 ± 5.8	-25.5 ± 0.1	40.6 ± 19.9	-25.5 ± 0.3
30-40	14.9 ± 3.4	-25.3 ± 0.1	21.4 ± 9.4	-25.3 ± 0.1
40-50	9.9 ± 2.6	-24.9 ± 0.1	10.8 ± 3.2	-25.1 ± 0.1
50-60	7.7 ± 1.6	-25.0 ± 0.1	5.7 ± 0.9	-25.0 ± 0.2
60-70	7.4 ± 1.1	-25.1 ± 0.3	3.5 ± 0.7	-24.6 ± 0.3
70-80	5.9 ± 1.4	-25.0 ± 0.3	2.8 ± 0.6	-24.6 ± 0.3
80-90	4.3 ± 1.4	-25.0 ± 0.3	1.8 ± 0.4	-24.9 ± 0.1
90-100	3.2 ± 0.6	-25.3 ± 0.5	2.0 ± 0.6	-25.0 ± 0.3

Table S2: : Anova table for fixed effects in the linear-mixed effects model (LMEs) assessing the influence of treatment, depth, and their interaction on soil organic carbon (SOC) concentration (mg g^{-1} soil), C/N ratios (-), and $\delta^{13}C$ values (‰). numDF denotes numerator degrees of freedom and denDF denotes denominator degrees of freedom, respectively. Due to heteroscedasticity, we log-transformed SOC and C/N to improve model fit. Full model (SOC as an example): logSOC ~ Treatment × Depth_interval, random = ~ 1 | Block_Treat, correlation = corAR1(form = ~ depth|Block_Treat).

Depth_interval (as factor) denotes the ten depth intervals throughout the soil profile (e.g., 10-20, 30-40, and 90-100 cm etc.). depth (as numeric) is the midpoint of each depth interval (e.g., 55 for 50-60 cm). Block_Treat is the treatment in each block (1, 2, and 3) so that each depth level will be distinguished between different treatments within in each block. corAR1 is the autoregression method we used to account for the autocorrelation between adjacent depths (see Materials and methods under 2.5 statistical analysis).

	SOC [mg g^{-1} soil]				**$\delta^{13}C$ [‰ VPDB]**			
Parameter	**numDF**	**denDF**	**F-value**	***p*-value**	**DF**	**denDF**	**F-value**	***p*-value**
Intercept (control, 0-10 cm)	1	36	0.234	0.632	1	36	23477.6	0
Treatment	1	4	0.585	0.487	1	4	0.105	0.762
Depth	9	36	80.081	0	9	36	8.770	< 0.001
Treatment: Depth	9	36	3.801	0.002	9	36	1.517	0.179

Table S3: Anova table for fixed effects in the linear-mixed effects model (LMEs) assessing the influence of treatment, depth, and their interaction on SOC concentration in each fraction (mg OC g^{-1} fractionated bulk soil) at three depths (10-20, 40-50, and 80-90 cm) in control and warmed plots (n = 3). We use Block as random effect. Df denotes the degree of freedom. Due to heteroscedasticity, we log-transformed mass of SOC recovered in each fraction to improve model fit.

Full model: log (SOC concentration in each fraction) ~ Treatment × Depth + (1 |Block)

	fPOM		**oPOM**		**MAOM**	
Parameter	**Df**	***p*-value**	**Df**	***p*-value**	**Df**	***p*-value**
Intercept (10-20 cm, control)	1	< 0.001	1	< 0.001	1	< 0.001
Treatment	1	0.421	1	0.952	1	0.685
Depth	2	< 0.001	2	< 0.001	2	< 0.001
Treatment: Depth	2	0.031	2	0.082	2	0.383

Table S4: Pairwise post hoc comparisons of mass of soil organic carbon (SOC) recovered in each fraction (mg C g^{-1} fractionated bulk soil) at three depths (10-20, 40-50, and 80-90 cm) in control and warmed plots (n = 3) based on estimated marginal means (EMMs) from linear mixed-effects models. The **Estimate** column shows the log-transformed difference in values between treatments (**warmed – control**). Df denotes the degree of freedom. The **Relative change (%)** represents the percent difference after exponentiating the **Estimate.** Positive values indicate distribution in the fraction increases under warming, while negative values indicate decreases. 2.5 % lower and 97.5 % upper limit represent the 95 % confidence interval of relative change (%). *p*-values reflect the significance of treatment differences at each depth.

Depth [cm]	**Estimate**	**Df**	**Relative Change [%]**	**2.5 % lower limit**	**97.5 % upper limit**	***p*-value**
fPOM						
10-20	0.446	10	56.2	-54.6	437.4	0.440
40-50	0.677	10	96.9	-42.8	577.4	0.250
80-90	-1.216	10	-70.4	-91.4	2.0	0.053
oPOM						
10-20	-0.038	10	-3.5	-74.3	262.7	0.953
40-50	0.063	10	6.5	-71.7	300.4	0.918
80-90	-1.613	10	-80.1	-94.7	-25.1	0.022
MAOM						
10-20	0.133	10	14.3	-45.0	137.4	0.693
40-50	0.079	10	8.2	-47.9	124.9	0.814
80-90	-0.448	10	-36.1	-69.3	32.7	0.202

Table S5: Anova table for fixed effects in the linear-mixed effects model (LMEs) assessing the influence of treatment, depth, and their interaction on distribution of organic carbon (OC) in density fractions (g C g-1 total SOC) with block as the random effect. Df is the degree of freedom. *p*-values reflect the significance of each fixed effect.

Full model: Distribution of SOC in each fraction ~ Treatment × Depth + (1 | Block)

	fPOM		**oPOM**		**MAOM**	
Parameter	**Df**	***p*-value**	**Df**	***p*-value**	**Df**	***p*-value**
Intercept (control, 10-20 cm)	1	< 0.001	1	< 0.001	1	< 0.001
Treatment	1	0.343	1	0.189	1	0.735
Depth	2	0.032	2	0.385	2	0.032
Treatment: Depth	2	0.242	2	0.728	2	0.193

Table S6: Pairwise post hoc comparisons of distribution of organic carbon (OC) in different soil fractions (g C g^{-1} total SOC) between warming and control treatments at three depths (10-20, 40-50, and 80-90 cm), based on estimated marginal means (EMMs) from linear mixed-effects models. The **Estimate** column shows the difference in values between treatments (**warmed – control**). Positive values indicate distribution in the fraction increases under warming, while negative values indicate decreases. 95 % confidence interval of estimate was also reported. *p*-values reflect the significance of treatment differences at each depth.

Depth [cm]	**Estimate**	**Df**	**2.5 % lower limit**	**97.5 % upper limit**	***p*-value**
fPOM					
10-20	0.083	10	-0.112	0.277	0.366
40-50	0.129	10	-0.065	0.324	0.168
80-90	-0.069	10	-0.263	0.125	0.447
oPOM					
10-20	-0.050	10	-0.134	0.034	0.218
40-50	-0.041	10	-0.124	0.043	0.308
80-90	-0.081	10	-0.165	0.003	0.057
MAOM					
10-20	-0.033	10	-0.250	0.184	0.742
40-50	-0.089	10	-0.306	0.128	0.383
80-90	0.150	10	-0.067	0.367	0.155

Table S7: Relative proportion (%) of each carbon bond type, calculated as the absorbance of each carbon bond type divided by the total absorbance of all selected carbon bond types (mean ± SE, n = 3) in bulk soils at 10 cm increments from 0 to 100 cm in control and warmed plots.

Depth [cm]	Treatment	Aliphatic [%]	Carboxylic [%]	C=C aromatic (range 2) [%]	Lignin [%]	C=C aromatic (range 1) [%]	Polysaccharide [%]	C-H aromatic (range 2) [%]	C-H aromatic (range 1) [%]
0-10	Control	49.4 ± 4.4	2.7 ± 0.2	22.7 ± 1.9	1.7 ± 0.3	3.8 ± 0.7	3.9 ± 0.5	5.2 ± 2.0	10.7 ± 1.2
0-10	Warmed	49.6 ± 4.5	2.8 ± 0.3	22.1 ± 3.6	2.1 ± 0.1	3.5 ± 1.0	3.5 ± 1.0	5.0 ± 1.5	11.1 ± 2.3
10-20	Control	41.9 ± 5.6	3.2 ± 0.5	25.4 ± 2.0	2.7 ± 0.5	3.1 ± 0.5	4.1 ± 1.0	5.4 ± 1.5	14.2 ± 2.3
10-20	Warmed	46.0 ± 3.3	2.7 ± 0.5	25.2 ± 2.9	2.2 ± 0.3	3.9 ± 1.0	3.9 ± 1.0	4.2 ± 1.8	12.8 ± 3.1
20-30	Control	35.1 ± 5.0	3.4 ± 0.7	30.4 ± 3.2	3.2 ± 0.4	2.2 ± 0.6	2.1 ± 0.5	8.3 ± 2.2	15.3 ± 3.3
20-30	Warmed	44.1 ± 3.1	2.8 ± 0.3	27.0 ± 2.4	3.0 ± 0.4	2.0 ± 0.2	3.2 ± 0.8	5.6 ± 2.7	12.2 ± 2.1
30-40	Control	31.6 ± 2.7	5.5 ± 1.5	26.3 ± 4.1	5.4 ± 1.2	2.9 ± 0.9	1.6 ± 1.0	8.6 ± 0.7	18.0 ± 4.0
30-40	Warmed	36.1 ± 5.7	3.0 ± 0.2	26.9 ± 1.8	4.9 ± 0.2	1.3 ± 0.1	2.7 ± 0.4	8.9 ± 2.5	16.2 ± 2.6
40-50	Control	19.8 ± 4.9	3.3 ± 0.3	33.6 ± 3.1	4.9 ± 0.7	1.2 ± 0.2	0.7 ± 0.2	10.8 ± 2.4	25.8 ± 1.4
40-50	Warmed	23.2 ± 4.4	3.5 ± 0.4	29.9 ± 2.8	5.4 ± 0.7	1.4 ± 0.1	3.5 ± 1.0	13.1 ± 4.6	20.0 ± 3.3
50-60	Control	16.9 ± 2.8	3.4 ± 1.0	33.1 ± 1.8	5.6 ± 0.5	1.3 ± 0.3	1.9 ± 0.9	12.0 ± 0.4	26.0 ± 5.9
50-60	Warmed	14.7 ± 2.8	3.7 ± 0.7	33.0 ± 1.0	6.2 ± 0.5	1.3 ± 0.4	3.1 ± 1.8	13.3 ± 1.1	24.7 ± 5.5
60-70	Control	13.3 ± 1.7	3.1 ± 0.7	33.4 ± 0.7	5.4 ± 0.5	1.3 ± 0.3	2.3 ± 1.0	10.5 ± 3.5	30.8 ± 5.6
60-70	Warmed	9.8 ± 1.0	3.6 ± 0.8	35.4 ± 0.4	6.1 ± 0.8	1.2 ± 0.4	3.3 ± 0.7	15.6 ± 3.2	25.0 ± 5.9
70-80	Control	10.5 ± 2.4	2.5 ± 0.7	36.5 ± 2.5	4.5 ± 0.1	1.3 ± 0.4	1.0 ± 0.3	12.4 ± 0.3	31.4 ± 3.6

70-80	Warmed	8.0 ± 0.5	3.6 ± 1.0	34.1 ± 2.2	6.9 ± 1.4	1.2 ± 0.5	3.0 ± 1.6	18.5 ± 2.8	24.7 ± 1.5
80-90	Control	10.3 ± 2.0	2.4 ± 0.6	35.0 ± 0.8	5.1 ± 0.5	1.1 ± 0.3	1.4 ± 0.3	15.6 ± 1.4	29.1 ± 2.8
80-90	Warmed	9.0 ± 2.3	3.0 ± 0.8	34.3 ± 2.1	6.3 ± 1.1	0.8 ± 0.2	2.6 ± 1.0	17.9 ± 2.5	26.0 ± 6.0
90-100	Control	8.8 ± 0.4	1.9 ± 0.2	32.8 ± 2.4	5.2 ± 0.9	0.7 ± 0.2	2.0 ± 1.4	20.0 ± 1.8	28.7 ± 4.4
90-100	Warmed	12.2 ± 2.9	3.0 ± 0.7	32.8 ± 0.4	6.2 ± 1.2	0.8 ± 0.2	4.4 ± 1.2	22.0 ± 0.7	18.6 ± 3.1

Table S8: Relative proportion (%) of each carbon bond type, calculated as the absorbance of each carbon bond type divided by the total absorbance of all selected carbon bond types (mean ± SE, n = 3, except for several samples at depth) in soil fractions at 3 depths (10-20, 40-50, and 80-90 cm) in control and warmed plots. fPOM in warmed plots are not presented here due to insufficient material for DRIFT analysis.

Depth [cm]	Fraction	Treatment	Aliphatic [%]	Carboxylic [%]	C=C aromatic (range 2) [%]	Lignin [%]	C=C aromatic (range 1) [%]	Polysaccharide [%]	C-H aromatic (range 2) [%]	C-H aromatic (range 1) [%]
10-20	fPOM	Control	69.5 ± 4.5	4.6 ± 1.0	19.5 ± 3.2	2.0 ± 0.9	2.7 ± 0.7	1.1 ± 0.4	0.3 ± 0.1	0.2 ± 0.1
10-20	fPOM	Warmed	73.7 ± 4.0	2.3 ± 0.8	16.4 ± 3.5	3.6 ± 0.9	2.4 ± 0.3	0.8 ± 0.2	0.5 ± 0.2	0.3 ± 0.2
40-50	fPOM	Control	70.6 ± 1.7	3.4 ± 1.0	18.7 ± 0.8	1.2 ± 0.6	2.4 ± 0.2	3.0 ± 0.6	0.4 ± 0.2	0.2 ± 0.0
40-50	fPOM	Warmed	73.7 ± 2.5	1.4 ± 1.1	12.8 ± 2.0	6.6 ± 1.2	1.6 ± 0.3	3.0 ± 0.7	0.2 ± 0.0	0.4 ± 0.1
80-90	fPOM[a]	Control	73.3 ± 0.7	1.8 ± 0.7	15.6 ± 2.5	4.6 ± 1.5	1.7 ± 0.2	2.6 ± 1.1	0.1 ± 0.0	0.5 ± 0.2
10-20	oPOM	Control	72.3 ± 2.8	5.7 ± 1.4	12.9 ± 1.5	1.8 ± 0.6	1.6 ± 0.3	4.7 ± 0.2	0.7 ± 0.3	0.2 ± 0.1
10-20	oPOM	Warmed	77.2 ± 3.7	4.4 ± 0.6	10.1 ± 2.7	2.4 ± 0.1	1.5 ± 0.2	4.2 ± 0.3	0.1 ± 0.0	0.0 ± 0.0
40-50	oPOM	Control	75.9 ± 1.0	4.0 ± 0.4	11.9 ± 0.8	1.8 ± 04	1.6 ± 0.1	4.5 ± 0.2	0.1 ± 0.1	0.2 ± 0.0
40-50	oPOM	Warmed	78.7 ± 2.3	2.9 ± 0.7	8.4 ± 1.1	4.3 ± 1.2	1.3 ± 0.1	4.0 ± 0.5	0.2 ± 0.0	0.2 ± 0.1
80-90	oPOM[a]	Control	70.6 ± 1.1	4.1 ± 0.2	16.9 ± 0.7	1.2 ± 0.3	1.7 ± 0.1	4.8 ± 1.1	0.8 ± 0.6	0.1 ± 0.1
80-90	oPOM[b]	Warmed	76.7	1.7	12.1	4.3	1.3	3.7	0.1	0.2
10-20	MAOM	Control	29.4 ± 5.4	2.8 ± 0.1	27.2 ± 3.5	4.0 ± 1.0	2.0 ± 0.4	3.5 ± 1.3	11.2 ± 3.3	20.0 ± 6.8
10-20	MAOM	Warmed	38.5 ± 4.1	2.7 ± 0.5	21.9 ± 1.4	4.8 ± 2.0	1.8 ± 0.4	4.2 ± 2.1	10.2 ± 1.3	16.0 ± 2.2
40-50	MAOM	Control	15.0 ± 6.1	2.5 ± 0.3	28.1 ± 1.6	6.6 ± 0.5	0.2 ± 0.1	1.9 ± 0.4	15.2 ± 4.5	30.6 ± 7.7
40-50	MAOM	Warmed	13.9 ± 4.9	2.9 ± 0.7	28.7 ± 2.5	7.9 ± 1.1	0.5 ± 0.3	2.6 ± 0.4	18.0 ± 3.2	25.6 ± 7.0

80-90	MAOM	Control	8.3 ± 1.5	1.8 ± 0.1	30.0 ± 1.9	7.4 ± 0.6	0.1 ± 0.0	1.6 ± 0.9	13.5 ± 1.1	37.3 ± 2.6
80-90	MAOM	Warmed	5.0 ± 1.8	2.8 ± 1.0	28.6 ± 5.4	11.3 ± 3.7	0.3 ± 0.1	5.3 ± 2.1	18.9 ± 3.4	27.8 ± 9.5

[a] The fraction contains only two replicates.

[b] The fraction contains only one replicate.

Table S9: Results of carbon content (%), C/N ratio, and $\delta^{13}C$ [‰ VPDB] of fractions in control and warmed plots at three depths (10-20, 40-50, and 80-90 cm) (mean ± SE, n = 3).

		Control		Warmed	
Depth [cm]	**Fraction**	**Carbon content [%]**	**$\delta^{13}C$ [‰ VPDB]**	**Carbon content [%]**	**$\delta^{13}C$ [‰ VPDB]**
10-20	fPOM	32.7 ± 1.3	-25.7 ± 0.2	31.7 ± 0.8	-25.9 ± 0.6
40-50	fPOM	43.1 ± 2.0	-25.7 ± 0.2	43.0 ± 2.6	-26.2 ± 0.6
80-90	fPOM	42.0 ± 1.3	-26.0 ± 0.5	42.9 ± 0.9	-25.9 ± 0.5
10-20	oPOM	42.0 ± 0.9	-25.5 ± 0.1	41.2 ± 2.0	-25.7 ± 0.4
40-50	oPOM	44.2 ± 0.6	-25.6 ± 0.1	44.1 ± 1.1	-25.8 ± 0.4
80-90	oPOM	40.8 ± 1.1	-25.8 ± 0.3	43.8 ± 3.0	-26.0 ± 0.1
10-20	MAOM	1.3 ± 0.2	-24.7 ± 0.0	1.6 ± 0.4	-24.8 ± 0.3
40-50	MAOM	0.5 ± 0.1	-24.2 ± 0.0	0.5 ± 0.1	-24.3 ± 0.2
80-90	MAOM	0.2 ± 0.1	-24.4 ± 0.1	0.1 ± 0.0	-25.0 ± 0.5

[a] Due to very low N concentration, only with one replicate

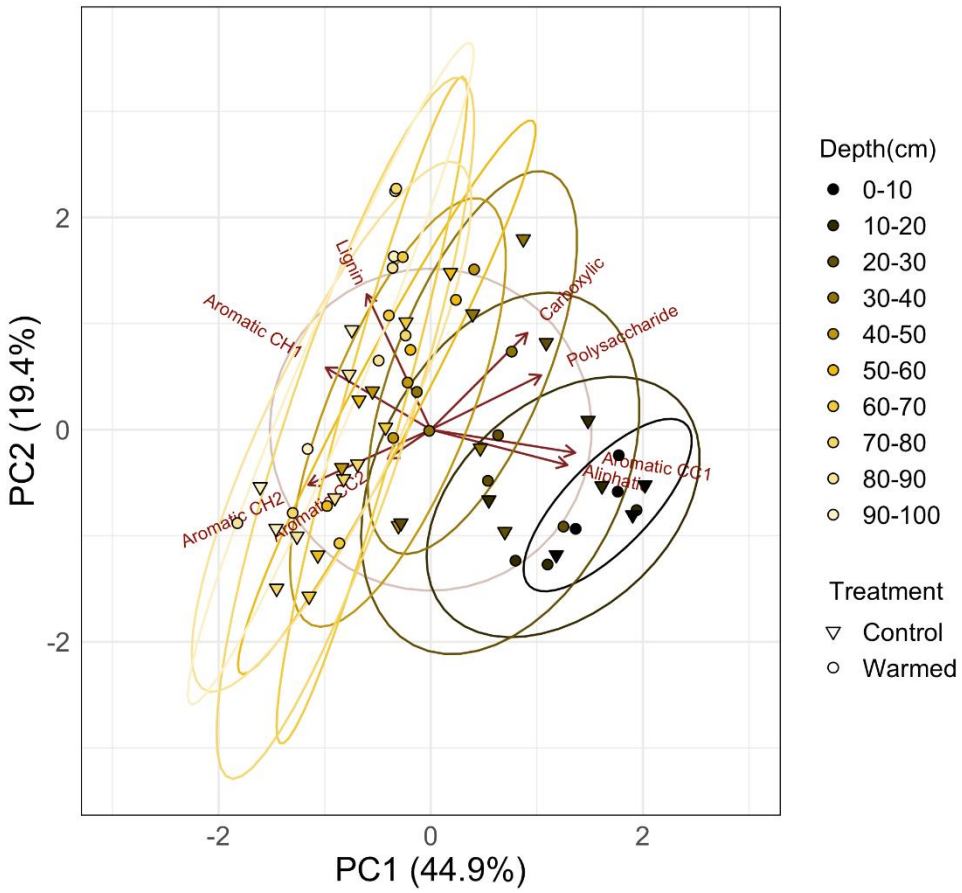

Fig. S1. Principal component analysis (PCA) of fit DRIFT spectra from bulk soil in warmed and control plots at 10 cm increments from 0 to 100 cm. PCA was performed using area under the curve (AUC) values of the DRIFT spectral bands of identified peak areas following baseline correction.

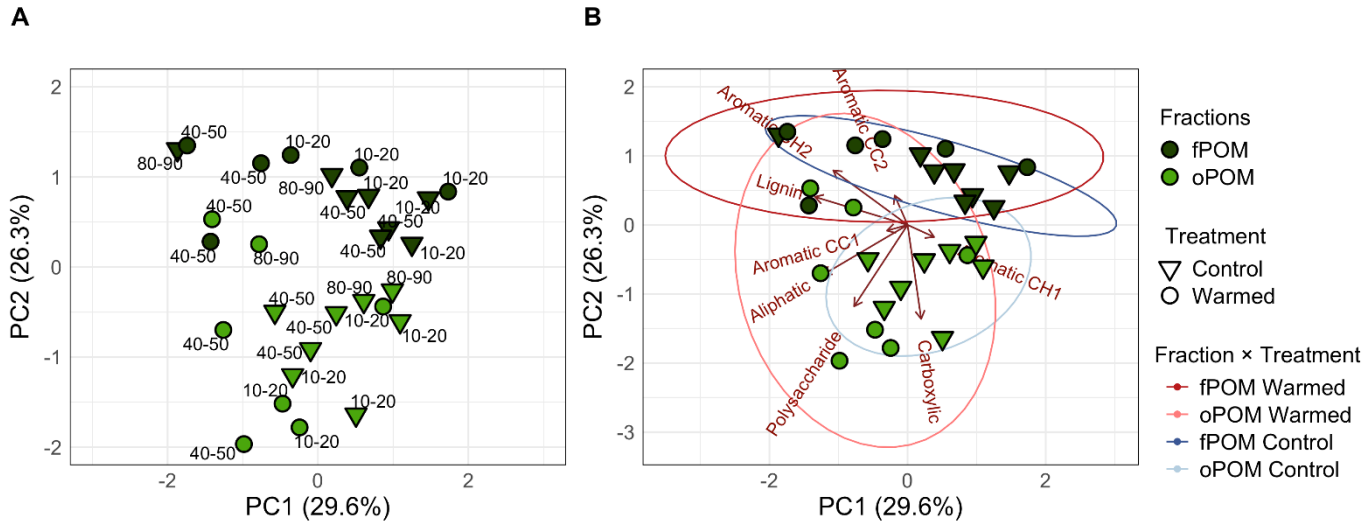

Fig. S2. Principal component analysis (PCA) of fit DRIFT spectra from fPOM and oPOM in the warmed and control plots at three depths 10-20, 40-50, and 80-90 cm. PCA was performed using area under the curve (AUC) values of the DRIFT spectral bands of identified peak areas following baseline correction. Left: data points labelled by depth. Right: samples grouped by fraction × treatment. Some 80-90 cm samples are missing due to insufficient material for reliable DRIFT analysis.

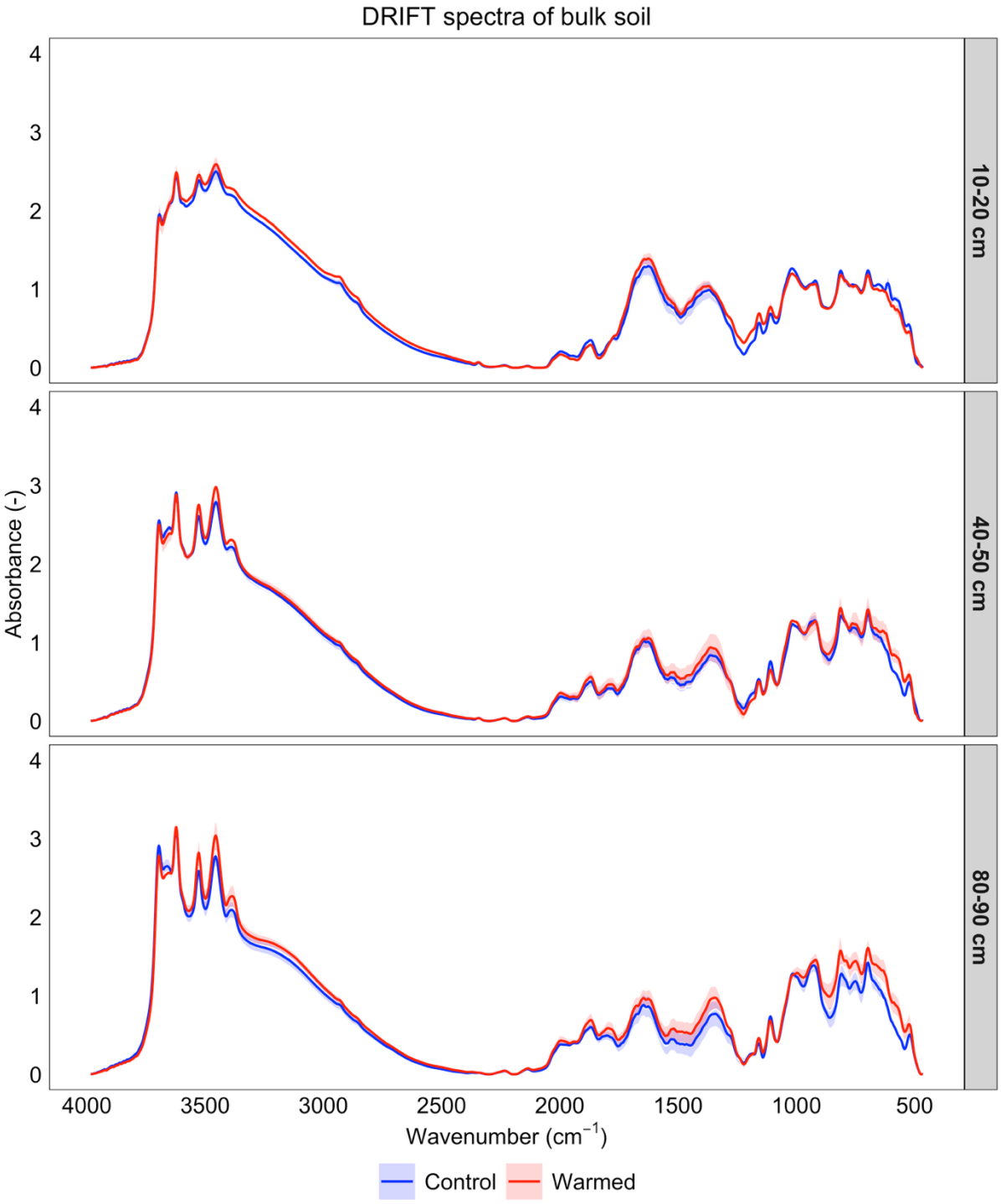

Fig. S3. The average DRIFT spectra of bulk soil at 10-20, 40-50, and 80-90 cm in control and warmed plots after baseline correction (mean ± SE, n = 3).

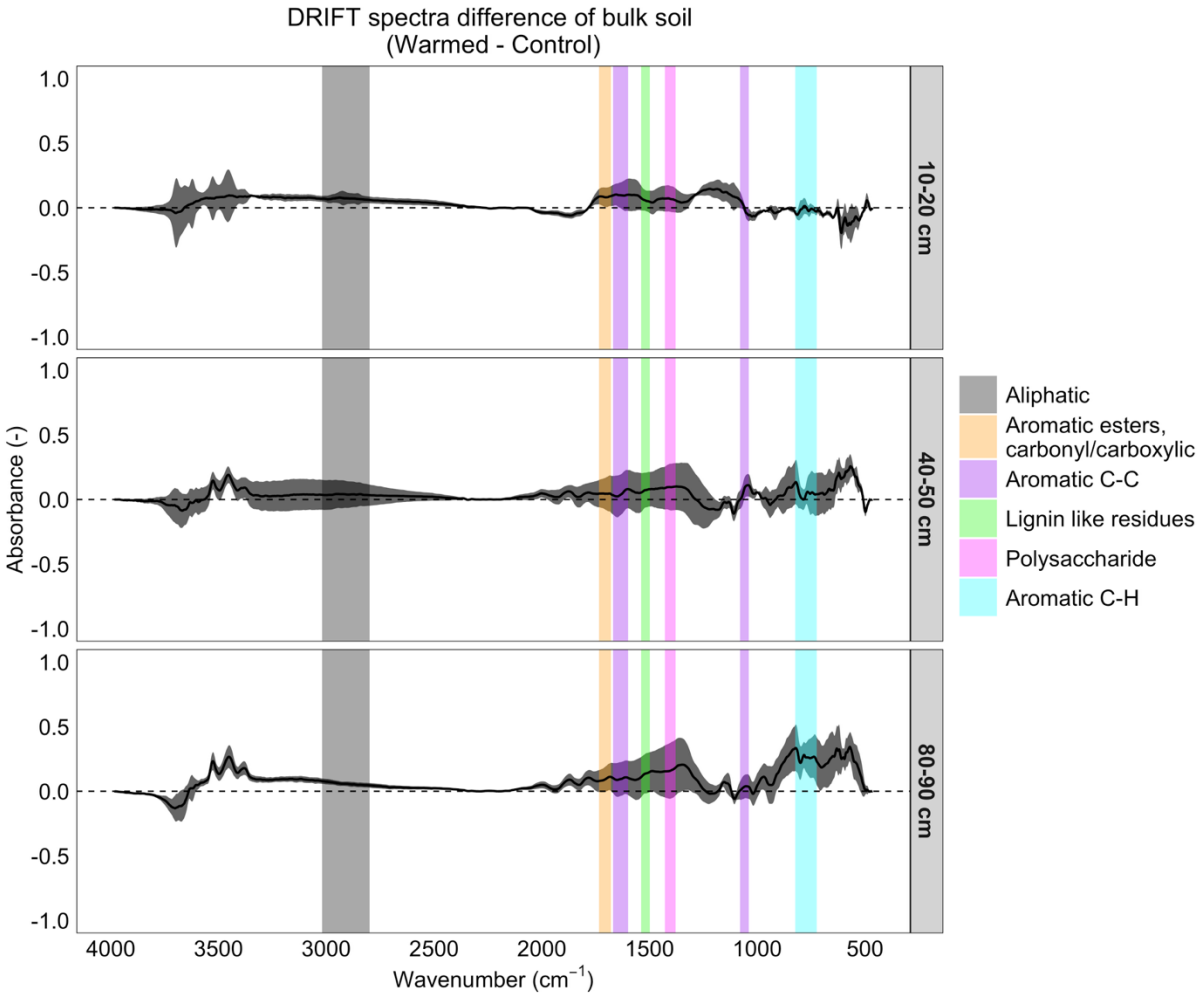

Fig. S4. The average difference (warmed – control) of DRIFT spectra from bulk soil at 10-20, 40-50, and 80-90 cm in control and warmed plots after baseline correction (mean ± SE, n = 3).

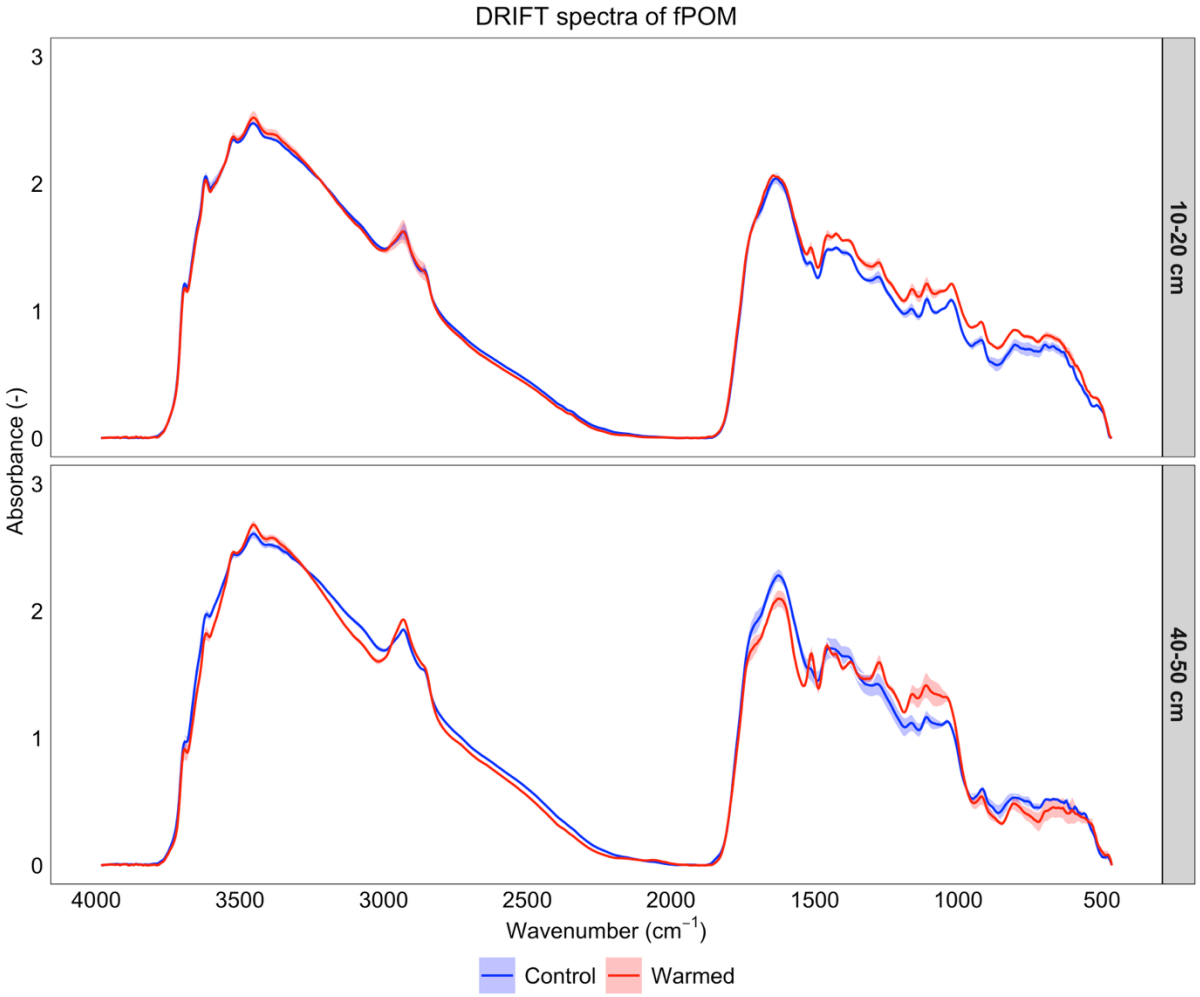

Fig. S5. The average DRIFT spectra from fPOM at 10-20, and 40-50 cm in control and warmed plots after baseline correction (mean ± SE, n = 3).

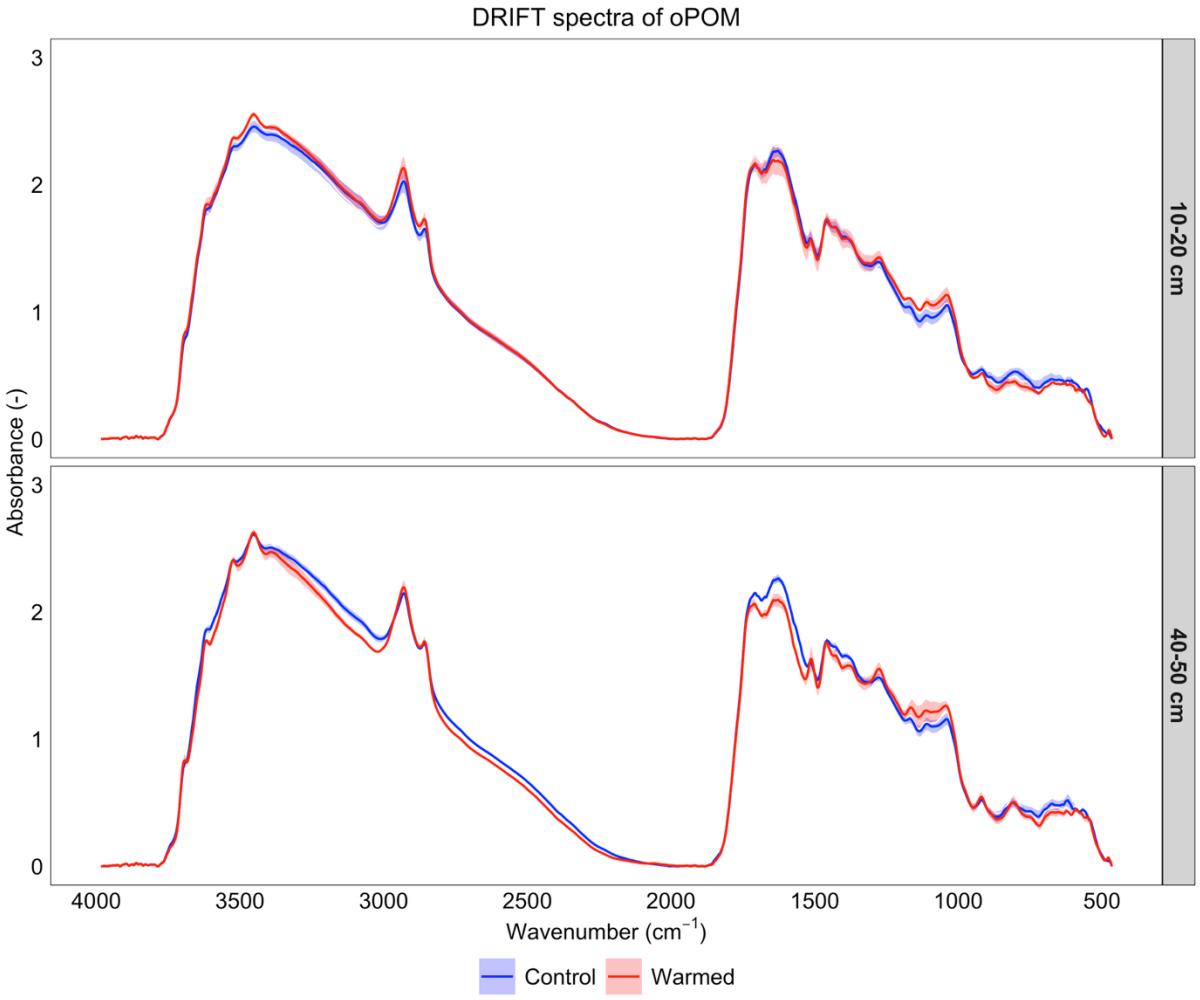

Fig. S6. The average DRIFT spectra from oPOM at 10-20, and 40-50 cm in control and warmed plots after baseline correction (mean ± SE, n = 3).

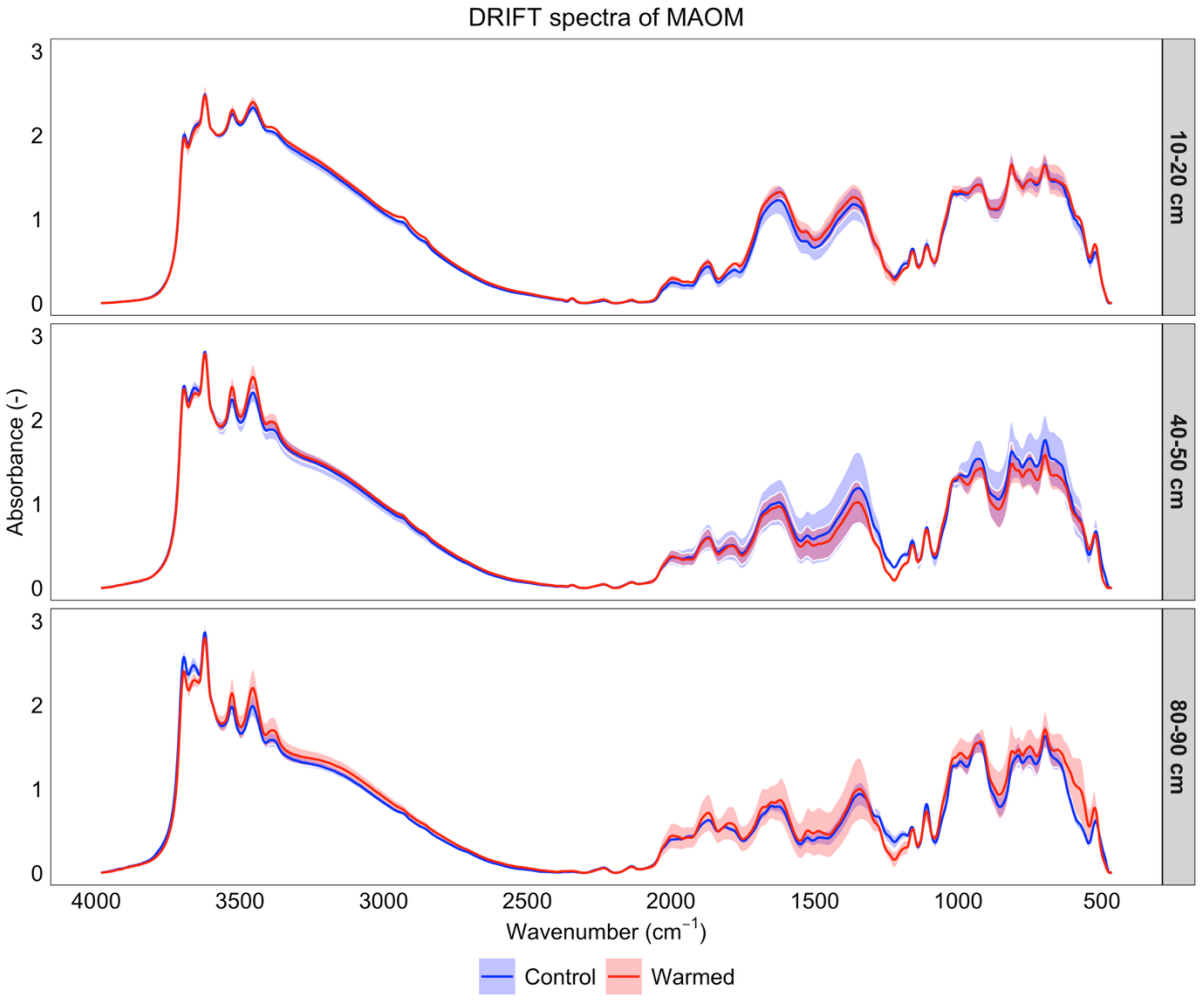

Fig. S7. The average DRIFT spectra from MAOM at 10-20, and 40-50 cm in control and warmed plots after baseline correction (mean ± SE, n = 3).

Table S10: Diffuse reflectance infrared Fourier transform (DRIFT) stability index (DSI; C=C aromatic [range 2] to aliphatic ratio; aromatic/aliphatic) in POM fractions at three soil depths (10-20, 40-50, and 80-90 cm) under control and warmed conditions (mean ± SE, n = 3). The ratio was calculated from DRIFT absorbance [-] in the aliphatic C-H region (3020–2800 cm^{-1}) and aromatic region (1670–1590 cm^{-1}).

	fPOM		oPOM	
	Control	Warmed	Control	Warmed
Depth [cm]	Ratio [-]	Ratio [-]	Ratio [-]	Ratio [-]
10-20	0.29 ± 0.07	0.23 ± 0.06	0.18 ± 0.03	0.14 ± 0.08
40-50	0.27 ± 0.02	0.18 ± 0.03	0.16 ± 0.01	0.11 ± 0.02
80-90	0.21 ± 0.04[a]	N.a.	0.24 ± 0.01[a]	0.16[b]

[a] Data contains only two replicates

[b] Data contains only one replicate

N.a. Data not available

Table S11: Anova table for fixed effects in the linear-mixed effects model (LMEs), assessing the influence of treatment, depth, and their interaction on Diffuse reflectance infrared Fourier transform (DRIFT) stability index (DSI; C=C aromatic [range 2] to aliphatic ratio; aromatic/aliphatic) of bulk soil, fPOM, oPOM, and MAOM with block as the random effect. Df is the degree of freedom. *p*-values reflect the significance level of different treatments or interaction between treatments. Due to insufficient material of fPOM and oPOM at 80-90 cm, the models for fPOM and oPOM only included samples from 10-20 and 40-50 cm.

Full model: log(DSI) ~ Treatment × Depth + (1| Block)

	Bulk		**fPOM**		**oPOM**		**MAOM**	
Parameter	**Df**	***p*-value**	**Df**	***p*-value**	**Df**	***p*-value**	**Df**	***p*-value**
Intercept (control, 0-10 cm for bulk soil; 10-20 cm for fractions)	1	< 0.001	1	< 0.001	1	< 0.001	1	< 0.001
Treatment	1	0.865	1	0.285	1	0.171	1	0.865
Depth	9	< 0.001	1	0.873	1	0.650	9	< 0.001
Treatment: Depth	9	0.631	1	0.585	1	0.926	9	0.631

Table S12: Pairwise post hoc comparisons of bulk soil organic carbon (SOC) concentration of mineral soils (0-100 cm with 10 cm increment) in control and warmed plots (n = 3) based on estimated marginal means (EMMs) from linear mixed-effects models. The relative difference column shows the relative difference in values between treatments (warmed – control)/control after back transformed (%, exponentiated). Positive values indicate warming increased SOC concentration, whereas negative values indicate warming decreased bulk SOC concentration. df denotes degree of freedom *p*-values are presented in bold to indicate statistical significance.

	Bulk SOC concentration		
Depth (cm)	**Relative difference (%)**	**df**	***p*-value**
0-10	0	4	0.992
10-20	15.1	4	0.427
20-30	15.2	4	0.424
30-40	11.3	4	0.539
40-50	4.0	4	0.817
50-60	-11.6	4	0.483
60-70	-28.9	4	0.099
70-80	-27.6	4	0.112
80-90	-30.3	4	0.086
90-100	-20.1	4	0.230

Table S13: Assignment of major infrared (IR) absorption bands in bulk soil or mineral associated organic matter (MAOM) and free or occluded particulate organic matter (fPOM or oPOM, respectively). Area under the curve (AUC) values were calculated using a local baseline across the bands for spectra from the different samples. Given the significantly higher carbon concentration in fPOM and oPOM fractions compared to bulk soil and MAOM, and the effect of the mineral matrix on SOC (Ellerbrock and Gerke, 2021), the corresponding spectral band ranges for fPOM and oPOM showed slight shifts and were selected from the average spectra of each sample type (Zaccheo et al., 2002; Tatzber et al., 2007; Artz et al., 2008; Chatterjee et al., 2012; Ofiti et al., 2021; Margenot et al., 2023).

Band for AUC calculation	**Bulk/MAOM**	**fPOM/oPOM**	**Assignment**
	Wavenumber [cm^{-1}]		
Aliphatic	3020–2800 cm^{-1}	3020–2800 cm^{-1}	(Anti)symmetric stretching aliphatic (CH_3) CH_2
Carboxylic	1735–1680 cm^{-1}	1735–1680 cm^{-1}	C=O stretching of COOH or COOR
C=C aromatic2	1670–1600 cm^{-1}	1670–1590 cm^{-1}	Aromatic C=C stretching and/or carboxylate C-O asymmetric stretch
Lignin	1540–1500 cm^{-1}	1530–1490 cm^{-1}	Aromatic C=C stretching
C=C aromatic1	1430–1380 cm^{-1}	1406–1360 cm^{-1}	Aromatic C=C stretch, aliphatic C-H bend, phenolic C-O stretch, carboxylate C-O symmetric stretch
Polysaccharide	1080–1040 cm^{-1}	1080–1020 cm^{-1}	Combination of C-O-C or C-O-H stretching in carbohydrates
C-H aromatic2	825–775 cm^{-1}	830–806 cm^{-1}	Aromatic C-H out-of-plane bending
C-H aromatic1	775–725 cm^{-1}	806–761 cm^{-1}	Aromatic C-H out-of-plane bending