Supplemental Table 1. Fast decomposing carbon pool size (C_F) (mgC per gram of initial C, mgC $gC_{initial}^{-1}$), decay rates (day^{-1}) for the fast (k_F) and slow (k_S) decomposing carbon fractions, and total C respired (C_R, mgC $gC_{initial}^{-1}$) at different depths and two incubation temperatures (15ºC & 25ºC) for soils from a field warmed tundra at 365 days of incubation.

Treatment	Depth(cm)	C_F (mgC $g_{Cinitial}^{-1}$)		k_F x 10^{-2} (day^{-1})		k_S x 10^{-4} (day^{-1})		C_R at 365 DOI	
		15ºC	25ºC	15ºC	25ºC	15ºC	25ºC	15ºC	25ºC
Control	0-15	41.42 ± 6.92	50.51 ± 4.19	4.10 ± 0.59	4.31 ± 1.47	3.48 ± 0.71	6.58 ± 1.03	152.22 ± 22.93	247.76 ± 34.21
	15-25	7.99 ± 3.51	22.70 ± 7.77	4.09 ± 0.79	1.79 ± 0.56	1.15 ± 0.10	2.04 ± 0.17	47.62 ± 6.01	91.17 ± 3.73
	45-55	4.17 ± 1.25	5.80 ± 2.46	3.27 ± 0.65	3.58 ± 1.53	0.52 ± 0.10	1.18 ± 0.19	22.58 ± 3.17	47.51 ± 7.07
Field Warming	0-15	32.99 ± 7.58	43.16 ± 5.85	6.42 ± 0.78	3.17 ± 0.48	3.38 ± 1.19	5.83 ± 1.26	122.33 ± 21.45	217.44 ± 38.43
	15-25	4.51 ± 1.75	18.27 ± 7.76	4.73 ± 1.08	2.23 ± 0.67	0.83 ± 0.14	1.97 ± 0.47	33.52 ± 6.70	84.34 ± 18.44
	45-55	2.76 ± 0.62	10.94 ± 4.30	2.66 ± 0.88	2.38 ± 1.09	0.54 ± 0.10	1.25 ± 0.13	20.50 ± 2.59	53.74 ± 4.87

DOI= Days of incubation.

Supplemental Table 2. Short term Q_{10} ($Q_{10\text{-}ST}$) at different depths, two incubation temperatures (15°C & 25°C) and different time of incubation (DOI), and equal C Q_{10} ($Q_{10\text{-}EC}$) for fast (C_F) and slow(C_S) decomposing C pools for soils from a field warmed tundra, Alaska.

Treatment	Depth(cm)	$Q_{10\text{-}ST}$ 14 DOI		$Q_{10\text{-}ST}$ 100 DOI		$Q_{10\text{-}ST}$ 280 DOI		$Q_{10\text{-}EC}(C_F)$	$Q_{10\text{-}EC}(C_S)$
		15ºC	25ºC	15ºC	25ºC	15ºC	25ºC		
Control	0-15	2.66 ± 0.26	2.31 ± 0.23	2.63 ± 0.20	2.30 ± 0.06	2.39 ± 0.15	2.54 ± 0.12	1.38 ± 0.54	1.97 ± 0.21
	15-25	2.52 ± 0.13	2.97 ± 0.19	2.51 ± 0.18	2.75 ± 0.13	2.52 ± 0.08	2.20 ± 0.07	NE	1.85 ± 0.27
	45-55	2.36 ± 0.13	2.43 ± 0.26	3.15 ± 0.45	3.38 ± 0.38	2.80 ± 0.26	2.40 ± 0.28	NE	2.33 ± 0.35
Field Warming	0-15	3.13 ± 0.24	2.54± 0.19	2.45 ± 0.12	2.60 ± 0.10	2.52 ± 0.07	2.53 ± 0.11	0.95 ± 0.23	2.13 ± 0.28
	15-25	3.10 ± 0.35	2.55 ± 0.31	2.22 ± 0.14	2.74 ± 0.18	2.85 ± 0.15	2.43 ± 0.16	NE	2.32 ± 0.20
	45-55	2.34 ± 0.07	2.44 ± 0.28	2.09 ± 0.10	2.15 ± 0.10	2.36 ± 0.13	2.16 ± 0.10	NE	2.54 ± 0.24

Supplemental Table 3. Indices of alpha diversities based on GeoChip carbon degradation gene probe signal intensities for Alaskan tundra soils incubated at 15°C and 25°C for 365 days.

Field Trmt	Depth (cm)	DOI	Temp (°C)	Shannon Index	Simpson Index	Pielou evenness	Simpson evenness
C	0- 15	14	15/ 25	**9.74/ 9.34**	**16326/ 11415**	**0.9961/ 0.9971**	**0.9221/ 0.9430**
C	15- 25	14	15/ 25	**9.64/ 9.47**	**14922/ 12599**	**0.9965/ 0.9972**	**0.9298/ 0.9457**
C	45- 55	14	15/ 25	**9.59/ 9.28**	**14002/ 10757**	**0.9965/ 0.9971**	**0.9291/ 0.9434**
W	0- 15	14	15/ 25	**9.73/ 9.45**	**16062/ 12396**	**0.9963/ 0.9972**	**0.9252/ 0.9461**
W	15- 25	14	15/ 25	**9.71/ 9.02**	**15982/ 8136**	**0.9972/ 0.9967**	**0.9331/ 0.9521**
W	45- 55	14	15/ 25	**9.53/ 9.30**	**13359/ 10877**	**0.9967/ 0.9974**	**0.9352/ 0.9490**
C	0- 15	90	15/ 25	9.75/ 9.66	16489/ 15356	**0.9962/ 0.9968**	**0.9234/ 0.9356**
C	15- 25	90	15/ 25	9.68/ 9.63	15404/ 14832	**0.9967/ 0.9972**	**0.9335/ 0.9442**
C	45- 55	90	15/ 25	9.57/ 9.62	13816/ 14741	**0.9967/ 0.9971**	**0.9350/ 0.9422**
W	0- 15	90	15/ 25	9.68/ 9.62	15524/ 14669	**0.9965/ 0.9970**	**0.9307/ 0.9397**
W	15- 25	90	15/ 25	**9.70/ 9.44**	**15739/12216**	**0.9963/ 0.9972**	**0.9295/ 0.9416**
W	45- 55	90	15/ 25	**9.73/ 9.52**	**16115/ 13288**	**0.9921/ 0.9861**	**0.9272/ 0.9438**
C	0- 15	288	15/ 25	9.71/ 9.76	15899/16690	0.9964/ 0.9963	0.9274/ 0.9267
C	15- 25	288	15/ 25	9.71/ 9.67	15839/ 15562	0.9963/ 0.9967	0.9257/ 0.9345
C	45- 55	288	15/ 25	9.63/ 9.58	14651/ 14079	**0.9963/ 0.9970**	**0.9264/ 0.9398**
W	0- 15	288	15/ 25	**9.68/ 9.80**	**15434/ 17389**	0.9963/ 0.9963	0.9264/ 0.9259
W	15- 25	288	15/ 25	9.75/ 9.68	16351/ 15463	0.9960/ 0.9964	0.9213/ 0.9291
W	45- 55	288	15/ 25	9.52/ 9.55	13189/ 15382	0.9966/ 0.9967	0.9323/ 0.9359

Field Trmt= Field Treatment, C = Control, W field warming.
DOI= Day of incubation
Temp= Temperature of incubation
Bold values represent statistically significant differences between 15°C and 25°C incubations based on Mann-Whitney-Wilcoxon tests ($p<0.05$)

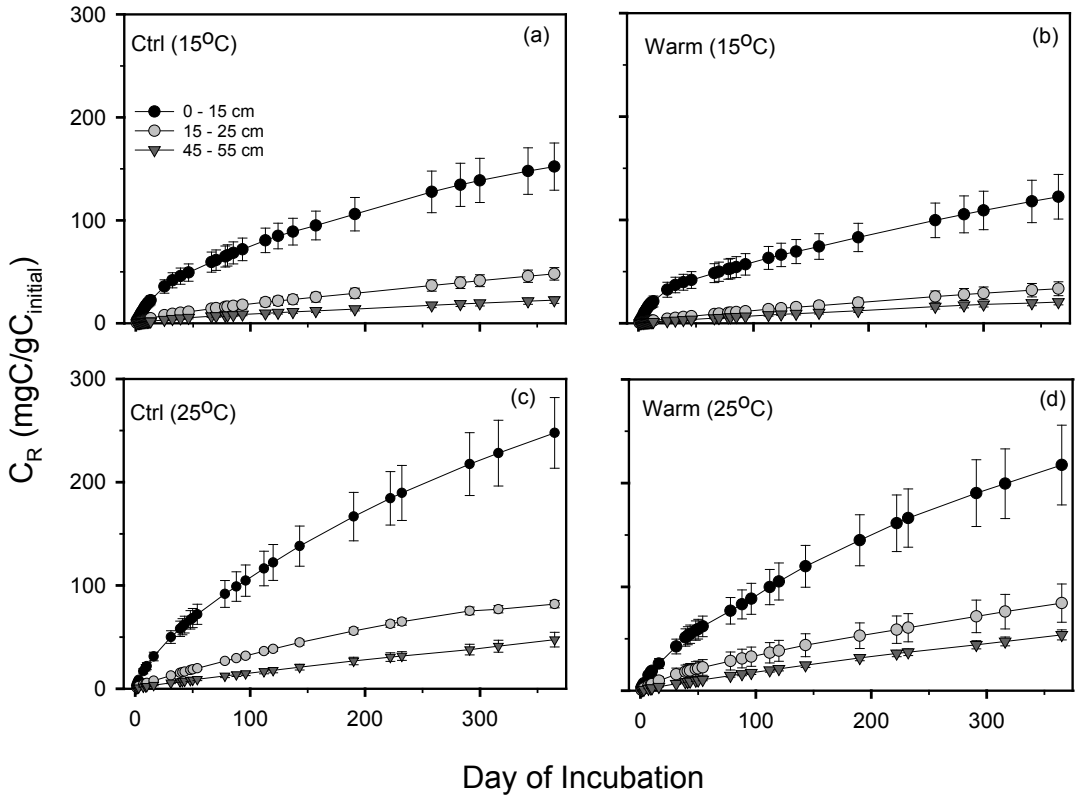
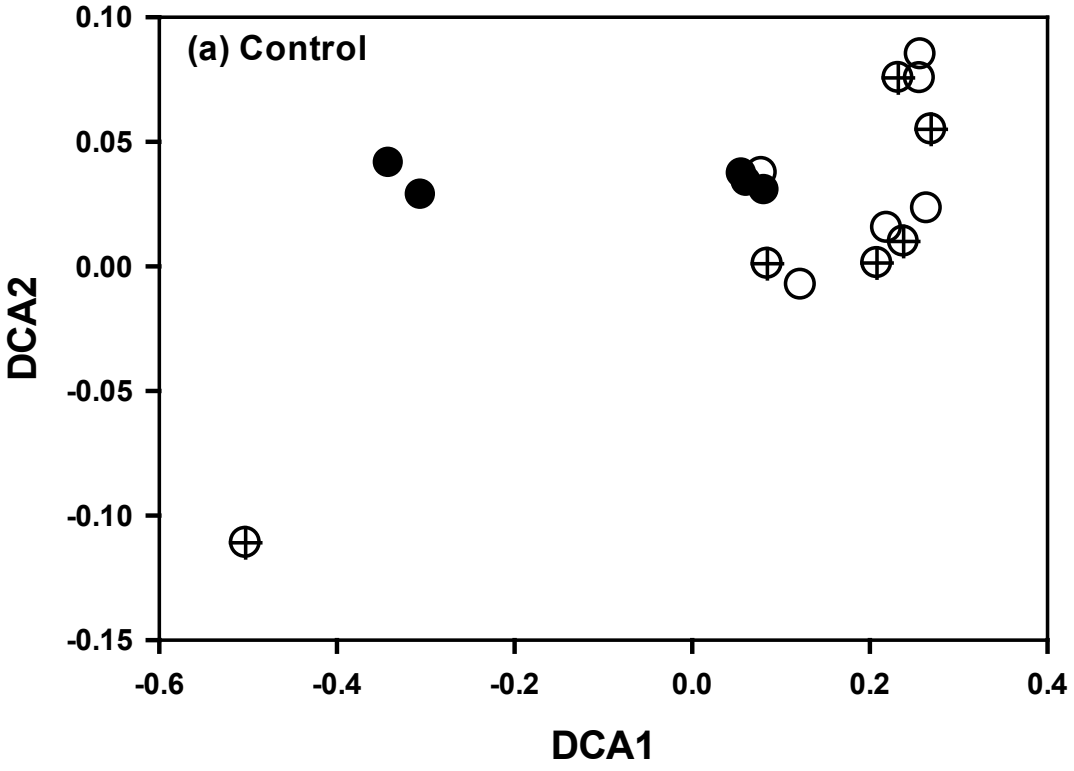

Ctrl (15°C)
(a)
0 - 15 cm
15 - 25 cm
45 - 55 cm
Warm (15°C)
(b)
Ctrl (25°C)
(c)
Warm (25°C)
(d)
C_R (mgC/gC_initial)
Day of Incubation
0
100
200
300

Figure S1.


(a) Control
0.10
0.05
0.00
-0.05
-0.10
-0.15
DCA2
-0.6
-0.4
-0.2
0.0
0.2
0.4
DCA1

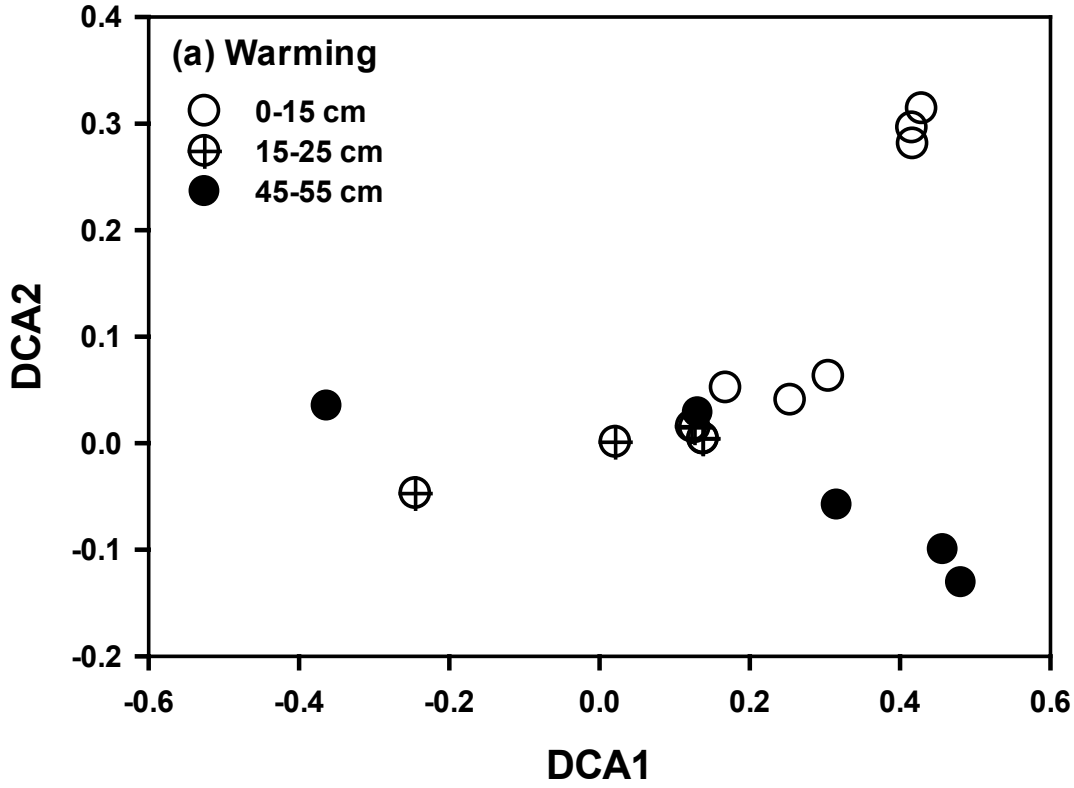

(a) Warming
0-15 cm
15-25 cm
45-55 cm
0.4
0.3
0.2
0.1
0.0
-0.1
-0.2
DCA2
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6
DCA1

Figure S2.

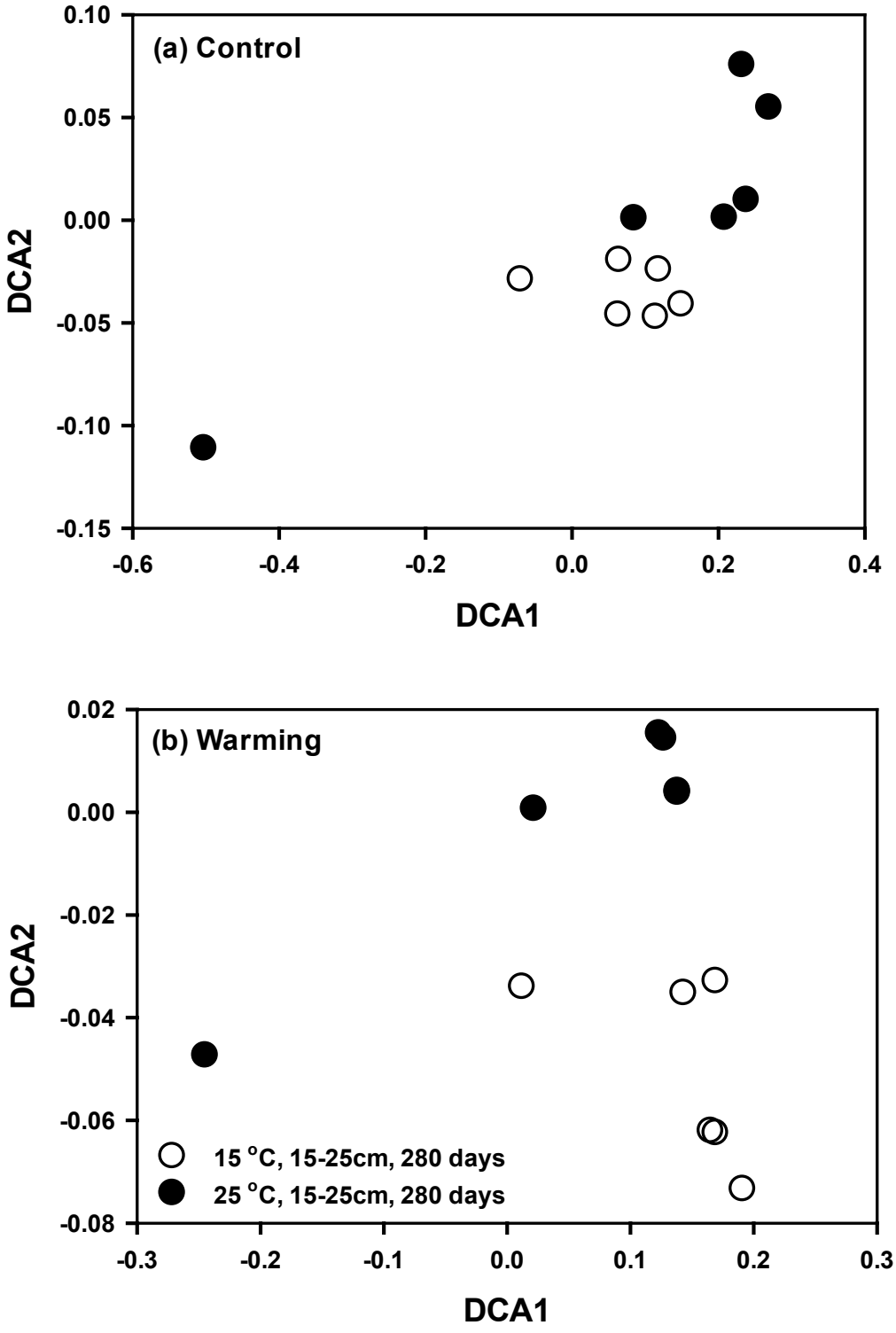

(a) Control
0.10
0.05
0.00
-0.05
-0.10
-0.15
DCA2
-0.6
-0.4
-0.2
0.0
0.2
0.4
DCA1
(b) Warming
0.02
0.00
-0.02
-0.04
-0.06
-0.08
DCA2
15 °C, 15-25cm, 280 days
25 °C, 15-25cm, 280 days
-0.3
-0.2
-0.1
0.0
0.1
0.2
0.3
DCA1

Figure S3.

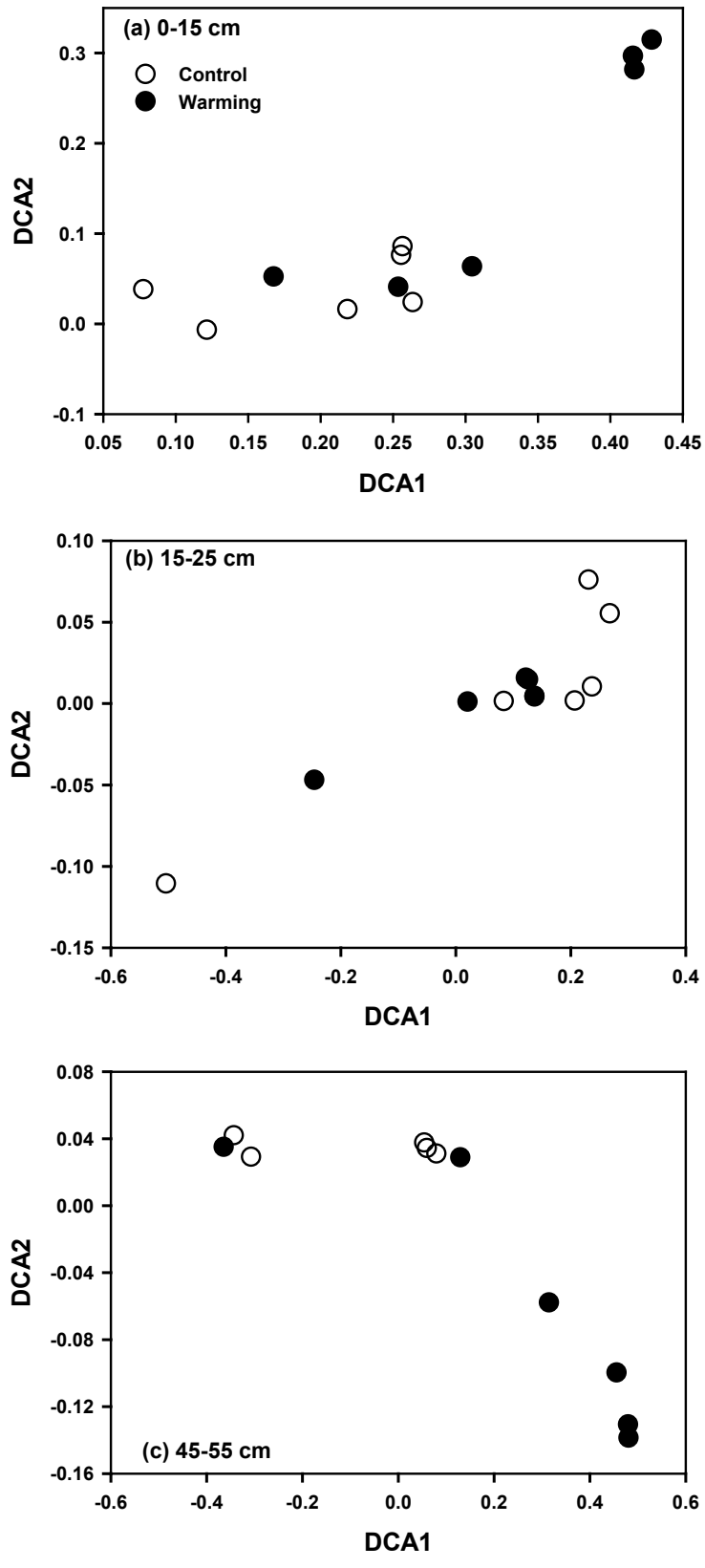

(a) 0-15 cm
Control
Warming
DCA2
DCA1
0.3
0.2
0.1
0.0
-0.1
0.05
0.10
0.15
0.20
0.25
0.30
0.35
0.40
0.45
(b) 15-25 cm
DCA2
DCA1
0.10
0.05
0.00
-0.05
-0.10
-0.15
-0.6
-0.4
-0.2
0.0
0.2
0.4
(c) 45-55 cm
DCA2
DCA1
0.08
0.04
0.00
-0.04
-0.08
-0.12
-0.16
-0.6
-0.4
-0.2
0.0
0.2
0.4
0.6

Figure S4.