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Radiocarbon measurements of ecosystem respiration and soil pore-space CO₂ in Utqiagvik (Barrow), Alaska

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Table S1. Flux rate and radiocarbon abundance of soil surface CO₂ emissions with associated thaw depth and temperature measurements

Profile	Date	Thaw depth (cm)	Air temp °C	5cm soil temp* °C	10cm soil temp* °C	CO ₂ flux** (μmol m ⁻² d ⁻¹)	¹⁴ C Analysis year	¹⁴ C sample size (mg C)	F ¹⁴ C	Δ ¹⁴ C _{CO₂} *** (‰)
HC1-center	8/9/12	31	--	5.9 ± 0.0	4.3 ± 0.0	--	2013	0.23	1.0298	-58.4 ± 6.1
	9/2/14	32	4.6	4.3 ± 0.6	3.3 ± 0.5	0.547 ± 0.0047	2016	0.33	0.8916	-115.5 ± 10.2
HC1-rim	10/6/12	--	-1.0	1.4	1.6	--	2013	0.81	1.0298	22.0 ± 4.1
HC1-trough	8/8/12	--	--	--	--	--	2017	0.68	1.0420	33.6 ± 3.5
	8/11/12	32	--	6.3 ± 0.6	4.6 ± 0.2	--	2017	0.41	1.0501	41.6 ± 4.1
	10/6/12	--	-1.0	1.4	1.5	--	2013	0.73	0.9936	-14.0 ± 3.2
	9/6/13	36	0.5	0.85 ± 0.07	0.85 ± 0.16 (n=3)	1.53 ± 0.016	2013	0.82	1.0271	19.3 ± 3.6
HC2-center	9/7/14	23	4.0	3.4 ± 0.1	2.3 ± 0.	0.425 ± 0.0038	2016	0.66	0.9775	-31.3 ± 5.0
HC3-center	8/13/12	29	9.7	11.7 ± 1.1 (n=4)	9.8 ± 1.6 (n=4)	--	2013	0.17	1.0408	32.9 ± 5.2
	9/7/14	31	4.0	2.8 ± 0.2	2.4 ± 0.4	0.408 ± 0.0043	2017	0.23	0.9991	-9.0 ± 1.9
HC3-trough	7/12/13	--	10	--	--	1.65 ± 0.0070	2013	0.24	1.0520	44.0 ± 6.0
	9/6/13	32	4.0	--	3.1 ± 0.2 (n=3)	0.489 ± 0.0033	2013	0.98	1.0211	13.3 ± 3.7
FC1-center	9/2/14	37	5.3	4.3 ± 1.5	2.9 ± 0.1	0.572 ± 0.0066	2016	0.57	1.0044	-3.6 ± 2.9
FC2-rim	8/12/12	29	--	4.7 ± 0.4	3.9 ± 0.2	--	2017	0.60	1.0343	25.9 ± 2.5
	10/6/12	--	-1.0	--	--	--	2013	0.42	1.0375	29.7 ± 3.3
FC2-trough	8/11/12	27	--	3.7 ± 0.5	2.8 ± 0.2	--	2017	0.74	1.0428	34.3 ± 3.4
	7/14/13	25	9.8	3.3 ± 0.1 (n=3)	2.3 ± 0.2 (n=3)	2.47 ± 0.011	2013	1.10	1.0372	29.3 ± 3.7
	9/6/13	30	3.2	2.1 ± 1.6 (n=3)	1.5 ± 0.4 (n=3)	1.50 ± 0.0076	2013	0.76	1.0171	9.4 ± 3.6
FC3-center	9/2/14	44	4.5	3.5 ± 0.2	2.8 ± 0.1	0.464 ± 0.0043	2016	0.80	1.0173	9.2 ± 3.6
FC4-center	9/7/14	34	2.0	2.4 ± 0.8	1.8 ± 0.7	0.312 ± 0.0032	2016	0.74	1.0418	33.5 ± 4.1
FC4-trough	9/5/13	36	5.2	--	4.4 ± 0.6 (n=3)	0.471 ± 0.0029	2013	0.93	1.0163	8.6 ± 3.9
LC1-center	8/10/12	31	--	5.7 ± 0.07	4.3 ± 0.07	--	2017	0.48	1.0317	23.3 ± 2.5
	10/6/12	--	-1.0	1.9	1.9	--	2013	0.26	0.8470	-159.5 ± 13.1
	9/7/13	34	3.2	--	2.1 ± 0.2 (n=3)	0.825 ± 0.0092	2013	0.61	1.0026	-5.0 ± 4.4
LC1-rim	10/6/12	--	-1.0	1.8	1.9	--	2013	0.18	1.0663	58.2 ± 7.3
LC1-trough	8/10/12	33	--	5.5 ± 2.3	4.1 ± 1.5	--	2017	1.08	1.0464	40.0 ± 3.7
	10/6/12	--	-1.0	1.9	2.1	--	2013	0.31	1.0339	26.1 ± 6.5
	9/7/13	41	3.2	--	2.7 ± 0.3 (n=3)	0.320 ± 0.0033	2013	0.45	1.0389	31.0 ± 4.6
LC2-center	9/2/14	29	4.8	5.2 ± 0.1	4.3 ± 0.1	0.372 ± 0.0032	2016	0.47	1.0221	14.0 ± 3.8

(table continues)

Profile	Date	Thaw depth (cm)	Air temp °C	5cm soil temp* °C	10cm soil temp* °C	CO ₂ flux** ($\mu\text{mol m}^{-2} \text{d}^{-1}$)	¹⁴ C Analysis year	¹⁴ C sample size (mg C)	F ¹⁴ C	$\Delta^{14}\text{C}_{\text{CO}_2}$ *** (‰)
LC3-center	10/6/12	--	-1.0	1.7 ± 0.2	1.6 ± 0.07	--	2013	0.36	1.0304	22.5 ± 3.4
	7/12/13	23	8.2	12.9 ± 0.04	8.8 ± 0.2	0.607 ± 0.0032	2013	0.88	1.0336	25.8 ± 3.6
	9/7/13	33	2.0	--	2.5 ± 0.02 (n=3)	1.12 ± 0.019	2013	0.31	1.0386	30.7 ± 4.2
	9/2/14	27	5.0	5.1 ± 0.1	4.3 ± 0.0	0.521 ± 0.0023	2016	0.69	1.0167	8.6 ± 3.7
LC3-trough	10/6/12	--	-1.0	--	--	--	2013	0.18	1.0686	60.5 ± 9.8
	7/12/13	31	8.2	10.5 ± 0.4	6.6 ± 0.08	0.674 ± 0.0021	2013	1.00	1.0445	36.5 ± 4.1
	9/7/13	37	2.0	--	2.3 ± 0.2 (n=3)	1.31 ± 0.0046	2013	0.52	1.0686	27.3 ± 4.1
LC4-center	9/7/14	28	3.1	7.1 ± 0.3	6.1 ± 0.9	0.463 ± 0.0029	2016	0.88	1.0031	-4.9 ± 3.8

Note: -- indicates measurements for which data are unavailable.

*Error ranges represent standard deviations across measurements with n=2 unless otherwise noted. When only one measurement was made, no error range is reported.

**Error ranges represent standard error of the regression used to calculate CO₂ flux.

***Values have been corrected to exclude atmospheric CO₂ using a 2-pool isotopic mixing model. Error ranges represent standard errors from the 2-pool mixing model, derived from analytical error and standard deviations in the source isotopic compositions.

Table S2. Radiocarbon abundance of bulk soil samples collected on September 8, 2014

Profile	Soil depth cm	Carbon content %	$\Delta^{14}\text{C}_{\text{SOC}}$ * ‰
HC1-center	0 – 11.25	7.25	-169.7 ± 1.3
	11.25 – 22.5	7.25	-575.5 ± 0.7
HC2-center	0 – 11	41.02	-70.2 ± 1.3
	11 – 22	28.96	-359.3 ± 1.0
HC3-center	0 – 11.25	30.97	-149.6 ± 1.4
	11.25 – 22.5	25.56	-432.7 ± 0.9
FC1-center	0 – 11.5	12.61	-57.0 ± 1.3
	11.5 – 23	1.06	-416.2 ± 0.9
FC3-center	0 – 8	12.42	-94.4 ± 1.3
	8 – 16	3.45	-375.1 ± 1.1
FC4-center	0 – 15.5	23.99	-49.7 ± 1.4
	15.5 – 31	8.43	-349.6 ± 0.9
LC2-center	0 – 10	35.48	45.5 ± 1.4
	10 – 44	36.97	-86.0 ± 1.2
LC3-center	0 – 9.5	36.96	-39.9 ± 1.4
	9.5 – 41	44.73	55.4 ± 1.4
LC4-center	0 – 15	39.3	--
	15 - 41	41.48	-38.3 ± 1.3

*Values have been corrected for losses as respired CO₂ during the 387-day incubation.