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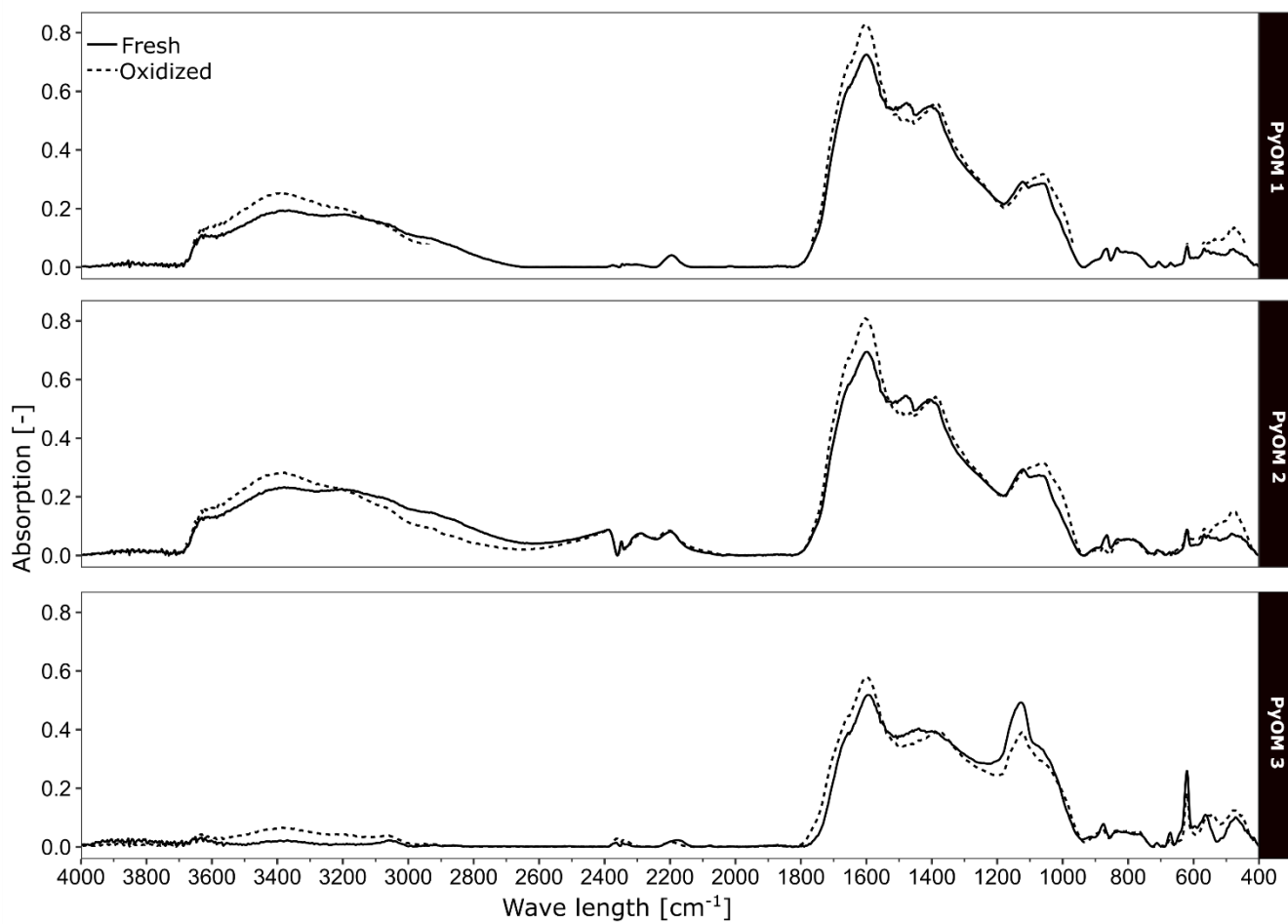
*Supplement of*

## **Vertical mobility of pyrogenic organic matter in soils: a column experiment**

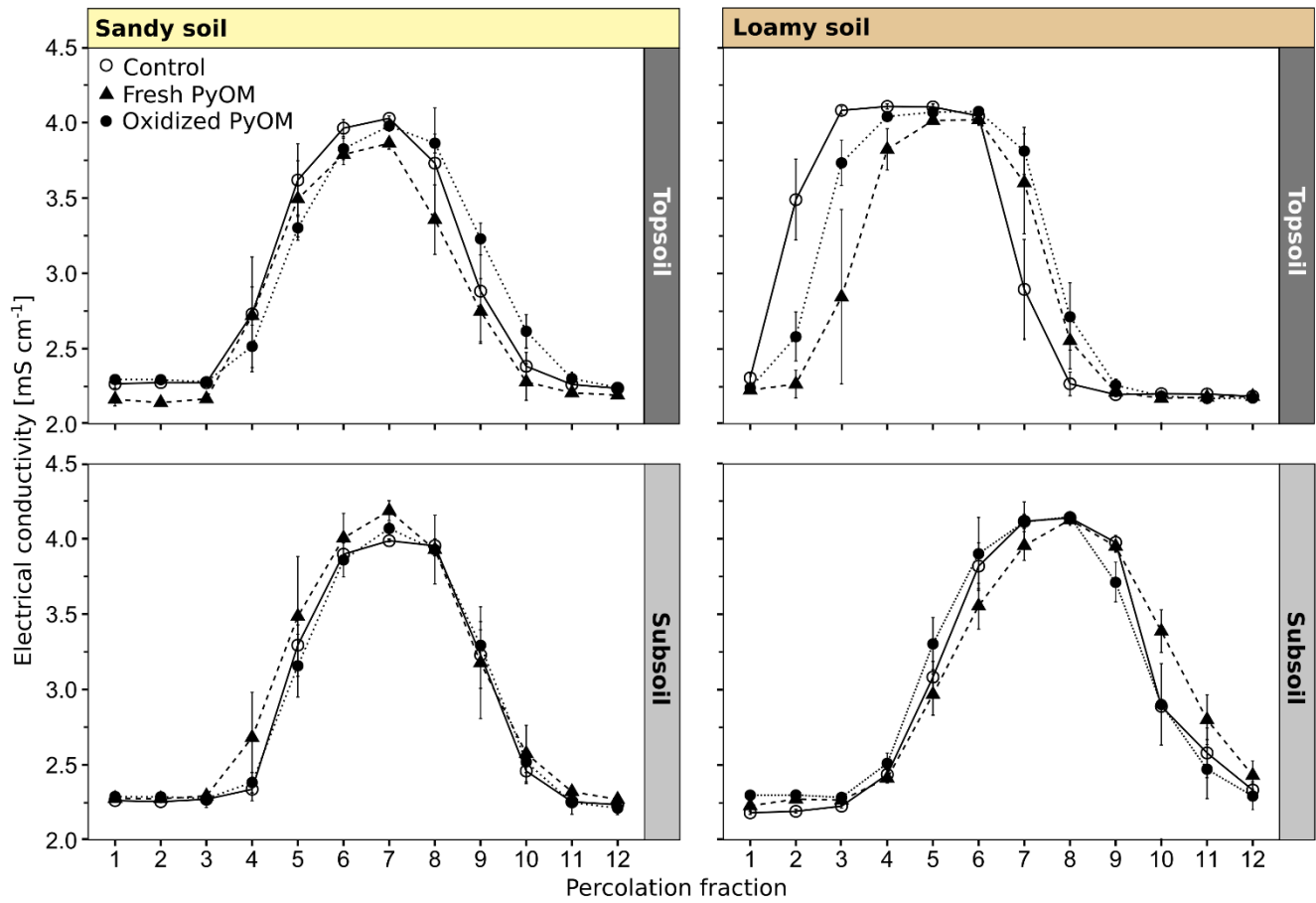
**Marcus Schiedung et al.**

*Correspondence to:* Samuel Abiven ([abiven@biotite.ens.fr](mailto:abiven@biotite.ens.fr))

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**Figure S1:** Full DRIFT spectra of all three used fresh and oxidized PyOM. For details see figure 1 and table 2.



5 Figure S2: Breakthrough curves (BTC) for topsoil and subsoil of the sandy and loamy soil as average of control columns and columns with fresh and oxidized PyOM addition ( $\pm 1$  SE). The percolation fraction represent each a percolation for 6 minutes with a flow of  $1 \text{ ml min}^{-1}$ . Only the BTCs of the loamy topsoil were conducted with a flow of  $2 \text{ ml min}^{-1}$ .

**Table S1: Diffusion coefficients  $D$ , convective velocity  $v$  and dispersivities  $\lambda$  fitted for all columns for sandy and loamy soil.**

	Column replicate	$v$ [cm min <sup>-1</sup> ]	$D$ [cm <sup>2</sup> min <sup>-1</sup> ]	$\lambda$ [cm]
<b>Sandy topsoil</b>				
Control	1	0.31	0.036	0.12
	2	0.36	0.035	0.10
	3	0.31	0.027	0.09
	4	0.30	0.030	0.09
Fresh PyOM	1	0.31	0.038	0.12
	2	0.33	0.053	0.16
	3	0.34	0.041	0.12
	4	0.29	0.039	0.13
Oxidized PyOM	1	0.28	0.057	0.21
	2	0.29	0.033	0.12
	3	0.29	0.031	0.11
	4	0.31	0.057	0.19
<b>Sandy subsoil</b>				
Control	1	0.28	0.030	0.10
	2	0.29	0.024	0.08
	3	0.28	0.025	0.09
	4	0.31	0.020	0.08
Fresh PyOM	1	0.27	0.041	0.15
	2	0.27	0.058	0.21
	3	0.33	0.076	0.23
	4	0.31	0.056	0.18
Oxidized PyOM	1	0.27	0.023	0.09
	2	0.28	0.037	0.13
	3	0.29	0.029	0.10
	4	0.28	0.050	0.18

**Table S1: continued**

	<b>Column replicate</b>	$\nu$ [cm min <sup>-1</sup> ]	$D$ [cm <sup>2</sup> min <sup>-1</sup> ]	$\lambda$ [cm]
<b>Loamy topsoil</b>				
Control	1	0.72	0.326	0.46
	2	0.77	0.081	0.10
	3	0.85	0.318	0.37
	4	0.71	0.310	0.44
Fresh PyOM	1	0.50	0.271	0.54
	2	0.54	0.097	0.18
	3	0.50	0.116	0.23
	4	0.42	0.053	0.13
Oxidized PyOM	1	0.49	0.121	0.25
	2	0.63	0.142	0.23
	3	0.54	0.141	0.26
	4	0.53	0.142	0.27
<b>Loamy subsoil</b>				
Control	1	0.28	0.027	0.10
	2	0.27	0.042	0.15
	3	0.26	0.039	0.15
	4	0.28	0.030	0.12
Fresh PyOM	1	0.27	0.041	0.15
	2	0.25	0.065	0.26
	3	0.24	0.056	0.24
	4	0.25	0.050	0.20
Oxidized PyOM	1	0.39	0.229	0.59
	2	0.29	0.036	0.12
	3	0.29	0.029	0.10
	4	0.29	0.040	0.14

15 **Table S2: pH, EC, percolated native soil organic carbon (nSOC), excess isotope-amount fraction  $\delta E(^{13}C)$ , PyOM-C and proportion of PyOM-C on TOC (PyOM-C: percolated TOC) for all percolates of the sandy and loamy soil ( $\pm 1$  SE).**

	Percolation	pH	EC	Percolated nSOC	$\delta E(^{13}C)$	PyOM-C	PyOM-C: perc. TOC
	[l m <sup>-2</sup> ]	[-]	[mS cm <sup>-1</sup> ]	[mg l <sup>-1</sup> ]	[%]	[ $\mu$ g l <sup>-1</sup> ]	[%]
<b>Sandy topsoil</b>							
Control	1,000	3.42 (0.02)	2.30 (0.01)	12.12 (0.24)			
	3,000	3.70 (0.04)	2.25 (0.01)	4.12 (0.07)			
	8,000	4.05 (0.01)	2.21 (0.01)	1.51 (0.03)			
	13,000	4.25 (0.02)	2.24 (0.01)	1.51 (0.13)			
	18,000	4.34 (0.02)	2.27 (0.01)	0.68 (0.09)			
Fresh PyOM	1,000	3.72 (0.03)	2.48 (0.01)	45.54 (7.69)	0.070 (0.008)	997.0 (72.0)	2.4 (0.3)
	3,000	3.95 (0.02)	2.23 (0.01)	4.67 (0.30)	0.037 (0.002)	57.7 (8.2)	1.3 (0.1)
	8,000	4.18 (0.04)	2.23 (0.01)	2.04 (0.33)	0.017 (0.001)	12.0 (3.4)	0.6 (0.1)
	13,000	4.41 (0.02)	2.24 (0.01)	1.69 (0.19)	0.013 (0.002)	6.9 (0.5)	0.4 (0.1)
	18,000	4.51 (0.03)	2.24 (0.01)	1.32 (0.19)	0.015 (0.001)	6.3 (0.9)	0.5 (0.1)
Oxidized PyOM	1,000	3.62 (0.02)	2.51 (0.01)	28.16 (2.09)	0.263 (0.010)	2,862.9 (319.5)	9.2 (0.5)
	3,000	3.93 (0.02)	2.28 (0.01)	4.45 (0.14)	0.104 (0.007)	166.2 (8.7)	3.7 (0.2)
	8,000	4.18 (0.02)	2.25 (0.01)	1.71 (0.08)	0.050 (0.002)	30.0 (1.8)	1.8 (0.1)
	13,000	4.36 (0.01)	2.24 (0.01)	1.35 (0.19)	0.030 (0.005)	13.4 (1.7)	1.0 (0.2)
	18,000	4.51 (0.01)	2.26 (0.01)	0.90 (0.10)	0.030 (0.002)	9.4 (1.2)	1.1 (0.1)
<b>Sandy subsoil</b>							
Control	1,000	4.38 (0.02)	2.35 (0.02)	3.28 (0.18)			
	3,000	4.63 (0.04)	2.32 (0.01)	0.61 (0.04)			
	8,000	4.88 (0.04)	2.24 (0.01)	0.74 (0.06)			
	13,000	5.20 (0.05)	2.25 (0.01)	0.65 (0.21)			
	18,000	5.40 (0.03)	2.23 (0.01)	1.08 (0.13)			
Fresh PyOM	1,000	4.98 (0.07)	2.52 (0.02)	13.31 (1.55)	0.183 (0.008)	1,114.7 (169.5)	6.8 (0.3)
	3,000	5.06 (0.03)	2.25 (0.01)	1.57 (0.04)	0.073 (0.003)	50.1 (3.4)	2.7 (0.1)
	8,000	5.41 (0.04)	2.26 (0.01)	0.57 (0.06)	0.045 (0.002)	10.8 (0.4)	1.7 (0.1)
	13,000	5.43 (0.04)	2.24 (0.01)	1.61 (0.21)	0.030 (0.001)	20.6 (2.1)	1.1 (0.1)
	18,000	5.74 (0.03)	2.20 (0.01)	1.14 (0.19)	0.008 (0.003)	3.6 (1.2)	0.3 (0.1)
Oxidized PyOM	1,000	4.96 (0.07)	2.58 (0.02)	11.88 (0.51)	0.463 (0.018)	2,836.9 (166.1)	17.2 (1.0)
	3,000	4.96 (0.05)	2.29 (0.01)	1.42 (0.14)	0.162 (0.006)	105.8 (8.6)	6.0 (0.3)
	8,000	5.19 (0.04)	2.23 (0.01)	0.86 (0.13)	0.082 (0.009)	31.6 (6.4)	3.0 (0.4)
	13,000	5.36 (0.03)	2.25 (0.01)	0.73 (0.08)	0.056 (0.003)	18.3 (2.9)	2.1 (0.1)
	18,000	5.58 (0.01)	2.23 (0.01)	0.67 (0.09)	0.056 (0.005)	16.3 (1.9)	2.0 (0.2)

Table S2: Continued

	Percolation	pH	EC	Percolated nSOC	$\delta E(^{13}C)$	PyOM-C	PyOM-C: perc. TOC
	[l m <sup>-2</sup> ]	[-]	[mS cm <sup>-1</sup> ]	[mg l <sup>-1</sup> ]	[%]	[μg l <sup>-1</sup> ]	[%]
<b>Loamy topsoil</b>							
Control	1,000	5.99 (0.08)	2.25 (0.01)	9.65 (1.07)			
	3,000	5.76 (0.21)	2.25 (0.01)	4.30 (1.22)			
	8,000	5.99 (0.10)	2.17 (0.01)	1.56 (0.36)			
	13,000	6.11 (0.02)	2.12 (0.01)	1.57 (0.22)			
	18,000	6.11 (0.07)	2.19 (0.02)	0.63 (0.11)			
Fresh PyOM	1,000	6.75 (0.06)	2.36 (0.03)	21.14 (1.96)	0.106 (0.002)	596.4 (46.6)	2.9 (0.1)
	3,000	6.26 (0.12)	2.16 (0.01)	2.50 (0.16)	0.070 (0.009)	45.3 (4.2)	1.9 (0.2)
	8,000	6.21 (0.08)	2.15 (0.01)	1.21 (0.14)	0.031 (0.001)	9.8 (1.2)	0.8 (0.1)
	13,000	6.06 (0.12)	2.19 (0.01)	2.01 (0.61)	0.008 (0.005)	6.1 (4.4)	0.2 (0.1)
	18,000	6.21 (0.07)	2.19 (0.01)	1.25 (0.25)	ND	ND	-
Oxidized PyOM	1,000	6.45 (0.09)	2.47 (0.03)	15.89 (2.08)	0.295 (0.033)	1,411.4 (439.8)	7.7 (1.3)
	3,000	6.44 (0.07)	2.20 (0.01)	1.76 (0.24)	0.182 (0.024)	87.9 (18.2)	4.8 (0.9)
	8,000	6.31 (0.04)	2.16 (0.01)	1.35 (0.15)	0.065 (0.005)	22.8 (2.3)	1.7 (0.2)
	13,000	6.01 (0.07)	2.15 (0.01)	2.96 (1.00)	0.024 (0.001)	18.5 (6.8)	0.6 (0.1)
	18,000	6.14 (0.10)	2.19 (0.01)	1.17 (0.19)	ND	ND	-
<b>Loamy subsoil</b>							
Control	1,000	4.29 (0.03)	2.22 (0.01)	7.86 (0.49)			
	3,000	4.35 (0.04)	2.23 (0.01)	1.22 (0.16)			
	8,000	4.49 (0.03)	2.22 (0.01)	1.33 (0.11)			
	13,000	4.64 (0.07)	2.23 (0.01)	0.74 (0.07)			
	18,000	5.04 (0.06)	2.20 (0.01)	0.85 (0.07)			
Fresh PyOM	1,000	4.39 (0.03)	2.49 (0.05)	12.23 (1.55)	0.071 (0.005)	357.5 (49.5)	2.6 (0.2)
	3,000	4.55 (0.09)	2.29 (0.01)	1.62 (0.11)	0.043 (0.005)	28.6 (3.7)	1.6 (0.1)
	8,000	4.69 (0.07)	2.27 (0.01)	0.90 (0.06)	0.053 (0.007)	19.6 (3.1)	1.9 (0.2)
	13,000	4.65 (0.01)	2.24 (0.01)	0.70 (0.04)	0.038 (0.005)	10.8 (1.1)	1.4 (0.2)
	18,000	4.87 (0.11)	2.27 (0.01)	0.66 (0.09)	0.033 (0.003)	9.0 (1.4)	1.2 (0.1)
Oxidized PyOM	1,000	4.32 (0.02)	3.42 (0.03)	10.92 (0.79)	0.165 (0.008)	724.2 (67.5)	5.7 (0.3)
	3,000	4.50 (0.01)	3.03 (0.01)	1.41 (0.08)	0.168 (0.019)	93.8 (7.1)	5.8 (0.6)
	8,000	4.72 (0.09)	2.70 (0.01)	0.98 (0.08)	0.163 (0.012)	63.5 (4.6)	5.6 (0.3)
	13,000	4.63 (0.04)	2.29 (0.01)	0.60 (0.05)	0.140 (0.012)	34.0 (5.3)	4.8 (0.3)
	18,000	4.82 (0.04)	2.33 (0.01)	0.83 (0.04)	0.081 (0.003)	26.3 (0.4)	2.8 (0.1)

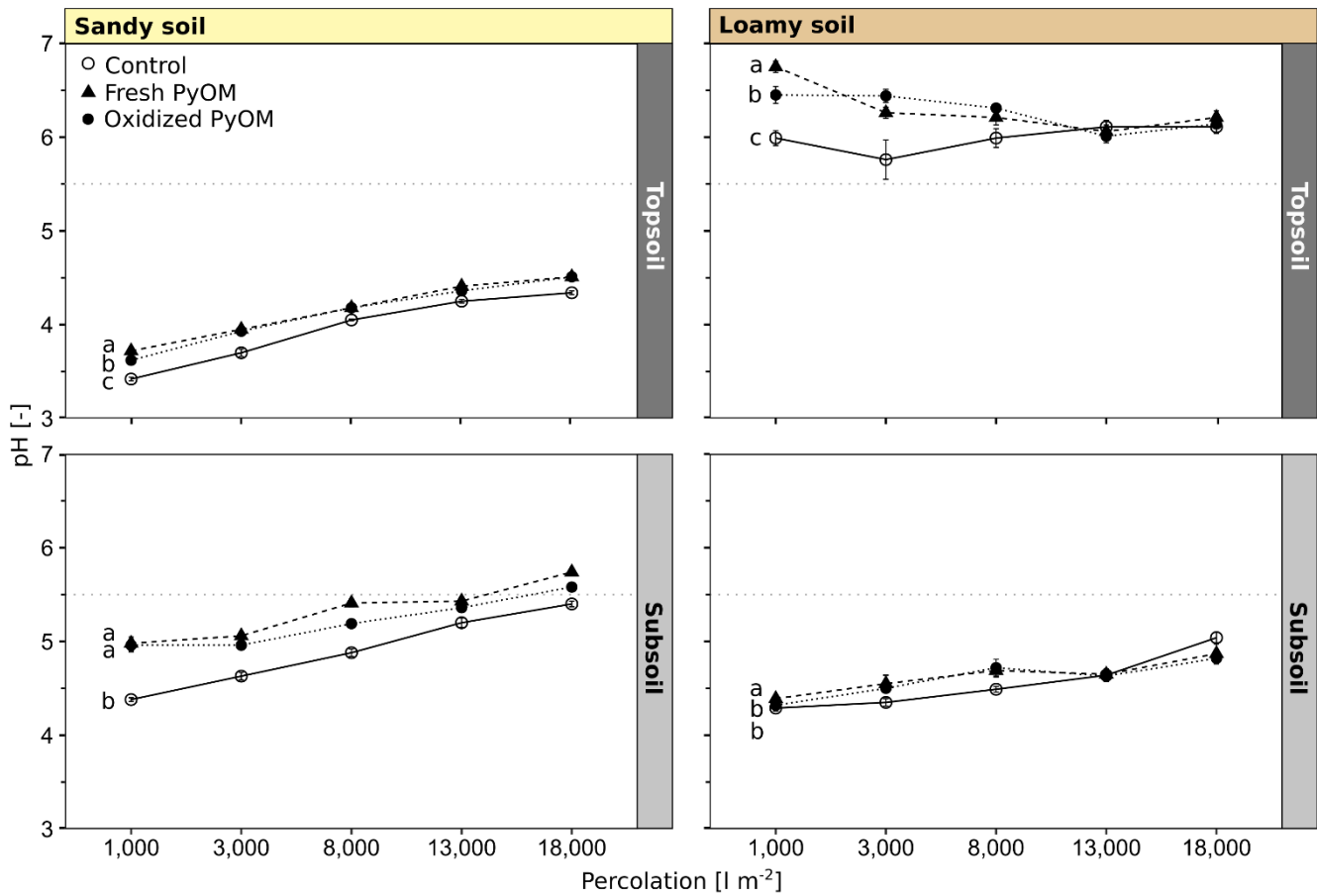
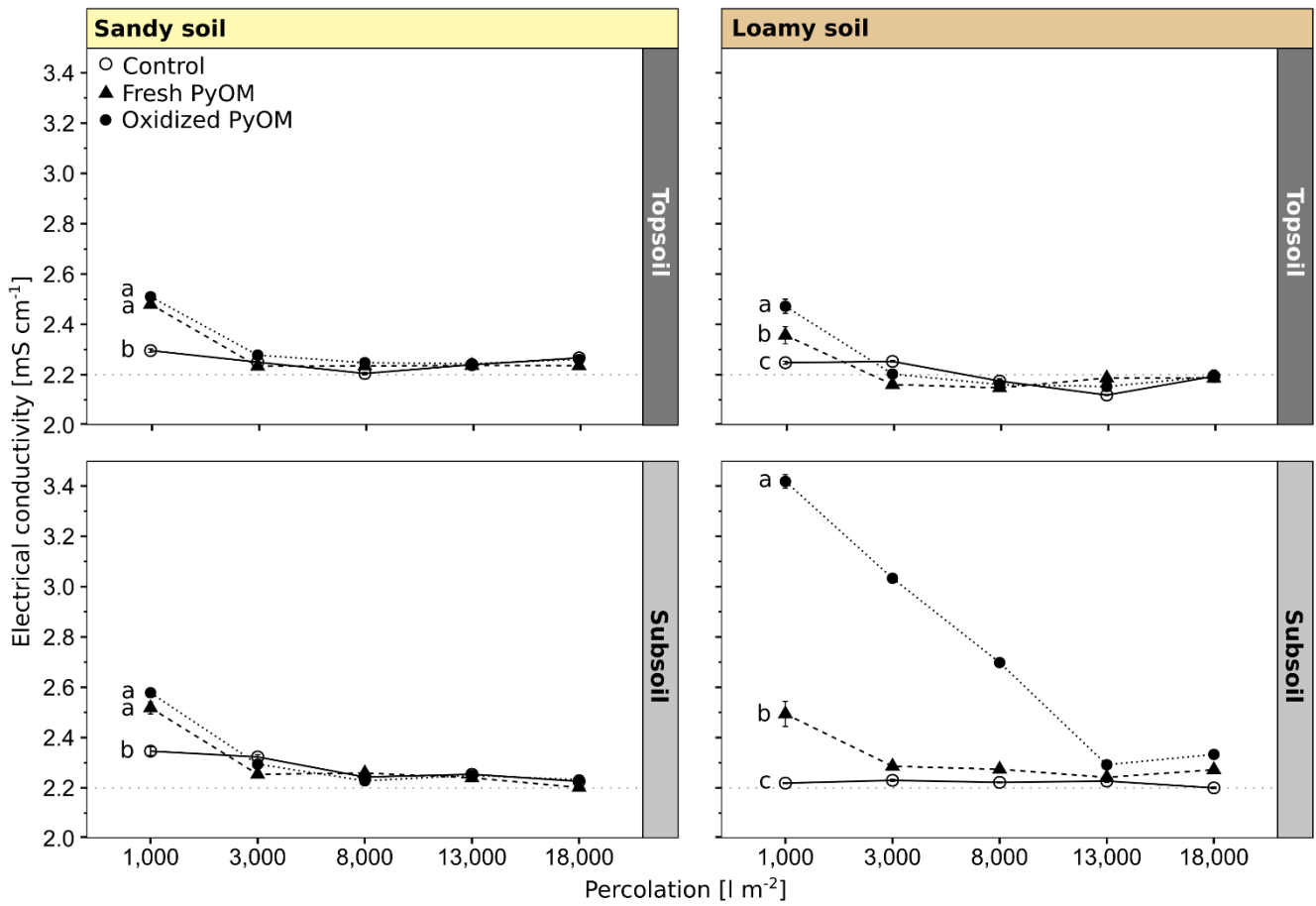


Figure S3: pH values of percolates from controls columns and columns with addition of fresh and oxidized PyOM percolated from topsoils and subsoils of the sandy and loamy soil ( $\pm 1$  SE). Significant differences in pH of the first flush ( $1,000\ l\ m^{-2}$ ) are shown by lettering ( $p < 0.05$ ). The grey dotted line shows the background value (pH=5.5) of the 0.01 M  $CaCl_2$  solution used for the percolation.





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Figure S4: EC values of percolates from controls columns and columns with addition of fresh and oxidized PyOM percolated from topsoils and subsoils of the sandy and loamy soil ( $\pm 1$  SE). Significant differences in EC of the first flush ( $1,000 \text{ l m}^{-2}$ ) are shown by lettering ( $p < 0.05$ ). The grey dotted line shows the background value ( $\text{EC} = 2.2 \text{ mS cm}^{-1}$ ) of the  $0.01 \text{ M CaCl}_2$  solution used for the percolation.

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