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Impact of urban soil surface treatments on soil water and thermal regimes in Haplic Chernozem

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Electronic Supplementary Material (ESM)

The authors are fully responsible for both the content and the formal aspects of the electronic supplementary material. No editorial adjustments were made.

Table S1. Properties of two soil horizons of the Haplic Chernozem on loess and properties of bark chips when measuring thermal properties: soil texture, organic matter content, soil particle density (ρ_s), soil bulk density (ρ_d), and porosity (P) of tested soil columns (Kodešová et al. 2013)

Depth (cm)	Sand	Silt	Clay	Organic matter	ρ_s	ρ_d	P	Textural class
	(%)				(g/cm^3)			
0–35	24.4	56.3	19.3	3.47	2.52	1.31	0.480	silty loam
35–90	23.7	51.8	24.5	0.76	2.53	1.37	0.459	silty loam
Bark chips	–	–	–	100	1.66	0.23	0.861	–

Table S2. Parameters of the van Genuchten soil hydraulic functions θ_r, θ_s, α, n, l, and K_s (m = 1–1/n) in Equations (1) describing relationships between soil water content, θ (cm^3/cm^3), pressure head, h (cm), and hydraulic conductivity, K (cm/h)

Depth (cm)	θ_r	θ_s	α	n	l	K_s
	(cm^3/cm^3)		(1/cm)	(–)		(cm/h)
0–35	0.227	0.486	0.095	1.38	0.5	16.3
35–90	0.178	0.464	0.057	1.45	0.5	9.81

$$\theta_e = \frac{\theta(h)-\theta_r}{\theta_s-\theta_r}, \quad \theta_e = \frac{1}{\left(1+\left(\alpha|h|\right)^n\right)^m} \text{ for } h < 0,\ \theta_e = 1 \text{ for } h \geq 0 \qquad (1)$$

$$K(\theta) = K_s\theta_e^l\left[1-\left(1-\theta_e^{1/m}\right)^m\right]^2 \text{ for } h < 0,\ K(\theta) = K_s \text{ for } h \geq 0$$

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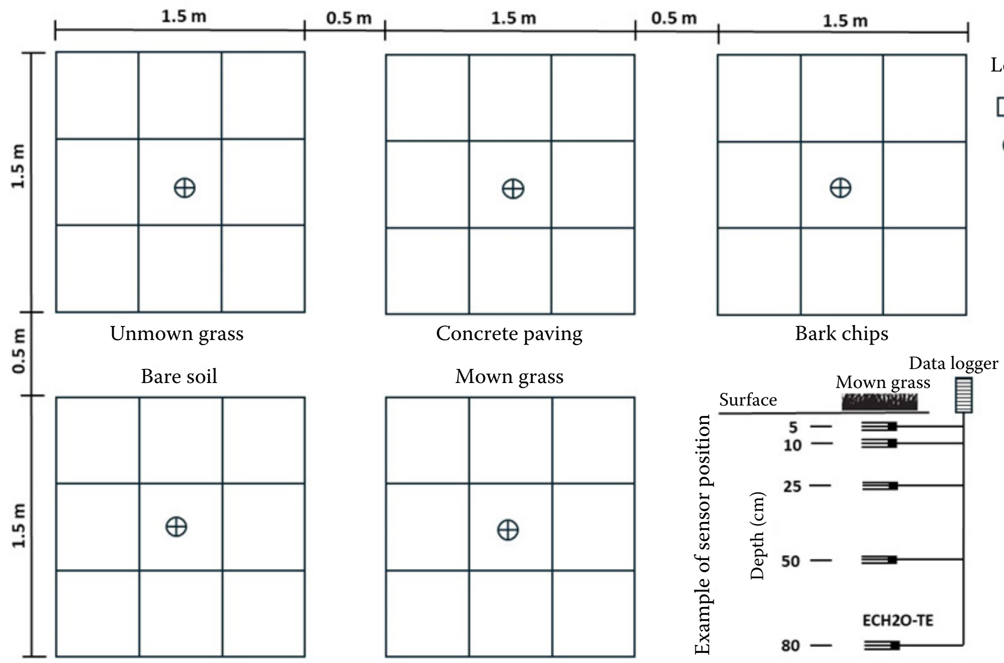
Table S3. Parameters b_1, b_2, and b_3 in Equation (2) describing relationships between soil water content, θ (cm^3/cm^3), and heat conductivity, λ (W/m/K), and parameters *a* and *b* in Equation (3) describing relationships between soil water content, θ (cm^3/cm^3), and heat capacity, *C* ($MJ/m^3/K$) (Kodešová et al. 2013)

Depth (cm)	b_1	b_2	b_3	a	b
		(W/m/K)		($MJ/m^3/K$)	
0–35	0.184	2.42	0.248	1.09	4.92
35–90	0.193	2.19	0.618	1.14	4.93
Bark chips	0.096	0.74	–0.140	0.41	4.27

$$\lambda(\theta) = b_1 + b_2\theta + b_3\theta^{0.5} \quad (2) \qquad C(\theta) = a + b\theta \quad (3)$$

(A)



(B)

Figure S1. (A) The experimental design (Thet et al. 2024), (B) detailed photos of individual surfaces (Thet et al. 2024)

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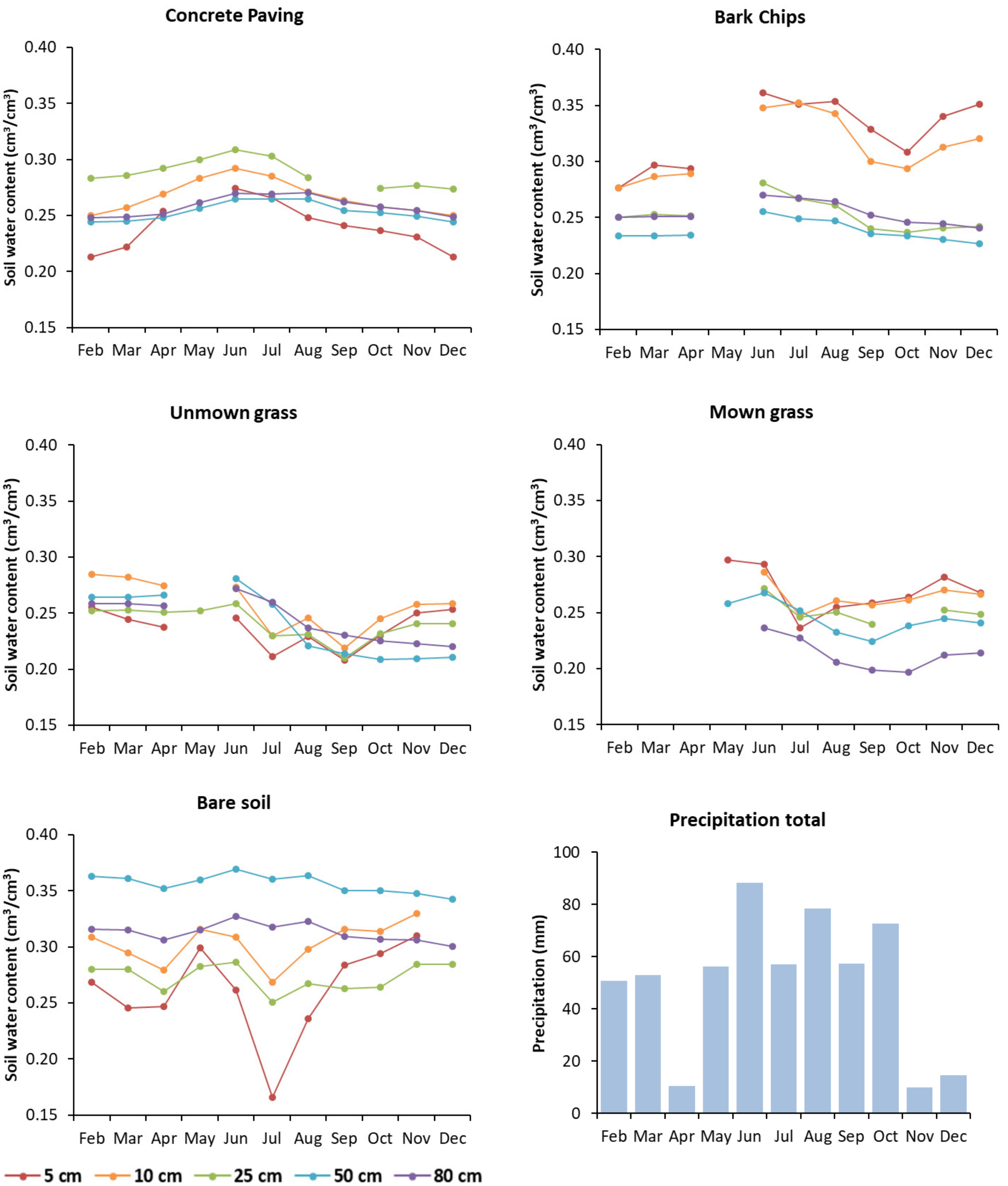

Figure S2. Average monthly soil water contents under each soil cover at different depths and monthly precipitation totals

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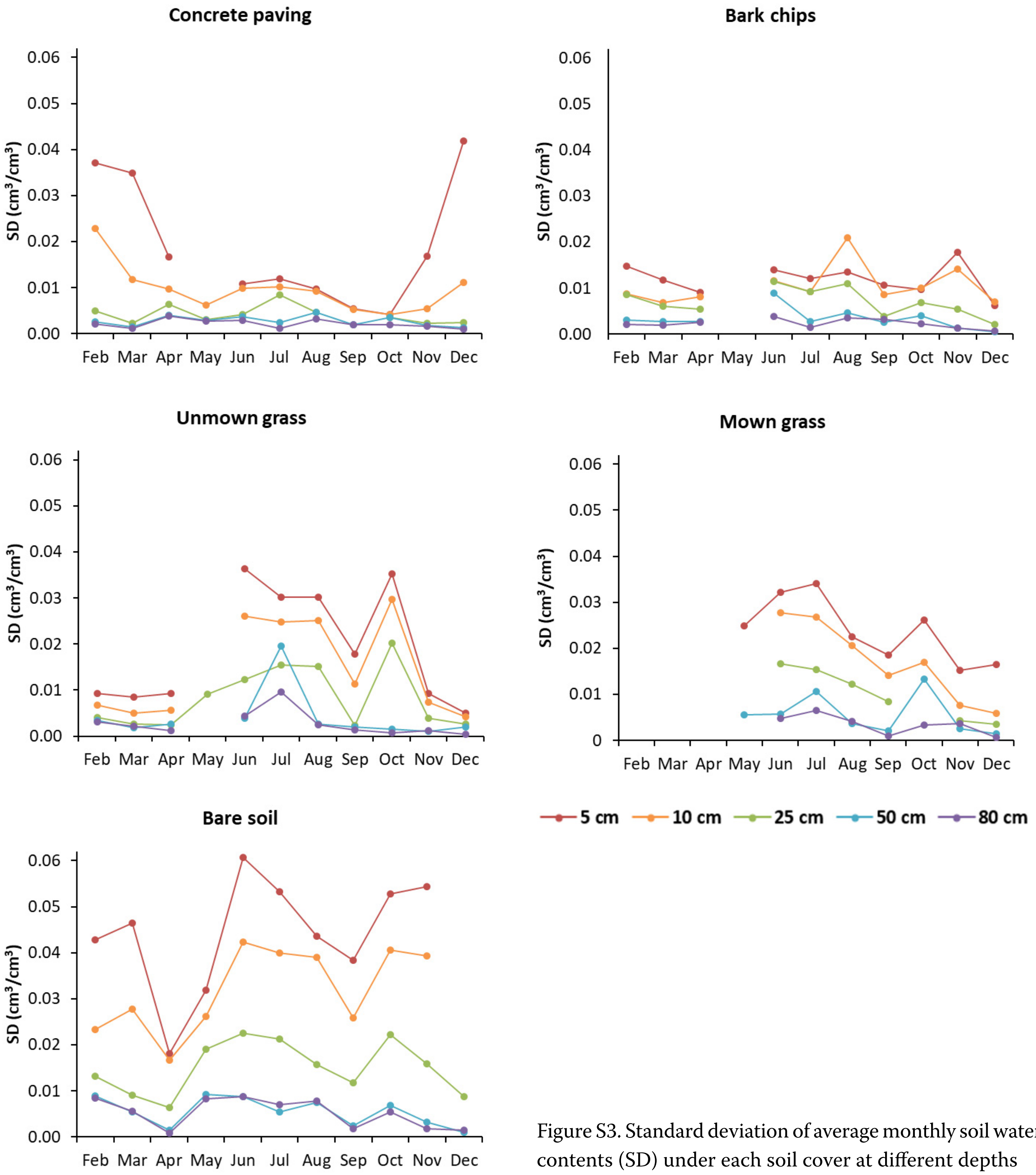

Figure S3. Standard deviation of average monthly soil water contents (SD) under each soil cover at different depths

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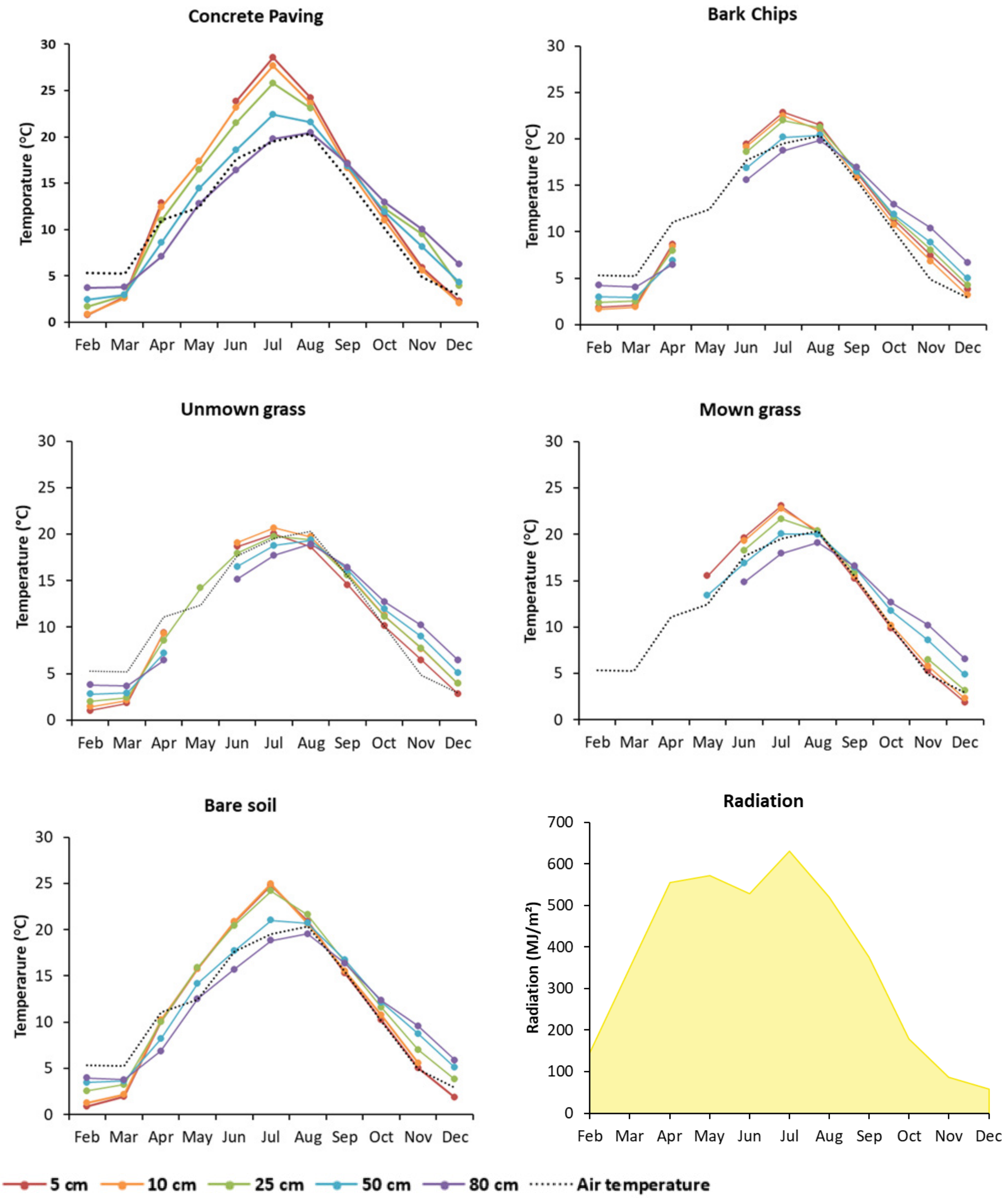

Figure S4. Average monthly soil temperatures under each soil covers at different depths, average monthly air temperatures and monthly solar radiation totals

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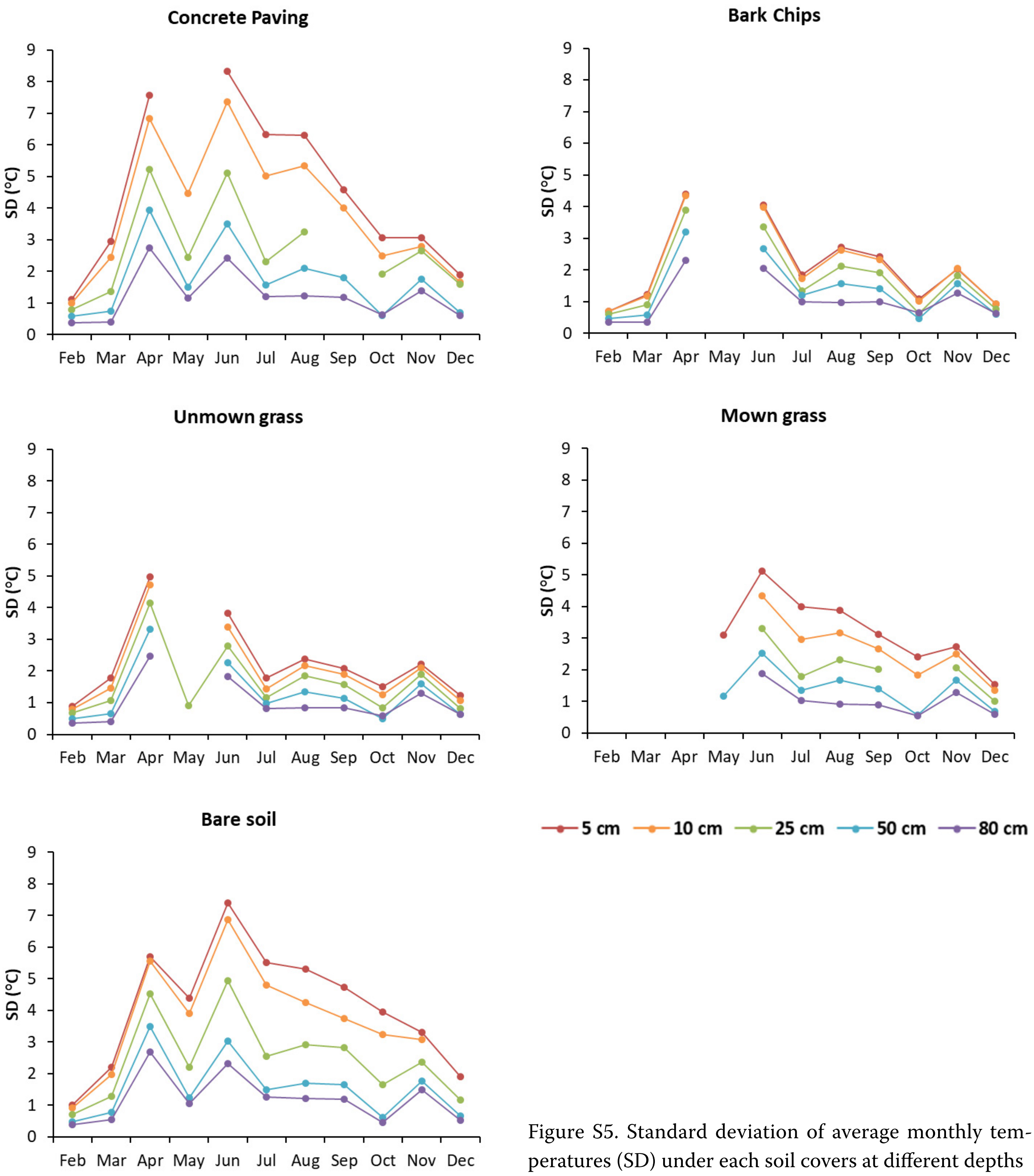

Figure S5. Standard deviation of average monthly temperatures (SD) under each soil covers at different depths

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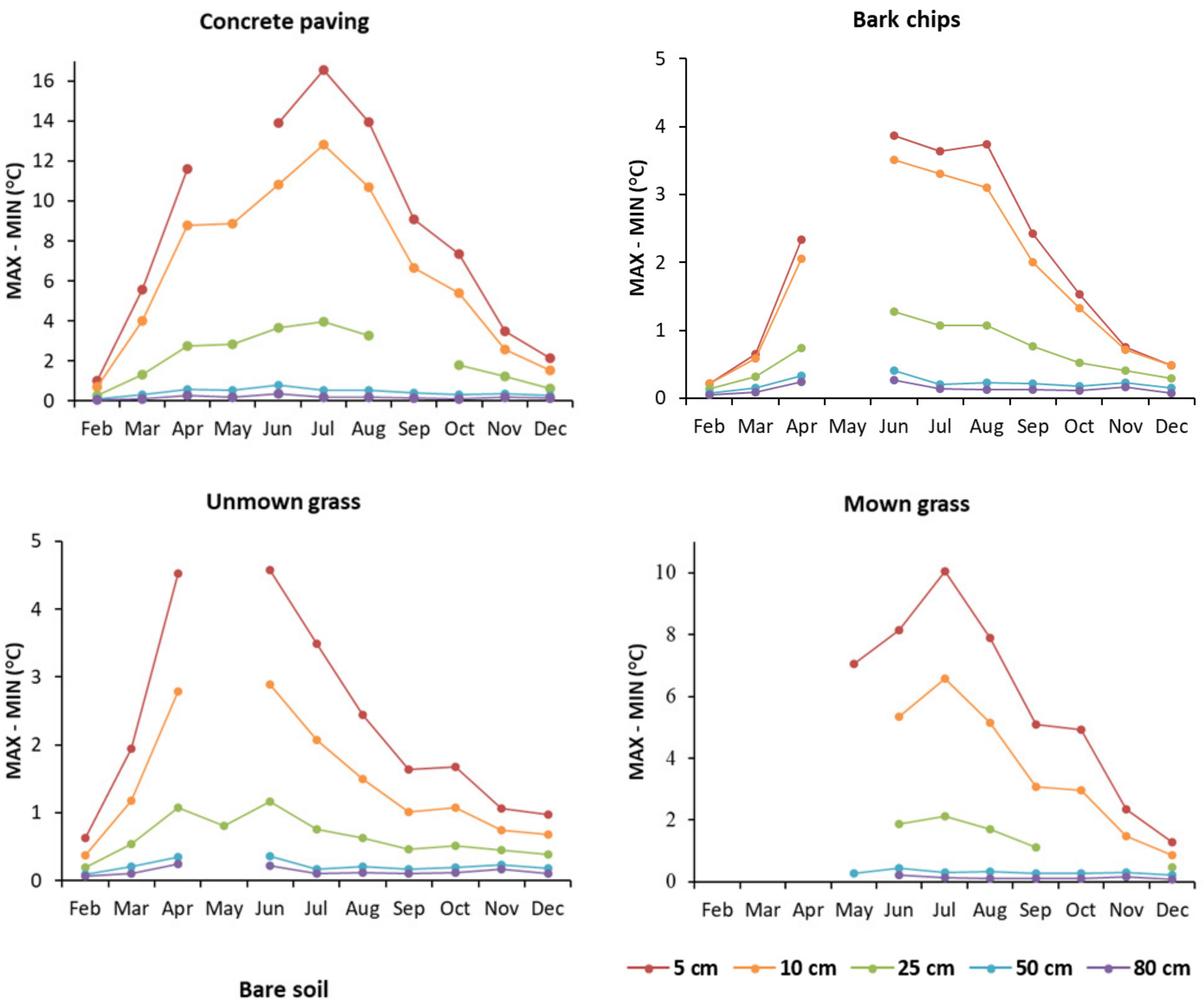

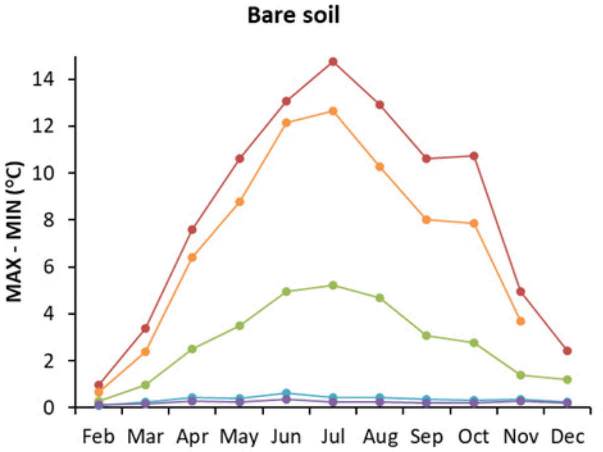

Figure S6. Average differences between daily maximum and minimum soil temperatures under each soil cover at different depths

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