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Supporting Information for:

Impacts of Drying and Rewetting on the Radiocarbon Signature of Respired CO_2 and Implications for Incubating Archived Soils

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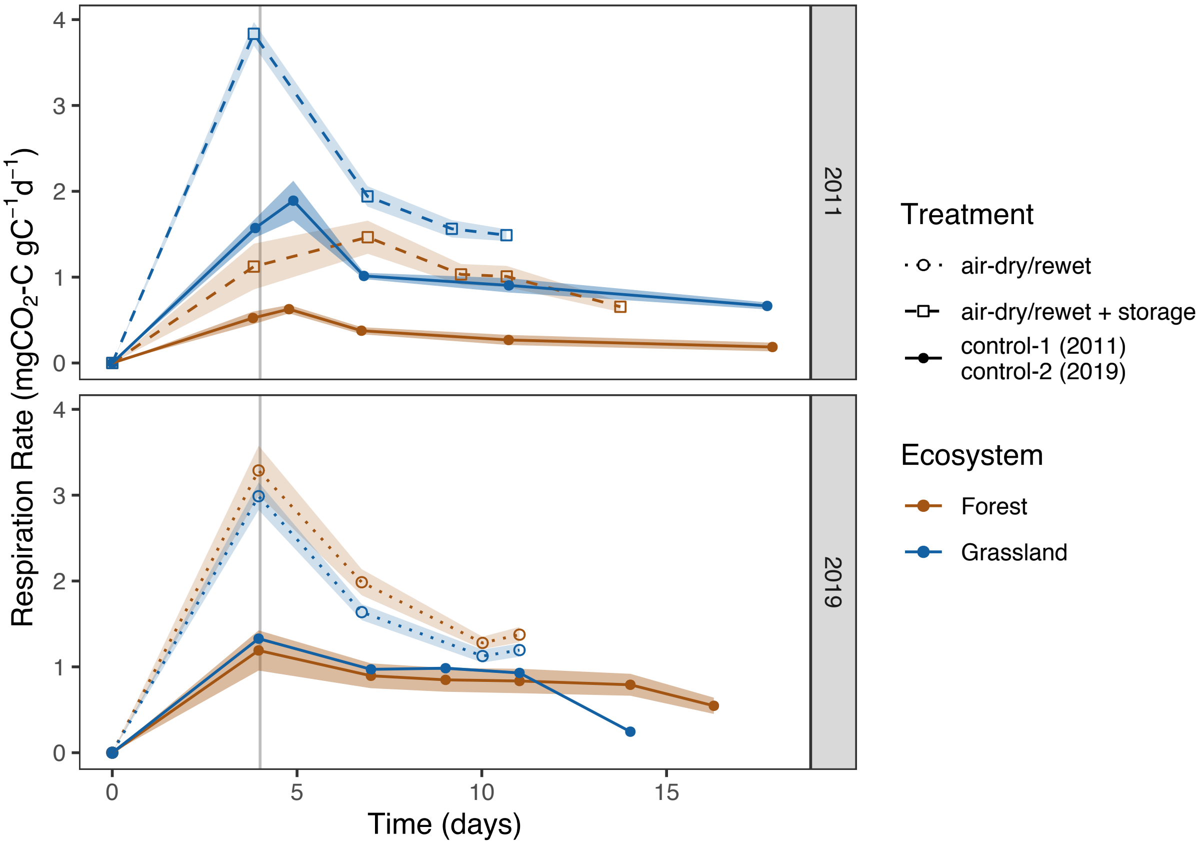
Contents

Respiration rates

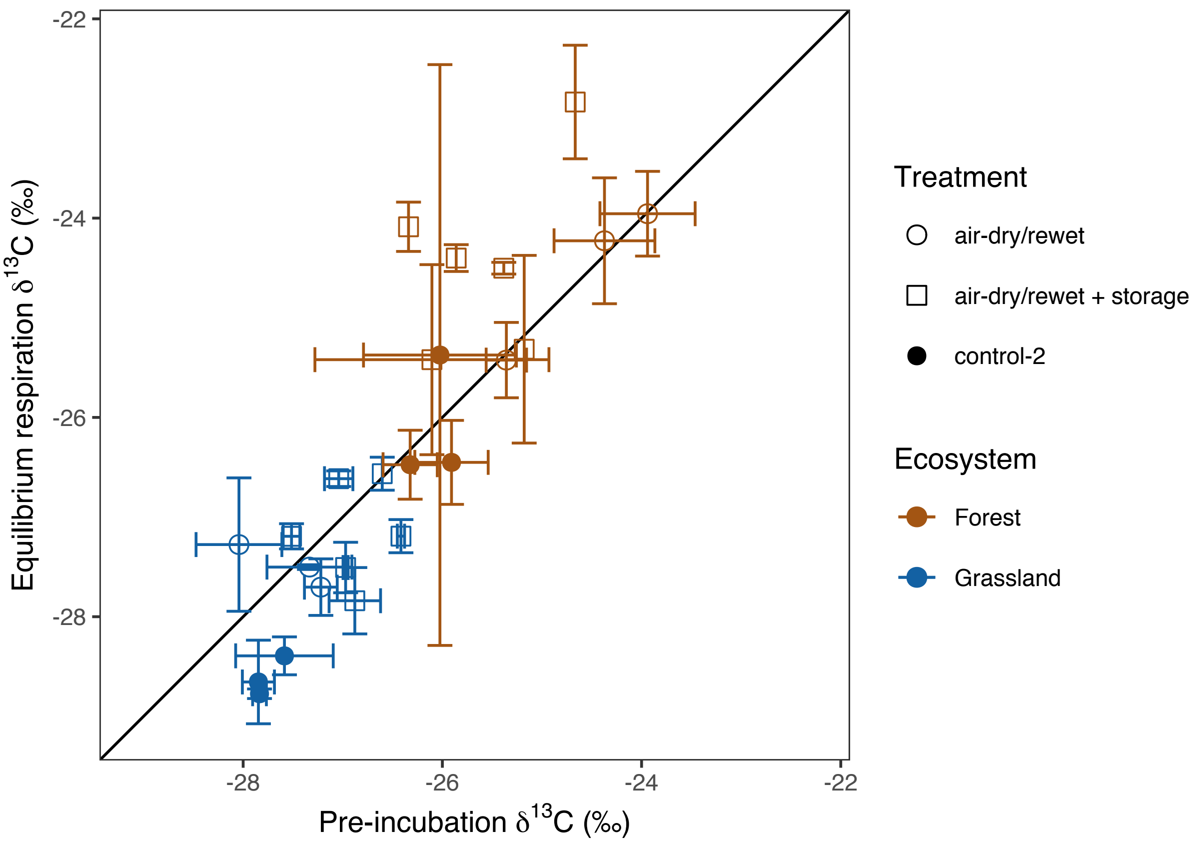
Figure S1



Supplemental Fig 1. Respiration rates for Experiment 1 and Experiment 2 (pre-incubation respiration rates shown as a cumulative average for all samples)

Caption: CO_2 concentrations for Experiment 1 control samples were only measured once during the pre-incubation period, in contrast to daily measurements for all other samples. Pre-incubation respiration rates are shown here calculated as cumulative averages for the whole pre-incubation period for ease of comparison across all treatments in both Experiment 1 and Experiment 2.

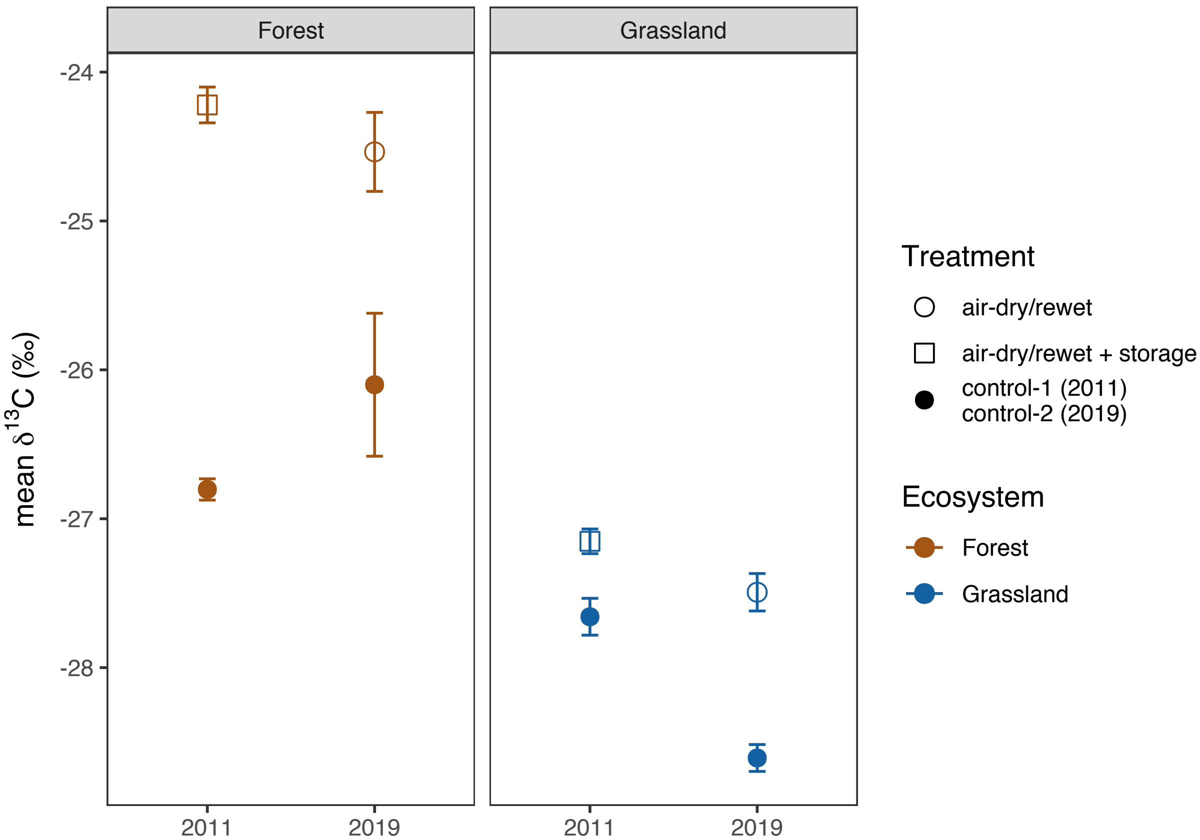
Treatment effects on δ^{13}C-CO_2 (Figures S2, S3)



Supplemental Fig 2. Rewetting pulse (pre-incubation period) δ^{13}C-CO_2 versus equilibrium respiration δ^{13}C-CO_2

Caption: Points are means and error bars show the minimum and maximum of laboratory duplicates.

Figure S3



Supplemental Fig 3. Time series of control and treatment δ^{13}C-CO_2 (Experiments 1 and 2)

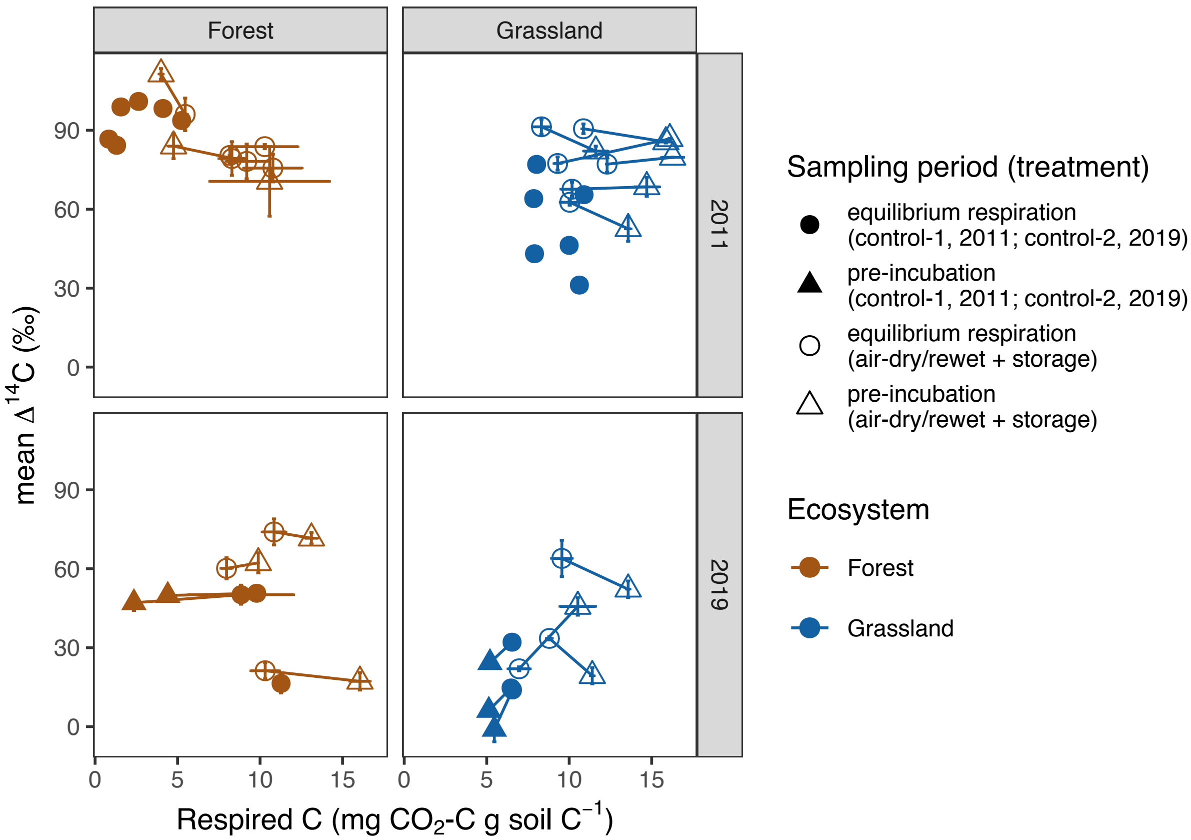
Caption: Points are means and error bars show 2x standard error.

Additional factors influencing treatment effects on Δ^{14}C-CO_2

Text S1: Change in Δ^{14}C-CO_2 relative to the difference in carbon respired

We looked at the possible effect of the difference in the amount of carbon respired (mg CO_2-C g soil C^{-1}) on the differences between control and treatment Δ^{14}C-CO_2 using a linear regression model, but it was not significant overall. When data from Experiment 1 and Experiment 2 were considered separately, we observed a slight positive trend between the difference in respired carbon and the difference in Δ^{14}C-CO_2 within Experiment 2, but it was only marginally significant ($p = 0.063$).

Figure S4



Supplementary Fig. 4. Change in $\Delta^{14}C$-CO_2 in relation to cumulative soil carbon respired

Caption: Error bars show minimum and maximum values measured for laboratory duplicates, while points show the mean. Lines connect mean pre-incubation and equilibrium respiration observations for a single sample. Lines parallel to the x-axis indicate a lack of trend in $\Delta^{14}C$-CO_2 with the amount of carbon respired, while differences between open and filled symbols show the impact of treatments on both the amount of carbon respired and $\Delta^{14}C$-CO_2. Note that pre-incubation $\Delta^{14}C$-CO_2 was not measured for the control-1 samples in 2011. Plot limits exclude outlier point (HEW22 control-2, pre-incubation) for improved legibility.

Text S2: Change in equilibrium respiration $\Delta^{14}C$-CO_2 as a function of field-moisture content

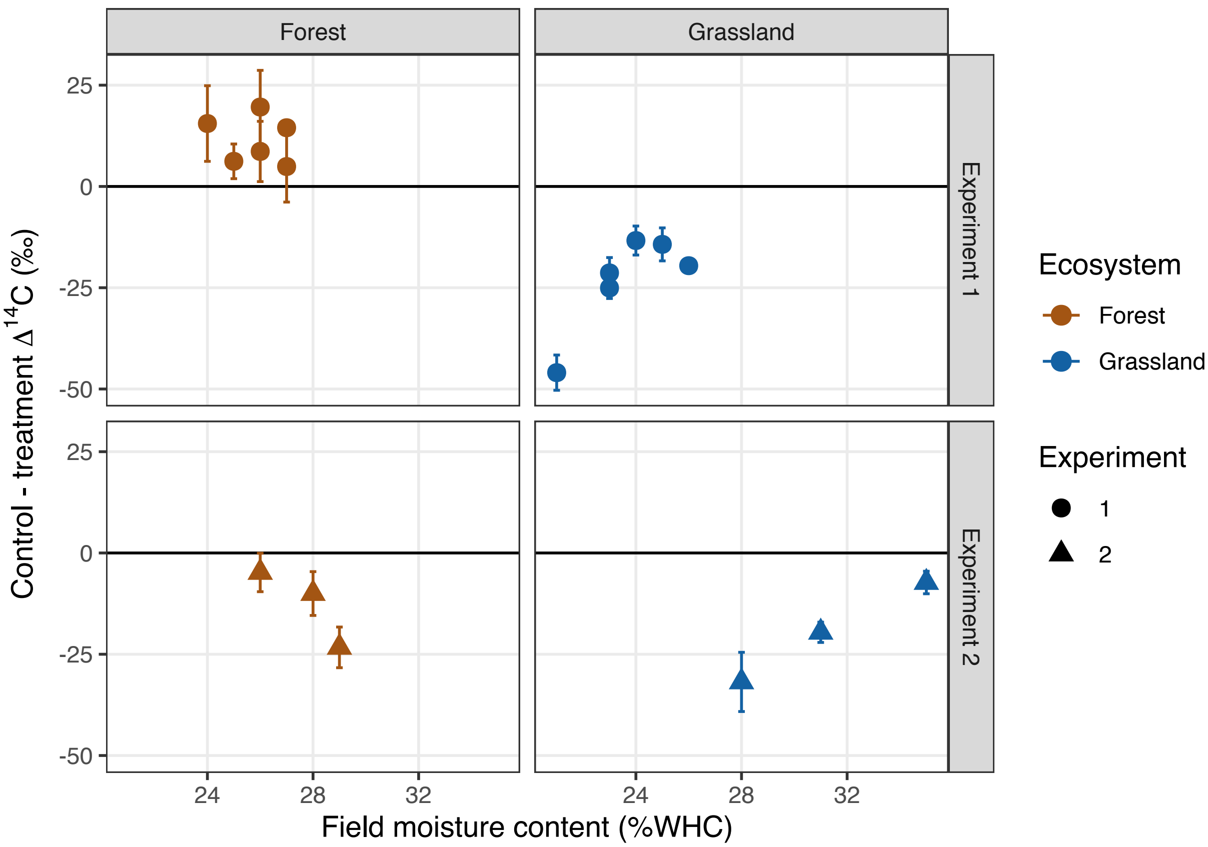
Differences in field moisture content of samples could be related to the magnitude of the shift in $\Delta^{14}C$-CO_2 observed between control and treatment sample, as control sample field moisture content varied. All treatment samples were air-dried in the laboratory prior to rewetting: a change in moisture content of zero percent water holding capacity (%WHC) to 60 %WHC. In contrast, moisture adjustment of control samples was made from field moisture, thus, for example, control samples with lower field moisture contents received a correspondingly greater water addition than wetter control samples.

In order to control for the variance in field moisture content of control samples, we looked at the relationship of the difference in equilibrium respiration period $\Delta^{14}C$-CO_2 observed between control and treatment samples and the change in moisture content of the control samples. If the shift in $\Delta^{14}C$-CO_2 observed in response to the air-drying and rewetting treatment were a linear function of the change in moisture content, the differences between control and treatment $\Delta^{14}C$-CO_2 should be smaller for samples with lower field moisture.

However, we did not observe any consistent relationship between the difference in $\Delta^{14}C\text{-}CO_2$ and field moisture (Supplemental Fig. 5).

We observed the strongest trend in the Experiment 2 grassland samples, but the trend was opposite to what we expected: differences in $\Delta^{14}C\text{-}CO_2$ between treatment samples and control samples were greater for drier samples than wetter samples (Supplemental Fig. 5). Experiment 2 forest samples showed the expected trend, but it did not appear to be linear (Supplemental Fig. 5). Given the relatively low sample number when considered within treatment and ecosystem groups (Experiment 1 $n = 6$, Experiment 2 $n = 3$), we do not consider these trends to be significant, but the data from Experiment 2 suggest that the relationship between the change in $\Delta^{14}C\text{-}CO_2$ and the magnitude of rewetting warrents further study.

Figure S5



Supplemental Fig. 5. Change in $\Delta^{14}C\text{-}CO_2$ (control - treatment) relative to the change in moisture content

Caption: Differences in $\Delta^{14}C\text{-}CO_2$ are shown as means; error bars show one standard deviation of the difference in means. All samples were moisture-adjusted to 60% of water holding capacity (WHC) prior to incubation, but control samples were adjusted from field moisture whereas treatment samples were moisture adjusted after air-drying. Data from Experiment 3 are not shown as field moisture content was unknown for the majority of samples (Supplemental Table 1).

Site data, soil properties, and supporting references for all samples (Experiments 1, 2, and 3)

Table S1

Supplementary Table 1. Site data and soil properties for all soils (Experiments 1, 2, and 3)

											Depth							Particle size distribution			
Experiment	Collection date	Control Incubation Laboratory*	Latitude	Longitude	Site Name	Land cover	ID	Incubation replicates	Soil order	Sieved	Top	Bottom	Field Moisture	Incubation Moisture		Organic C	Total N	Sand	Silt	Clay	Reference**
	year								*WRB name*	*< 2mm*	*cm*		*gravimetric*	*gravimetric*	*percent water holding capacity*	*g kg-1*	*g kg-1*	*g kg-1*	*g kg-1*	*g kg-1*	
1	2011	MPI-BGC	53.09	13.63	Schorfheide-Chorin (Germany)	forest	SEW11	2	Cambisol	Yes	0	10	0.26	0.26	60	31.3	1.3	884	85	31	Solly et al. 2014
1	2011	MPI-BGC	52.9	13.85	Schorfheide-Chorin (Germany)	forest	SEW34	2	Albeluvisol	Yes	0	10	0.24	0.24	60	16.4	0.7	889	69	42	Solly et al. 2014
1	2011	MPI-BGC	52.9	13.93	Schorfheide-Chorin (Germany)	forest	SEW43	2	Cambisol	Yes	0	10	0.3	0.3	60	18.4	1.1	810	121	69	Solly et al. 2014
1	2011	MPI-BGC	53.12	13.68	Schorfheide-Chorin (Germany)	grassland	SEG38	2	Cambisol	Yes	0	10	0.25	0.27	60	22.8	2.2	838	72	89	Solly et al. 2014
1	2011	MPI-BGC	53.12	13.84	Schorfheide-Chorin (Germany)	grassland	SEG40	2	Luvisol	Yes	0	10	0.26	0.27	60	21.3	2	710	192	98	Solly et al. 2014
1	2011	MPI-BGC	52.98	13.83	Schorfheide-Chorin (Germany)	grassland	SEG46	2	Cambisol	Yes	0	10	0.31	0.34	60	24.3	2.3	644	210	146	Solly et al. 2014
1, 2	2011	MPI-BGC	51.34	10.36	Hainich-Dün (Germany)	forest	HEW22	2	Luvisol	Yes	0	10	0.38	0.37	60	23.3	1.7	68	747	184	Solly et al. 2014
1, 2	2011	MPI-BGC	51.11	10.45	Hainich-Dün (Germany)	forest	HEW41	2	Luvisol	Yes	0	10	0.4	0.42	60	23.4	1.9	34	754	210	Solly et al. 2014
1, 2	2011	MPI-BGC	51.1	10.46	Hainich-Dün (Germany)	forest	HEW42	2	Stagnosol	Yes	0	10	0.34	0.36	60	24.3	1.7	60	760	184	Solly et al. 2014
1, 2	2011	MPI-BGC	51.28	10.45	Hainich-Dün (Germany)	grassland	HEG10	2	Vertisol	Yes	0	10	0.47	0.61	60	43.7	4	30	532	436	Solly et al. 2014
1, 2	2011	MPI-BGC	51.08	10.57	Hainich-Dün (Germany)	grassland	HEG32	2	Cambisol	Yes	0	10	0.52	0.54	60	40	3.8	17	640	340	Solly et al. 2014
1, 2	2011	MPI-BGC	51.29	10.38	Hainich-Dün (Germany)	grassland	HEG48	2	Cambisol	Yes	0	10	0.55	0.56	60	41.6	4	50	488	465	Solly et al. 2014
1, 2	2019	MPI-BGC	51.34	10.36	Hainich-Dün (Germany)	forest	HEW22	2	Luvisol	Yes	0	10	0.38	0.37	60	23.3	1.7	68	747	184	Solly et al. 2014
1, 2	2019	MPI-BGC	51.11	10.45	Hainich-Dün (Germany)	forest	HEW41	2	Luvisol	Yes	0	10	0.4	0.42	60	23.4	1.9	34	754	210	Solly et al. 2014
1, 2	2019	MPI-BGC	51.1	10.46	Hainich-Dün (Germany)	forest	HEW42	2	Stagnosol	Yes	0	10	0.34	0.36	60	24.3	1.7	60	760	184	Solly et al. 2014
3	2009	UCI	37.03	-119.27	Musick (Sierra Nevada, CA)	forest	MA	3	Ultic Haploxeralf	Yes	5	20	0.07	0.33	50	27.4	1	600	270	150	Koarashi et al. 2012
3	2009	UCI	37.03	-119.27	Musick (Sierra Nevada, CA)	forest	MB	3	Ultic Haploxeralf	Yes	55	70	0.08	0.21	50	1.1	0	670	180	170	Koarashi et al. 2012
3	2009	UCI	37.03	-119.19	Shaver (Sierra Nevada, CA)	forest	SA	3	Pachic Xerumbrept	Yes	5	20	0.07	0.31	50	29.4	1.2	800	150	50	Koarashi et al. 2012
3	2009	UCI	37.03	-119.19	Shaver (Sierra Nevada, CA)	forest	SB	3	Pachic Xerumbrept	Yes	40	60	0.06	0.22	50	0.4	0	790	170	40	Koarashi et al. 2012
3	2008	UCI	35.98	-79.09	Duke, NC	forest	120	1	Ultic Alfisol	Yes	5	15	0.95	0.04		16.6	0.8				Hopkins et al. 2012
3	2004	UCI	35.94	-84.33	Tennessee Valley Authority (Oak Ridge, TN)	forest	TVA 6E C	1	Inceptisol	No	0	5	0.28	0.2		24.9	1.2				Cisneros-Dozal et al. 2005
3	2004	UCI	35.94	-84.33	Tennessee Valley Authority (Oak Ridge, TN)	forest	TVA 2B C	1	Inceptisol	No	0	5	0.3	0.2		24.9	1.2				Cisneros-Dozal et al. 2005
3	2004	UCI	35.94	-84.33	Tennessee Valley Authority (Oak Ridge, TN)	forest	TVA 3B C	1	Inceptisol	No	0	5	0.49	0.2		24.9	1.2				Cisneros-Dozal et al. 2005
3	2004	UCI	35.94	-84.33	Tennessee Valley Authority (Oak Ridge, TN)	forest	TVA 5B C	1	Inceptisol	No	0	5	0.26	0.2		24.9	1.2				Cisneros-Dozal et al. 2005
3	2004	UCI	35.97	-84.27	Walker Branch (Oak Ridge, TN)	forest	WB 4B C	1	Ultisol	No	0	5	0.34	0.2		24.9	1				Cisneros-Dozal et al. 2005
3	2004	UCI	35.97	-84.27	Walker Branch (Oak Ridge, TN)	forest	WB 5B C	1	Ultisol	No	0	5	0.25	0.2		24.9	1				Cisneros-Dozal et al. 2005
3	2004	UCI	35.97	-84.27	Walker Branch (Oak Ridge, TN)	forest	WB 8B C	1	Ultisol	No	0	5	0.34	0.2		24.9	1				Cisneros-Dozal et al. 2005
3	2004	UCI	35.97	-84.27	Walker Branch (Oak Ridge, TN)	forest	WB 3E C	1	Ultisol	No	0	5	0.36	0.2		24.9	1				Cisneros-Dozal et al. 2005
3	2004	UCI	35.97	-84.27	Walker Branch (Oak Ridge, TN)	forest	WB 7E C	1	Ultisol	No	0	5	0.18	0.2		24.9	1				Cisneros-Dozal et al. 2005
3	2011	MPI-BGC	51.34	10.51	Hainich-Dün (Germany)	forest	HEW26	2	Luvisol	Yes	0	10	0.34	0.36	60	24.4	1.6	54	796	150	Solly et al. 2014
3	2011	MPI-BGC	51.18	10.38	Hainich-Dün (Germany)	forest	HEW47	2	Stagnosol	Yes	0	10	0.43	0.45	60	32.5	2.4	46	632	323	Solly et al. 2014
3	2011	MPI-BGC	51.22	10.37	Hainich-Dün (Germany)	grassland	HEG20	3	Stagnosol	Yes	0	10	0.47	0.45	60	27.2	2.3	102	661	239	Solly et al. 2014
3	2011	MPI-BGC	51.11	10.43	Hainich-Dün (Germany)	grassland	HEG33	3	Cambisol	Yes	0	10	0.47	0.47	60	40.1	3.8	29	618	353	Solly et al. 2014
3	2011	MPI-BGC	51.21	10.39	Hainich-Dün (Germany)	grassland	HEG6	3	Stagnosol	Yes	0	10	0.41	0.45	60	20.8	2	45	698	257	Solly et al. 2014
3	1999	UCI	42.54	-72.18	Harvard, MA	forest	WN-1 Ap (ba	1	Inceptisol	Yes	0	16				60					Gaudinski et al. 2001
3	1999	UCI	42.54	-72.18	Harvard, MA	forest	WN-1 Ap #2	1	Inceptisol	Yes	0	16				60					Gaudinski et al. 2001
3	1999	UCI	42.54	-72.18	Harvard, MA	forest	WN-2 Ap #3	1	Inceptisol	Yes	0	16				60					Gaudinski et al. 2001
3	1999	UCI	42.54	-72.18	Harvard, MA	forest	WN-1 Ap #4	1	Inceptisol	Yes	0	16				60					Gaudinski et al. 2001
3	2004	UCI	35.94	-84.33	Tennessee Valley Authority (Oak Ridge, TN)	forest	TVA 4E	1	Inceptisol	No	0	5				24.9	1.2				Cisneros-Dozal et al. 2005
3	2004	UCI	35.94	-84.33	Tennessee Valley Authority (Oak Ridge, TN)	forest	TVA 6E	1	Inceptisol	No	0	5				24.9	1.2				Cisneros-Dozal et al. 2005
3	2004	UCI	35.94	-84.33	Tennessee Valley Authority (Oak Ridge, TN)	forest	TVA 8E	1	Inceptisol	No	0	5				24.9	1.2				Cisneros-Dozal et al. 2005
3	2004	USGS Menlo Park	35.94	-84.33	Tennessee Valley Authority (Oak Ridge, TN)	forest	TVA2B-C_iT2	1	Inceptisol	No	0	5				24.9	1.2				Cisneros-Dozal et al. 2005
3	2004	USGS Menlo Park	35.94	-84.33	Tennessee Valley Authority (Oak Ridge, TN)	forest	TVA3-C_iT1	1	Inceptisol	No	0	5				24.9	1.2				Cisneros-Dozal et al. 2005
3	2004	USGS Menlo Park	35.97	-84.27	Walker Branch (Oak Ridge, TN)	forest	WB4B-C_iT2	1	Ultisol	No	0	5				24.9	1				Cisneros-Dozal et al. 2005
3	2004	USGS Menlo Park	35.97	-84.27	Walker Branch (Oak Ridge, TN)	forest	WB5-C_iT2	1	Ultisol	No	0	5				24.9	1				Cisneros-Dozal et al. 2005
3	2004	USGS Menlo Park	35.97	-84.27	Walker Branch (Oak Ridge, TN)	forest	WB8-C_iT2	1	Ultisol	No	0	5				24.9	1				Cisneros-Dozal et al. 2005

* Not all data were available (e.g. moisture content, texture) for control samples samples incubated at UCI and USGS Menlo Park

** See references section in main text for full citations

Text S3

Supplementary Text 3

The data referenced as Schoening, unpublished in the main text comprise $\delta^{13}C$ and $\Delta^{14}C$ measurements made on CO_2 purified from laboratory soil incubations. The data are provided below as Supplementary Table 2. These data were originally collected by I. Schoening for a project related to the Biodiversity Exploratories, a large scale initiative assessing the influence of biodiversity and management practices on ecosystem health and services in Central Germany (Fischer, et al. 2010 "Implementing large-scale and long-term functional biodiversity research: The Biodiversity Exploratories" doi:10.1016/j.baae.2010.07.009).

Methodology notes from I. Schoening:

Soil sampling

In 2011, we sampled the surface soil (0 10 cm depth) at 14 locations per plot along two 18 m transects at each of the 300 plots established for the Biodiversity Exploratories project. The distance between sampling points was 3 m. Mineral soil samples were taken using a split tube auger, 40 cm long and 5 cm wide (Eijkelkamp, Giesbeek, The Netherlands). A composite soil sample was prepared by mixing all soil samples from the same plot. Each composite sample was homogenized, sieved (<2 mm), weighed and split into three subsamples. One aliquot was air-dried (at 40°C), another one was kept field moist at a temperature of +4°C and a third one was frozen at -20°C.

Basic soil analyses

A subsample (10 g) of the field moist soil was used to determine gravimetric water content. Air-dried soil was used for the determination of soil pH, soil texture and CN concentrations. We measured the soil pH in the supernatant of 1:2.5 mixture of soil and 0.01M $CaCl_2$. Soil texture was determined after removal of soil organic matter by the pipette method (Schlichting et al. 1995). Total carbon (TC) and nitrogen (N) contents were analyzed on ground subsamples by dry combustion in a CN analyzer "Vario Max" (Elementar Analysensysteme GmbH, Hanau, Germany). Inorganic carbon (IC) was determined after combustion of organic carbon in a muffle furnance (450°C for 16 h). The soil organic carbon (SOC) equals the difference between TC and IC.

Soil Incubations

We incubated sieved (<2mm) field-moist soil at a constant temperature of 20°C. All samples were moistened to a standardised water holding capacity (WHC) of 60%. This allowed us excluding the water content as a variable in subsequent analyses. Depending on initial C concentrations, 70 to 250 g soil were filled in 250 ml beaker glasses and placed in 1000 ml glass jars with airtight lids and two stopcocks. The relative humidity in the CO_2 free air was adapted to an ambient level by adding 5 mL of deionised water on the bottom of the glass jars. After a preincubation period of 4 days, the jar headspace was purged with CO_2-free air. Soil samples were then incubated for 14 days. The CO_2 release from soil was measured after 1, 3, 7 and 14 days on 1-2 ml aliquots of headspace air by a LI-6262 CO2/H2O infrared gas analyzer (LI-COR-Environmental, Lincoln, Nebraska USA). Fluxes reported in this study are calculated using the total amount of CO_2 evolved after an incubation period of 14 days.

Aliquots of headspace air were collected at the end of the 14-day incubation period for determining the radiocarbon signature of heterotrophic respiration. We purified CO_2 from headspace gas samples using cryogenic separation, with splits of the purified CO_2 analyzed for both $\delta^{13}C$ and $\Delta^{14}C$. Radiocarbon analysis of the gas samples was performed at the Max Planck Institute for Biogeochemistry (MPI-BGC) facility for accelerator mass spectrometry in Jena, Germany. Radiocarbon values are reported in units of $\Delta^{14}C$, defined as the deviation in parts per thousand of the ratio of ^{14}C to ^{12}C from that of the oxalic acid standard measured in 1950. In order to account for potential mass-dependent fractionation effects, the $^{14}C/^{12}C$ ratio of all samples is corrected to a common $\delta^{13}C$ value of -25 per mil (Stuiver & Polach, 1977). The $\delta^{13}C$ content was also measured at MPI-BGC (Delta+XL, Thermo Finnigan, Bremen, Germany) and data are reported using the $\delta^{13}C$ notation, which refers to the deviation in parts per thousand of the ratio of $^{13}C/^{12}C$ in the PDB standard.

Table S2

EP_Plotid	Plotid	Exploratory	Type	13c_CO2	14c_CO2
AEG22	A45310	A	G	-20	73.05
AEG23	A45122	A	G	-28.61	61.24
AEG21	A21850	A	G	-28.23	71.56
AEG19	A35463	A	G	-23.35	69.18
AEG20	A21699	A	G	-28.01	15.98
AEG18	A46500	A	G	-27.97	52.31
AEG16	A36692	A	G	-28.17	45.36
AEG17	A46114	A	G	-28.11	25.51
AEG14	A46088	A	G	-28.18	44.86
AEG15	A35767	A	G	-28.28	43.97
AEG12	A20771	A	G	-27.35	21.93
AEG13	A22610	A	G	-27.36	24.02
AEG11	A20470	A	G	-28.5	41.59
AEG10	A2277	A	G	-28.57	67.89
AEG9	A43687	A	G	-28.31	59.26
AEG8	A42131	A	G	-28.76	54.39
AEG7	A24854	A	G	-27.54	50.62
AEG6	A34651	A	G	-27.62	54.39
AEG5	A34237	A	G	-27.52	30.17
AEG4	A31160	A	G	-28.02	69.68
AEG2	A39275	A	G	-27.66	41.29
AEG3	A48112	A	G	-25.54	47.64
AEG1	A19557	A	G	-28.94	38.11
AEG24	A42306	A	G	-27.64	41.69
AEG25	A7116	A	G	-27.76	60.15
AEG26	A28932	A	G	-27.33	46.05
AEG27	A40320	A	G	-27.54	61.14
AEG28	A42175	A	G	-28.12	59.45
AEG29	A22026	A	G	-27.11	38.21
AEG30	A36956	A	G	-22.1	37.52
AEG31	A37367	A	G	NA	42.18
AEG32	A41172	A	G	NA	17.27
AEG33	A41959	A	G	-28.14	44.46
AEG34	A43366	A	G	-27.11	48.24
AEG35	A11495	A	G	-28.21	55.19
AEG36	A13124	A	G	-27.35	25.31
AEG37	A30361	A	G	NA	34.54
AEG38	A32042	A	G	-28.17	74.94
AEG39	A32195	A	G	-27.52	52.21
AEG40	A53417	A	G	-28.78	48.34
AEG41	A28088	A	G	-26.74	28.09
AEG42	A24657	A	G	-26.71	66.8
AEG43	A49542	A	G	-28.57	50.02
AEG44	A33605	A	G	-28.76	61.14
AEG45	A37099	A	G	-26.76	70.57
AEG46	A33626	A	G	-27.99	41.39
AEG47	A35283	A	G	-28.3	59.16

AEG48	A43134	A	G	-27.23	59.55
AEG49	A43953	A	G	-27.85	54.29
AEG50	A38525	A	G	-25.46	68.78
AEW1	A18422	A	F	-27.61	57.67
AEW2	A20965	A	F	-26.6	145.22
AEW3	A21613	A	F	-24.42	-56.39
AEW4	A5276	A	F	-26.48	31.26
AEW5	A30591	A	F	NA	NA
AEW6	A35255	A	F	-27.73	98.56
AEW7	A7321	A	F	-27.45	110.18
AEW8	A25660	A	F	-24.45	-55.99
AEW9	A30535	A	F	-25.27	-20.26
AEW10	A27281	A	F	-26.47	113.55
AEW11	A16193	A	F	-26.24	125.07
AEW12	A5863	A	F	-26.37	123.78
AEW13	A28098	A	F	-24.93	125.96
AEW14	A18920	A	F	-26.48	58.46
AEW15	A29334	A	F	-24.28	-4.18
AEW16	A35042	A	F	-25.54	24.02
AEW17	A5149	A	F	-25.52	-31.97
AEW18	A4246	A	F	-27.04	101.94
AEW19	A14961	A	F	-27.71	65.21
AEW20	A16058	A	F	-26.07	42.08
AEW21	A16389	A	F	NA	84.17
AEW22	A36262	A	F	-27.24	85.76
AEW23	A41483	A	F	-26.78	106.51
AEW24	A12513	A	F	-24.48	84.67
AEW25	A31470	A	F	-26.99	102.73
AEW26	A34057	A	F	-27.53	97.57
AEW27	A39499	A	F	-25.9	99.85
AEW28	A13956	A	F	-25.14	98.17
AEW29	A21785	A	F	-26.05	135.49
AEW30	A24017	A	F	-26.64	47.24
AEW31	A6692	A	F	-23.65	10.02
AEW32	A23243	A	F	-26.18	75.53
AEW33	A41892	A	F	-23.12	95.49
AEW34	A42708	A	F	-23.11	121.49
AEW35	A30620	A	F	-25.6	92.31
AEW36	A3271	A	F	NA	NA
AEW37	A34233	A	F	-27.17	92.81
AEW38	A35243	A	F	-26.47	105.02
AEW39	A4506	A	F	-23.48	34.24
AEW40	A20690	A	F	-26.12	128.34
AEW41	A28898	A	F	-26.59	95.88
AEW42	A36277	A	F	-26.86	75.24
AEW43	A25044	A	F	-27.6	113.55
AEW44	A3277	A	F	-26.26	99.06
AEW45	A43486	A	F	-27.48	78.12

AEW46	A22196	A	F	-26.01	105.61
AEW47	A29568	A	F	-25.49	104.52
AEW48	A39288	A	F	-22.82	85.86
AEW49	A39748	A	F	-25.76	93.9
AEW50	A6296	A	F	-26.11	108.99
HEG1	H4580	H	G	-27.94	33.55
HEG2	H8302	H	G	-27.34	47.44
HEG3	H8709	H	G	-28.41	47.84
HEG4	H20510	H	G	-22.99	57.77
HEG5	H20816	H	G	-28.34	47.14
HEG6	H30409	H	G	-28.19	45.66
HEG7	H12850	H	G	NA	NA
HEG8	H14707	H	G	-25.72	67.3
HEG9	H30212	H	G	-28.37	47.05
HEG10	H22151	H	G	-27.82	31.16
HEG11	H24761	H	G	-27.99	61.94
HEG12	H20116	H	G	-24.73	72.36
HEG13	H4651	H	G	-26.22	18.46
HEG14	H19568	H	G	-27.64	28.38
HEG15	H16781	H	G	-28.41	35.53
HEG16	H12643	H	G	-28.41	24.81
HEG17	H14529	H	G	-28.46	41.29
HEG18	H16581	H	G	-26.5	46.95
HEG19	H20606	H	G	-28.34	37.81
HEG20	H30205	H	G	-21.99	64.32
HEG21	H30909	H	G	-28.67	59.95
HEG22	H37447	H	G	-24.4	74.94
HEG23	H20426	H	G	-27.89	66.3
HEG24	H20438	H	G	-27.21	54.99
HEG25	H37029	H	G	-27.86	63.62
HEG26	H2815	H	G	-27.7	66.8
HEG27	H20121	H	G	-27.93	70.67
HEG28	H20535	H	G	-27.64	53.99
HEG29	H20537	H	G	-26.96	44.76
HEG30	H20825	H	G	-27.04	55.38
HEG31	H20003	H	G	-27.66	48.14
HEG32	H20106	H	G	-27.36	65.51
HEG33	H20508	H	G	-26.42	70.07
HEG34	H30402	H	G	-27.28	52.6
HEG35	H30417	H	G	-27.3	54.69
HEG36	H20241	H	G	-27.54	53.4
HEG37	H20245	H	G	-27.44	61.54
HEG38	H20433	H	G	NA	NA
HEG39	H20436	H	G	NA	NA
HEG40	H30615	H	G	-27.46	36.13
HEG41	H888	H	G	-27.95	57.67
HEG42	H13708	H	G	-26.33	60.45
HEG43	H19577	H	G	-27.37	53.1

HEG44	H20215	H	G	-27.2	53.3
HEG45	H20258	H	G	-28.21	40.1
HEG46	H30915	H	G	-27.28	55.09
HEG47	H2818	H	G	-28.22	79.41
HEG48	H5053	H	G	-27.37	46.25
HEG49	H8020	H	G	-27.51	62.73
HEG50	H15457	H	G	-23.66	53.89
HEW1	H274	H	F	-22.83	-86.27
HEW2	H301	H	F	-24.22	27.19
HEW3	H303	H	F	-25.99	137.38
HEW4	H307	H	F	-26.7	3.57
HEW5	H154	H	F	-25.01	-5.76
HEW6	H150	H	F	-27.58	64.91
HEW7	H71011	H	F	-26.67	81.49
HEW8	H311	H	F	-28.06	88.04
HEW9	H71310	H	F	-28.09	81.59
HEW10	H1363	H	F	NA	NA
HEW11	H8568	H	F	-27.13	58.06
HEW12	H22701	H	F	-27.01	93.1
HEW13	H302	H	F	-26.89	79.9
HEW14	H306	H	F	-27	65.91
HEW15	H87	H	F	-27.13	64.32
HEW16	H58	H	F	-27.51	72.06
HEW17	H130	H	F	-26.45	54.59
HEW18	H637	H	F	-27.67	NA
HEW19	H32	H	F	-26.03	NA
HEW20	H548	H	F	-24.22	-61.15
HEW21	H20	H	F	-27.47	77.12
HEW22	H551	H	F	-26.82	84.27
HEW23	H104	H	F	-25.78	87.84
HEW24	H300	H	F	-26.68	84.96
HEW25	H304	H	F	-26.38	79.6
HEW26	H313	H	F	-27.29	100.15
HEW27	H310	H	F	-26.99	45.26
HEW28	H308	H	F	-27.14	72.95
HEW29	H71407	H	F	NA	80.99
HEW30	H71515	H	F	-26.43	86.85
HEW31	H71623	H	F	-26.43	93.1
HEW32	H72920	H	F	-26.8	94.59
HEW33	H38964	H	F	-27	98.96
HEW34	H1192	H	F	-26.78	97.08
HEW35	H9686	H	F	-27.43	98.27
HEW36	H10804	H	F	-26.79	92.11
HEW37	H12905	H	F	-26.67	113.65
HEW38	H13104	H	F	-27.12	95.29
HEW39	H13939	H	F	-26.29	94.2
HEW40	H18639	H	F	-26.72	93.4
HEW41	H22709	H	F	-26.87	93.7

HEW42	H23819	H	F		-26.89	86.65
HEW43	H531	H	F		-27.34	67.49
HEW44	H674	H	F		-25.17	-13.61
HEW45	H305	H	F		-25.08	66.2
HEW46	H238	H	F		-26.86	96.18
HEW47	H68	H	F		-26.73	91.71
HEW48	H70517	H	F		-27.33	96.98
HEW49	H71125	H	F		-26.37	85.86
HEW50	H12504	H	F		-26.86	103.43
SEG1	S1029	S	G		-28.17	18.46
SEG2	S573	S	G		-27.82	19.15
SEG3	S526	S	G		-27.12	25.6
SEG4	S712	S	G		-26.14	17.76
SEG5	S667	S	G		-26.34	8.33
SEG6	S1012	S	G		-28.41	21.63
SEG7	S570	S	G		-28.57	20.64
SEG8	S652	S	G		-28.63	10.52
SEG9	S990	S	G		-29.77	-1.4
SEG10	S502	S	G		-28.52	5.35
SEG11	S505	S	G		-27	-17.77
SEG12	S561	S	G		-27.33	-2.98
SEG13	S719	S	G		-28.4	35.53
SEG14	S1028	S	G		-27.73	4.26
SEG15	S658	S	G		-28.19	23.92
SEG16	S706	S	G		-28.21	24.81
SEG17	S1015	S	G		-29	22.33
SEG18	S1039	S	G		-27.91	46.05
SEG19	S676	S	G		-26.94	20.84
SEG20	S980	S	G		-27.38	-33.36
SEG21	S988	S	G		-27.8	18.36
SEG22	S999	S	G		-28.32	69.08
SEG23	S612	S	G		-27.79	18.06
SEG24	S761	S	G		-27.48	6.05
SEG25	S1007	S	G		-28.57	15.48
SEG26	S1022	S	G		-27	-13.31
SEG27	S1051	S	G		-28.68	-43.68
SEG28	S1042	S	G		-26.38	12.5
SEG29	S1043	S	G		-27.39	42.18
SEG30	S690	S	G	NA		-3.68
SEG31	S698	S	G		-26.76	70.27
SEG32	S701	S	G		-27.52	60.25
SEG33	S732	S	G		-27.31	26.5
SEG34	S738	S	G		-27.93	36.42
SEG35	S770	S	G		-26.4	31.96
SEG36	S1035	S	G		-27.11	2.28
SEG37	S1036	S	G		-27.38	67.69
SEG38	S1044	S	G		-28.33	77.02
SEG39	S780	S	G		-27.53	42.58

SEG40	S850	S	G	-27.47	43.07
SEG41	S974	S	G	-27.71	53.7
SEG42	S1045	S	G	-28.2	53.7
SEG43	S1046	S	G	-26.98	16.67
SEG44	S1047	S	G	-27.73	52.01
SEG45	S1048	S	G	-28.35	35.63
SEG46	S779	S	G	-27.6	64.02
SEG47	S801	S	G	-23.69	25.21
SEG48	S995	S	G	-26.74	17.86
SEG49	S1033	S	G	-26.78	20.34
SEG50	S1052	S	G	-26.75	78.41
SEW1	S5110	S	F	-24.58	104.22
SEW2	S5090	S	F	-27.07	127.45
SEW3	S5112	S	F	NA	NA
SEW4	S467	S	F	NA	NA
SEW5	S219	S	F	NA	NA
SEW6	S5111	S	F	-25.61	99.06
SEW7	S5106	S	F	NA	NA
SEW8	S5113	S	F	NA	NA
SEW9	S5114	S	F	-26.65	106.51
SEW10	S5073	S	F	-26.55	114.15
SEW11	S5075	S	F	-26.99	100.95
SEW12	S5094	S	F	-26.06	88.04
SEW13	S154	S	F	-26.6	145.62
SEW14	S5098	S	F	-25.81	123.78
SEW15	S5102	S	F	-27.35	88.74
SEW16	S260	S	F	-24.23	112.56
SEW17	S5001	S	F	-26.11	72.16
SEW18	S5051	S	F	-26.53	111.17
SEW19	S5070	S	F	-26.5	79.41
SEW20	S5074	S	F	-26.6	103.83
SEW21	S5101	S	F	NA	NA
SEW22	S213	S	F	-26.18	115.24
SEW23	S5089	S	F	-23.95	132.61
SEW24	S5092	S	F	-26.3	111.07
SEW25	S5095	S	F	NA	NA
SEW26	S5100	S	F	NA	NA
SEW27	S5105	S	F	-26.76	107.1
SEW28	S5107	S	F	-27.26	92.31
SEW29	S156	S	F	-26.55	89.83
SEW30	S217	S	F	NA	NA
SEW31	S5116	S	F	NA	NA
SEW32	S292	S	F	NA	NA
SEW33	S5038	S	F	-26.36	83.97
SEW34	S5108	S	F	-26.38	98.27
SEW35	S475	S	F	NA	NA
SEW36	S5086	S	F	-26.33	114.25
SEW37	S5091	S	F	NA	NA

SEW38	S5104	S	F	NA	NA
SEW39	S384	S	F	NA	NA
SEW40	S391	S	F	-26.5	94.89
SEW41	S397	S	F	-26.58	87.05
SEW42	S414	S	F	-27.03	105.61
SEW43	S421	S	F	-26.87	98.86
SEW44	S488	S	F	-26.56	79.51
SEW45	S353	S	F	-25.99	95.09
SEW46	S5060	S	F	NA	NA
SEW47	S5063	S	F	-26.45	94
SEW48	S360	S	F	-26.59	90.52
SEW49	S438	S	F	-25.73	102.14
SEW50	S5117	S	F	NA	NA