

# **Supplementary Materials of “How microplastics affect physical properties of silt loam soil under wetting–drying cycles?”**

## **Supplementary tables**

Table S1. Effects of microplastics with the same concentration and wet-dry cycles and different sizes on soil saturated hydraulic conductivity ( $K_s$ ). .....	2
Table S2. Van-Genuchten (V-G) model fitting parameters. ....	4
Table S3. Effects of microplastics with the same concentration and wet-dry cycles and different sizes on soil bulk density ( $\gamma_d$ ) and initial moisture content ( $\theta_i$ ).....	7
Table S4 RDA summary .....	9

1

**Table S1.** Effects of microplastics with the same concentration and wet-dry cycles and different sizes on soil saturated hydraulic conductivity ( $K_s$ ).

Wetting- drying cycles	Concentration(%)	Size (μm)	$K_s$	Wetting- drying cycles	Concentration(%)	Size (μm)	$K_s$ (cm/h)
T0	1	25	2.4568(0.3860)a	T3	1	25	0.4573(0.0462)a
		150	2.1019(0.0901)ab			150	0.2479(0.0097)b
		550	2.4204(0.1802)a			550	0.2165(0.0942)b
		1000	1.6985(0.2402)b			1000	0.2359(0.0667)b
	3	25	2.3203(0.5791)a		3	25	0.1645(0.0075)c
		150	2.0637(0.1081)a			150	0.3715(0.0150)ab
		550	2.2783(0.1039)a			550	0.4481(0.0097)a
		1000	2.5917(0.1864)a			1000	0.2946(0.0788)b
	5	25	1.5014(0.1930)c		5	25	0.3573(0.0220)b
		150	1.8835(0.1544)bc			150	1.8344(0.4324)a
		550	2.0617(0.0711)b			550	0.1908(0.0389)c
		1000	2.7674(0.1864)a			1000	0.1354(0.0113)c

Wetting- drying cycles	Concentration(%)	Size (μm)	$K_s$	Wetting- drying cycles	Concentration(%)	Size (μm)	$K_s$ (cm/h)
T1	1	25	2.3679(0.4663)a	T5	1	25	0.5332(0.0266)b
		150	1.8955(0.0865)a			150	0.2866(0.0150)c
		550	2.1266(0.3051)a			550	0.9660(0.0150)a
		1000	0.2716(0.0132)b			1000	0.2978(0.0893)c
	3	25	1.6496(0.2408)a		3	25	0.2667(0.0169)d
		150	1.5684(0.2527)a			150	0.3958(0.0193)b
		550	0.6772(0.4836)b			550	0.4795(0.0025)a
		1000	0.2745(0.0777)b			1000	0.3389(0.0289)c
	5	25	0.8469(0.0447)c		5	25	0.6677(0.0692)a
		150	0.5096(0.0450)c			150	0.5907(0.0884)a
		550	0.2200(0.0267)b			550	0.2912(0.0515)b
		1000	0.2406(0.0200)a			1000	0.1763(0.0434)b

2  $K_s$  represents soil saturated hydraulic conductivity. a b c d show the significant differences of adding microplastics of the different sizes. ( $P < 0.05$ )

**Table S2.** Van-Genuchten (V-G) model fitting parameters.

Size ( $\mu\text{m}$ )	Concentration (%)	Cycle	$\theta_s$ (%)	$\theta_r$ (%)	$\alpha$	$n$	RMSE
	)						
CK	0	T0	57.26%	13.35%	0.2106	1.6502	0.0055
		T1	40.91%	5.10%	0.0182	1.3262	0.0048
		T3	45.72%	8.44%	0.0361	1.0045	0.0054
		T5	42.63%	14.45%	0.0161	1.9611	0.0043
25	1%	T0	57.15%	10.64%	0.3307	1.4768	0.0035
		T1	51.69%	9.26%	0.2652	1.3637	0.0079
		T3	46.36%	16.71%	0.0529	1.7818	0.0044
		T5	44.13%	7.65%	0.0356	1.0943	0.0053
	3%	T0	53.85%	11.79%	0.4695	1.5938	0.0037
		T1	41.98%	15.04%	0.0379	1.1899	0.0045
		T3	44.80%	15.26%	0.0552	1.4428	0.0034
		T5	48.04%	12.73%	0.0838	1.3781	0.0049
	5%	T0	50.37%	9.24%	0.1243	1.5271	0.0049
		T1	42.21%	14.81%	0.0489	1.5291	0.0028
		T3	44.22%	15.84%	0.0769	2.3022	0.0065
		T5	45.32%	13.00%	0.0646	1.6280	0.0041
150	1%	T0	56.15%	9.02%	0.2393	1.5060	0.0026
		T1	43.10%	5.62%	0.0801	1.4494	0.0080
		T3	46.70%	2.10%	0.1249	1.8378	0.0054

Size ( $\mu\text{m}$ )	Concentration (%) )	Cycle	$\theta_s$ (%)	$\theta_t$ (%)	$\alpha$	$n$	RMSE
550	3%	T5	40.29%	19.92%	0.0125	1.6629	0.0038
		T0	52.59%	5.25%	0.1524	1.3883	0.0053
		T1	46.59%	13.33%	0.1730	1.5271	0.0085
		T3	44.88%	9.52%	0.1174	1.7729	0.0053
		T5	44.78%	15.70%	0.0716	1.6930	0.0070
	5%	T0	57.19%	9.84%	0.2595	1.5409	0.0037
		T1	39.77%	17.25%	0.0125	2.0841	0.0062
		T3	44.59%	12.97%	0.0725	1.6151	0.0042
		T5	45.64%	3.18%	0.0741	2.7015	0.0045
	1%	T0	55.29%	14.75%	0.1817	1.5015	0.0050
		T1	43.77%	13.30%	0.0399	1.0822	0.0036
		T3	44.60%	7.64%	0.0494	2.8877	0.0079
		T5	51.50%	20.00%	0.0789	1.5660	0.0032
	3%	T0	56.26%	13.22%	0.2859	1.6753	0.0028
		T1	39.49%	7.32%	0.0216	2.6378	0.0048
		T3	41.80%	10.48%	0.0157	1.6006	0.0047
		T5	47.72%	14.93%	0.1194	1.8540	0.0064
	5%	T0	56.01%	16.16%	0.1651	1.5496	0.0036
		T1	42.27%	10.07%	0.0392	1.2180	0.0033

Size (μm)	Concentration (%)		Cycle	$\theta_s$ (%)	$\theta_t$ (%)	$\alpha$	$n$	RMSE
	)							
1000	1		T3	44.58%	11.78%	0.0679	2.2339	0.0061
			T5	47.05%	16.58%	0.0804	1.9022	0.0048
			T0	56.64%	14.10%	0.3155	1.9080	0.0064
			T1	44.71%	8.50%	0.0491	1.2300	0.0063
			T3	42.94%	13.40%	0.0254	1.5143	0.0048
			T5	54.62%	11.61%	0.3017	1.3202	0.0072
	3		T0	55.64%	11.71%	0.1762	2.0001	0.0042
			T1	45.96%	8.59%	0.1216	1.6963	0.0087
			T3	46.84%	12.33%	0.0628	1.3724	0.0080
			T5	48.45%	17.77%	0.1001	1.4777	0.0062
	5		T0	54.61%	16.04%	0.0926	1.0002	0.0053
			T1	51.49%	12.37%	0.4276	1.5998	0.0085
			T3	41.00%	13.79%	0.0236	1.6559	0.0041
			T5	43.74%	16.15%	0.0329	2.0243	0.0055

**Table S3.** Effects of microplastics with the same concentration and wet-dry cycles and different sizes on soil bulk density ( $\gamma_d$ ) and initial moisture content ( $\theta_i$ ).

Wetting-drying cycles	Concentration (%)	Size( $\mu\text{m}$ )	$\gamma_d$ ( $\text{g}/\text{cm}^3$ )	$\theta_i$ (%)
T1	1	25	1.5233(0.0073)ab	0.2114(0.0068)a
		150	1.5020(0.0272)b	0.2066(0.0015)a
		550	1.4098(0.0054)c	0.2004(0.0124)a
		1000	1.5342(0.0058)a	0.2278(0.0082)a
	3	25	1.4707(0.0337)a	0.1841(0.0050)d
		150	1.4864(0.0435)a	0.2014(0.0038)c
		550	1.5224(0.0127)a	0.2311(0.0039)b
		1000	1.5001 (0.0111)a	0.2472(0.0059)a
	5	25	1.4019(0.0530)c	0.2203(0.0018)a
		150	1.5081(0.0004)a	0.1998(0.0040)a
		550	1.4571(0.0117)bc	0.2326(0.0030)a
		1000	1.4485(0.0021)b	0.2143(0.0124)a
T3	1	25	1.5870(0.0038)a	0.1775(0.0023)c
		150	1.6085(0.0078)a	0.2009(0.0032)b
		550	1.5282(0.0444)b	0.2168(0.0065)ab
		1000	1.5870(0.0038)a	0.2287(0.0112)a
	3	25	1.4752(0.0269)b	0.1466(0.0043)d
		150	1.5676(0.0512)a	0.2038(0.0013)c
		550	1.5750(0.0241)a	0.2223(0.0051)b
		1000	1.5363(0.0132)b	0.2336(0.0011)a
	5	25	1.4261(0.0214)b	0.1752(0.0114)b
		150	1.5611(0.0372)a	0.1561(0.0017)b
		550	1.4233(0.0290)b	0.2097(0.0091)a
		1000	1.4559(0.0049)b	0.2132(0.0016)a
	1	25	1.3542(0.0092)c	0.1464(0.0018)c
		150	1.5535(0.0346)a	0.1839(0.0002)b
		550	1.4373(0.0134)b	0.1911(0.0063)ab
		1000	1.4047(0.0029)b	0.1689(0.0221)a

T5	3	25	1.4209(0.0013)b	0.1407(0.0023)b
		150	1.5858(0.0378)a	0.1919(0.0023)a
		550	1.4238(0.0156)b	0.1751(0.0177)a
		1000	1.4132(0.0248)b	0.1989(0.0061)a
	5	25	1.4065(0.0128)b	0.1699(0.0033)b
		150	1.4760(0.0183)a	0.1576(0.0032)c
		550	1.4116(0.0166)b	0.1460(0.0085)bc
		1000	1.4995(0.0389)a	0.2154(0.0088)a

$\gamma_d$  represents soil bulk density;  $\theta_i$  represents initial water content; a, b, c, and d show the significant differences of adding microplastics of the different sizes. ( $P < 0.05$ ).



**Table S4** RDA summary

Statistic	Axis 1	Axis 2	Axis 3	Axis 4
Eigenvalues	0.2742	0.0227	0.0103	0.3521
Explained variation (cumulative)	27.42	29.86	30.71	65.92
Pseudo- canonical correlation	0.729	0.3391	0.3336	0
Explained fitted variation (cumulative)	89.27	94.64	100	
Permutation Test Results:				
On All Axes				
pseudo-F=6.7, P=0.002				