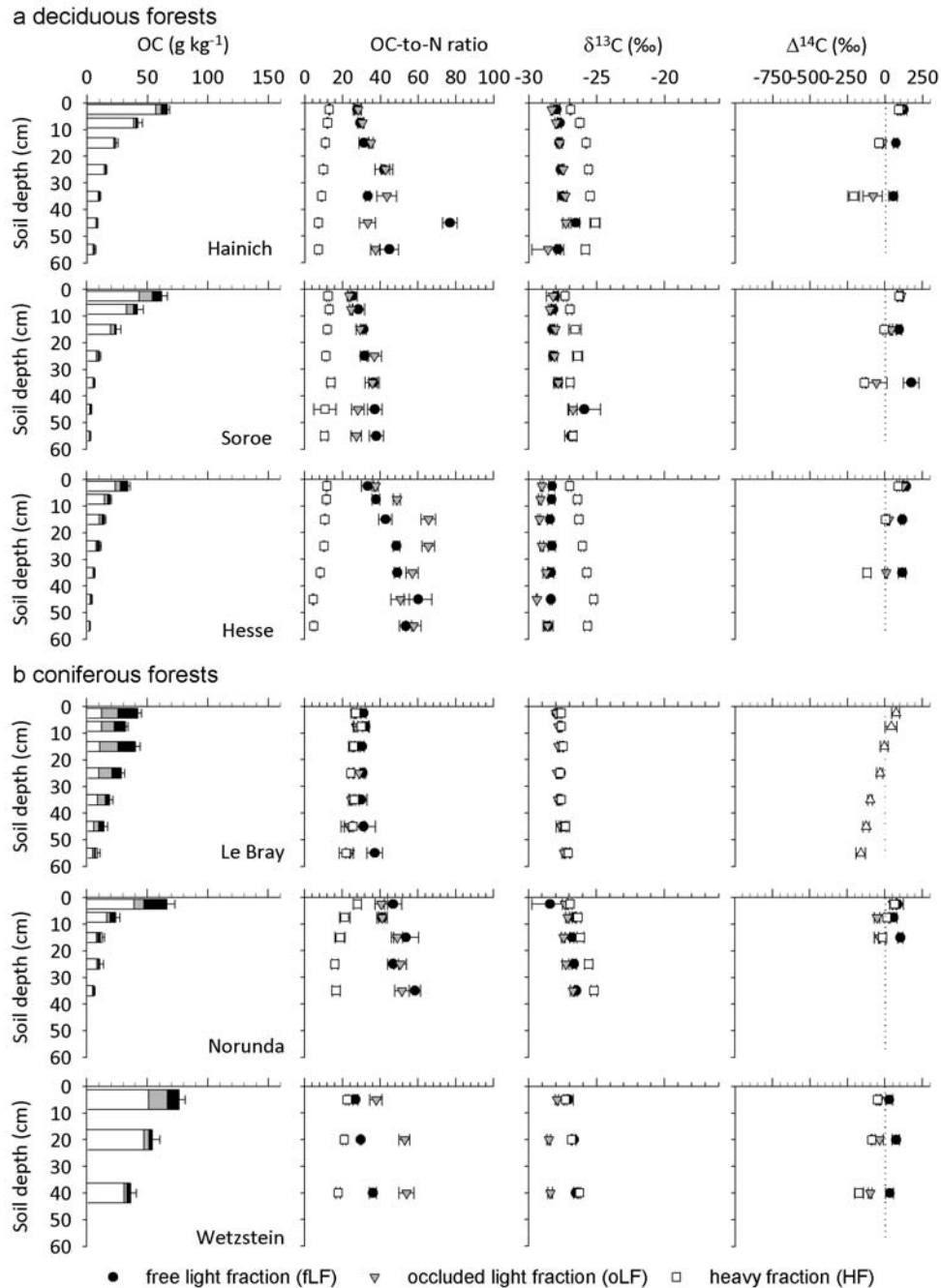


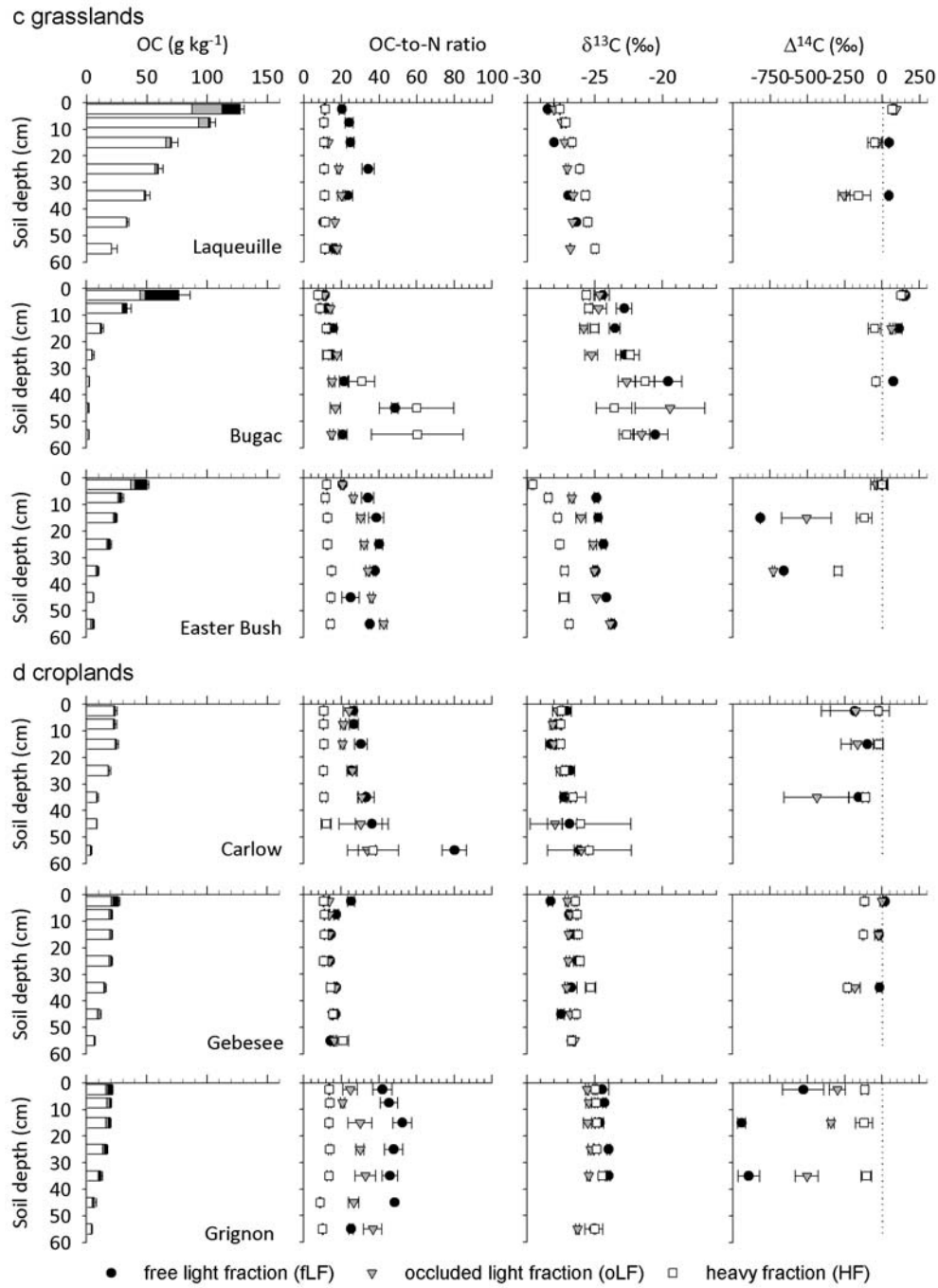
Supporting information Schrumpf et al.

Supplementary Figure A1

Contribution of density fractions (fLF: free light fraction, oLF: occluded light fraction, HF: heavy fraction) to OC at different soil depths (left diagrams) of deciduous forest (Hainich, Soroe, Hesse), coniferous forest (Le Bray, Norunda, Wetzstein), grassland (Laqueuille, Bugac, Easter Bush) and cropland (Carlow, Gebesee, Grignon) sites. The figures to the right present OC-to-TN ratios, $\delta^{13}\text{C}$, and $\Delta^{14}\text{C}$ values of density fractions at different soil depths of respective sites.

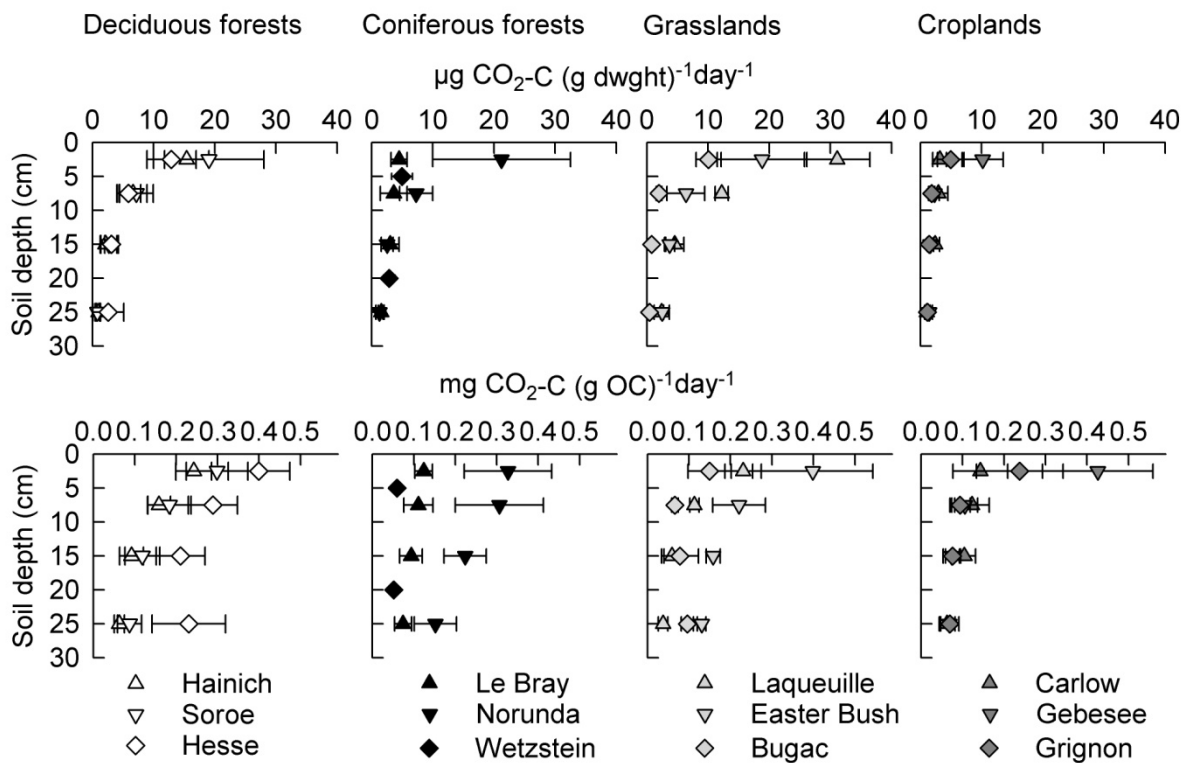


Supplementary Figure A1 continued



Supplementary Figure A2

Average C mineralization rates in the mineral soil over 20 days, given per g soil dry weight and per g OC.



Supplementary Table A1

Mass and carbon losses during density fractionation (average and standard deviation in brackets).

	Mass-loss	C-loss	Mass-loss	C-loss	Mass-loss	C-loss
	[%] of total weight or total OC					
	Carlow		Grignon		Gebesee	
0-5	13 (7)	2 (1)	1 (8)	8 (2)	20 (7)	6 (1)
5-10	10 (4)	2 (0)	10 (13)	11 (1)	21 (5)	6 (1)
10-20	13 (7)	2 (0)	8 (12)	11 (1)	20 (5)	6 (2)
20-30	17 (10)	3 (2)	8 (7)	12 (2)	20 (5)	6 (1)
30-40	19 (10)	5 (4)	16 (28)	13 (3)	29 (8)	6 (1)
50-60	28 (4)	8 (8)	38 (7)	20 (3)	n.d.	5 (1)
	Bugac		Easter Bush		Laqueuille	
0-5	15 (8)	5 (1)	15 (11)	3 (1)	11 (6)	11 (4)
5-10	19 (9)	4 (1)	16 (11)	3 (0)	6 (3)	1 (3)
10-20	18 (10)	3 (1)	23 (7)	4 (3)	3 (10)	0 (4)
20-30	16 (9)	3 (1)	19 (8)	2 (0)	2 (8)	-1(3)
30-40	14 (6)	3 (1)	20 (14)	20 (14)	27 (11)	22 (10)
50-60	21 (18)	3 (1)	14 (4)	14 (4)	24 (8)	20 (5)
	Hesse		Soroe		Hainich	
0-5	19 (7)	3 (1)	15 (4)	4 (2)	16 (3)	6 (2)
5-10	10 (6)	3 (1)	13 (8)	4 (2)	22 (6)	6 (3)
10-20	11 (7)	3 (1)	25 (10)	4 (3)	28 (6)	8 (3)
20-30	11 (6)	3 (1)	27 (12)	8 (5)	23 (7)	10 (4)
30-40	13 (4)	3 (2)	17 (19)	10 (6)	25 (6)	13 (5)
50-60	14 (7)	5 (3)	33 (16)	7 (4)	26 (19)	14 (6)
	Wetzstein		Norunda		Le Bray	
0-5	10 (5)	5 (3)	15 (7)	2 (1)	21 (11)	1 (0)
5-10	9 (5)	5 (2)	10 (9)	2 (0)	13 (6)	1 (0)
10-20	12 (5)	3 (1)	13 (7)	2 (2)	15 (10)	1 (0)
20-30	10 (5)	5 (3)	13 (9)	2 (3)	26 (10)	1 (0)
30-40	9 (5)	5 (2)	16 (7)	3 (4)	22 (10)	1 (0)
50-60					25 (12)	0 (0)

Supplementary Table A2

Carbon stocks in density fractions (se: standard error, n = 10 and n = 3 for the 40–50 cm layer), cv: coefficient of variation)

Soil depth [cm]	fLF			oLF			HF		
	mean [kg OC m ⁻²]	se	cv [%]	mean [kg OC m ⁻²]	se	cv [%]	mean [kg OC m ⁻²]	se	cv [%]
Hesse									
0–5	0.26	0.03	37	0.19	0.03	43	1.00	0.06	20
5–10	0.11	0.01	29	0.14	0.02	39	0.80	0.03	14
10–20	0.23	0.04	51	0.25	0.03	35	1.26	0.06	16
20–30	0.23	0.07	94	0.13	0.01	38	0.98	0.06	19
30–40	0.09	0.01	42	0.07	0.01	57	0.72	0.04	17
40–50	0.07	0.00	5	0.03	0.01	64	0.43	0.07	22
50–60	0.05	0.01	90	0.02	0.01	108	0.35	0.03	30
Sum	1.04			0.82			5.55		
Sorø									
0–5	0.31	0.07	70	0.41	0.07	55	1.71	0.10	19
5–10	0.15	0.04	81	0.30	0.05	57	1.63	0.10	20
10–20	0.11	0.03	74	0.41	0.11	83	2.05	0.18	28
20–30	0.09	0.01	49	0.21	0.04	64	1.15	0.11	30
30–40	0.04	0.01	62	0.09	0.01	45	0.75	0.07	30
40–50	0.16	-	-	0.17	-	-	0.28	-	-
50–60	0.04	0.01	78	0.04	0.01	88	0.38	0.07	51
Sum	0.92			1.64			7.94		
Hainich									
0–5	0.19	0.03	54	0.16	0.04	74	2.21	0.13	17
5–10	0.07	0.02	88	0.08	0.02	63	1.85	0.11	20
10–20	0.05	0.01	65	0.13	0.03	62	2.62	0.15	18
20–30	0.04	0.01	45	0.14	0.02	45	1.88	0.07	13
30–40	0.03	0.00	45	0.12	0.01	31	1.28	0.11	28
40–50	0.05	0.03	102	0.11	0.03	48	0.68	0.19	49
50–60	0.04	0.01	89	0.08	0.02	70	0.58	0.15	74
Sum	0.48			0.84			11.25		
Bugac									
0–5	1.05	0.15	44	0.14	0.03	63	1.97	0.21	32
5–10	0.23	0.03	44	0.06	0.04	196	2.24	0.14	20
10–20	0.12	0.02	53	0.06	0.02	127	2.51	0.24	30
20–30	0.07	0.01	57	0.04	0.02	124	1.24	0.06	15
30–40	0.05	0.01	87	0.02	0.01	108	1.11	0.11	31
40–50	0.04	0.03	96	0.01	0.01	103	1.23	0.21	24
50–60	0.02	0.01	87	0.03	0.01	96	1.35	0.14	33
Sum	1.43			0.33			11.30		

Table A2 *continued*

Soil depth [cm]	fLF			oLF			HF		
	mean [kg OC m ⁻²]	se	cv [%]	mean [kg OC m ⁻²]	se	cv [%]	mean [kg OC m ⁻²]	se	cv [%]
Laqueuille									
0–5	0.34	0.08	68	0.55	0.09	48	2.04	0.22	33
5–10	0.06	0.01	71	0.28	0.03	33	3.29	0.14	14
10–20	0.06	0.01	54	0.29	0.08	75	4.93	0.29	19
20–30	0.04	0.01	66	0.12	0.08	200	4.16	0.11	8
30–40	0.02	0.00	75	0.06	0.03	158	3.56	0.21	19
40–50	0.01	0.01	107	0.02	0.01	111	2.34	1.16	70
50–60	0.01	0.00	111	0.01	0.00	106	1.68	0.26	50
Sum	0.57			1.25			22.08		
Easter Bush									
0–5	0.45	0.07	44	0.17	0.04	65	1.69	0.11	19
5–10	0.12	0.01	34	0.07	0.01	41	1.49	0.07	14
10–20	0.16	0.02	37	0.14	0.01	27	2.95	0.10	10
20–30	0.24	0.07	94	0.14	0.02	46	2.34	0.13	17
30–40	0.07	0.01	63	0.12	0.02	51	1.15	0.11	31
40–50	0.08	0.04	66	0.23	0.05	73	0.78	0.29	42
50–60	0.10	0.03	78	0.20	0.04	65	0.52	0.05	31
Sum	1.08			0.81			9.55		
Carlow									
0–5	0.04	0.00	36	0.03	0.01	72	1.29	0.09	23
5–10	0.05	0.02	135	0.03	0.01	101	1.20	0.06	17
10–20	0.10	0.02	61	0.06	0.01	43	2.62	0.11	13
20–30	0.04	0.01	63	0.03	0.01	58	1.95	0.07	12
30–40	0.01	0.00	105	0.02	0.01	105	0.90	0.12	43
40–50	0.01	0.00	67	0.01	0.00	67	0.60	0.15	51
50–60	0.01	0.00	122	0.01	0.00	96	0.34	0.09	62
Sum	0.25			0.20			8.91		
Gebesee									
0–5	0.25	0.04	48	0.09	0.01	40	0.93	0.04	13
5–10	0.06	0.01	66	0.09	0.01	43	1.13	0.05	13
10–20	0.08	0.02	64	0.20	0.03	42	2.35	0.04	5
20–30	0.08	0.01	34	0.20	0.02	30	2.29	0.06	7
30–40	0.02	0.00	56	0.10	0.02	49	1.93	0.13	20
40–50	0.01	0.00	35	0.07	0.01	18	1.38	0.09	10
50–60	0.01	0.00	75	0.03	0.01	73	1.20	0.08	31
Sum	0.49			0.77			11.23		

Table A2 *continued*

Soil depth [cm]	fLF			oLF			HF		
	mean [kg OC m ⁻²]	se	cv [%]	mean [kg OC m ⁻²]	se	cv [%]	mean [kg OC m ⁻²]	se	cv [%]
Grignon									
0–5	0.25	0.03	37	0.12	0.01	18	1.10	0.06	16
5–10	0.10	0.01	37	0.16	0.01	21	1.29	0.03	9
10–20	0.27	0.05	56	0.31	0.03	25	2.47	0.10	12
20–30	0.30	0.02	23	0.23	0.03	36	2.15	0.13	19
30–40	0.21	0.04	62	0.15	0.03	54	1.56	0.15	30
40–50	0.11	0.04	46	0.05	0.01	22	0.82	0.13	22
50–60	0.01	0.00	62	0.06	0.01	51	0.60	0.04	22
Sum	1.23			1.09			10.02		
Norunda									
0–5	0.54	0.09	45	0.21	0.03	46	0.95	0.17	51
5–10	0.15	0.02	42	0.08	0.02	57	0.51	0.14	73
Wetzstein									
0–10	0.28	0.05	55	0.44	0.07	50	1.72	0.27	49
10–30	0.22	0.03	42	0.30	0.07	71	3.31	0.17	16
30–50	0.22	0.04	52	0.15	0.02	50	2.06	0.21	32
Sum	0.72			0.90			7.08		
Le Bray									
0–5	0.74	0.07	27	0.63	0.12	56	0.59	0.10	53
5–10	0.53	0.13	75	0.62	0.09	44	0.76	0.13	50
10–20	1.62	0.46	85	1.90	0.18	29	1.35	0.27	60
20–30	0.96	0.21	65	1.41	0.28	59	1.38	0.27	60
30–40	0.43	0.13	95	0.95	0.18	60	1.36	0.18	42
40–50	0.35	0.09	85	0.67	0.15	71	0.85	0.16	58
50–60	0.14	0.03	72	0.27	0.14	157	0.83	0.20	73
Sum	4.78			6.45			7.13		

Supplementary Table A3

Site characteristics, means of 10 samples per site (standard error in brackets).

Soil depth [cm]	OC [g kg ⁻¹]	IC	C/N	OC stock [kg C m ⁻²]	pH (H ₂ O)	Sand	Silt [g kg ⁻¹]	Clay
<i>Hesse, France, deciduous forest, 48°40'N, 07°05'E, 820 mm, Stagnic Luvisol</i>								
0–5	34 (2)	0	15 (1)	1.4 (0.1)	4.7 (0.0)	107 (14)	578 (13)	314 (5)
5–10	19 (1)	0	13 (0)	1.1 (0.1)	4.6 (0.0)	78 (12)	605 (10)	318 (8)
10–20	15 (1)	0	12 (0)	1.7 (0.1)	4.7 (0.0)	79 (12)	601 (13)	320 (8)
20–30	11 (1)	0	11 (1)	1.3 (0.1)	4.6 (0.0)	79 (11)	606 (12)	315 (10)
30–40	6 (1)	0	9 (0)	0.9 (0.1)		82 (14)	579 (14)	339 (10)
40–50	4 (1)	0	7 (1)	0.6 (0.1)		86 (17)	550 (15)	364 (13)
50–60	3 (0)	0	5 (1)	0.4 (0.1)		74 (16)	518 (18)	408 (10)
<i>Sorø, Denmark, deciduous forest, 55° 29'N, 11° 38'E, 660 mm, Gleyic Cambisol</i>								
0–5	62 (4)	0	14 (0)	2.4 (0.1)	5.9 (0.1)	482 (34)	260 (14)	258 (28)
5–10	42 (5)	0	13 (0)	2.1 (0.2)	5.6 (0.1)	498 (40)	267 (17)	235 (26)
10–20	24 (4)	0	12 (0)	2.6 (0.3)	6.1 (0.1)	534 (36)	246 (19)	220 (24)
20–30	10 (1)	0	12 (0)	1.4 (0.2)	6.8 (0.1)	524 (43)	207 (17)	269 (30)
30–40	6 (1)	17 (7)	10 (0)	0.8 (0.1)		477 (52)	211 (23)	312 (33)
40–50	3 (1)	43 (15)	10 (1)	0.2 (0.2)		262 (12)	285 (12)	453 (23)
50–60	3 (1)	37 (9)	9 (0)	0.4 (0.1)		425 (64)	245 (31)	330 (39)
<i>Hainich, Germany, deciduous forest, 51°04'N, 10°27'E, 800 mm, Eutric Cambisol</i>								
0–5	62 (7)	1 (0)	13 (0)	2.4 (0.2)	6.0 (0.1)	24 (1)	459 (25)	517 (26)
5–10	41 (5)	0 (0)	12 (0)	2.0 (0.1)	5.9 (0.1)	28 (3)	466 (26)	506 (27)
10–20	24 (2)	0 (0)	11 (0)	2.8 (0.2)	6.6 (0.1)	27 (1)	473 (31)	500 (32)
20–30	16 (1)	1 (0)	10 (0)	2.1 (0.1)	7.1 (0.0)	29 (3)	350 (37)	621 (35)
30–40	10 (1)	3 (1)	9 (0)	1.4 (0.1)	7.4 (0.0)	37 (7)	305 (39)	658 (39)
40–50	8 (2)	9 (5)	9 (1)	0.9 (0.3)	7.6 (0.0)	47 (9)	325 (28)	628 (26)
50–60	7 (1)	11 (3)	8 (1)	0.7 (0.2)	7.8 (0.0)	17 (4)	279 (39)	704 (40)
<i>Bugac, Hungary, grassland, 46.8 °, E 18.9°, 500 mm, Eutric Arenosol</i>								
0–5	74 (7)	10 (2)	10 (0)	3.2 (0.2)	7.8 (0.0)	601 (32)	179 (26)	220 (28)
5–10	39 (4)	11 (2)	10 (0)	2.5 (0.2)	8.1 (0.0)	684 (28)	164 (24)	152 (16)
10–20	19 (3)	9 (1)	13 (1)	2.6 (0.3)	8.4 (0.0)	782 (15)	103 (19)	116 (14)
20–30	9 (1)	9 (1)	20 (2)	1.5 (0.1)	8.6 (0.0)	805 (32)	73 (15)	122 (21)
30–40	8 (1)	11 (2)	^b	1.2 (0.1)		799 (47)	74 (21)	127 (30)
40–50	7 (1)	13 (3)	^b	1.2 (0.1)				
50–60	8 (1)	15 (2)	^b	1.4 (0.1)		803 (33)	90 (22)	107 (18)
<i>Laqueuille, France, grassland, 45°38'N, 02°44'E, 1313 mm, Umbric Andosol</i>								
0–5	126 (3)	0	11 (0)	2.9 (0.2)	5.3 (0.0)	186 (12)	551 (10)	263 (9)
5–10	103 (4)	0	10 (0)	3.6 (0.2)	5.3 (0.0)	232 (21)	538 (15)	229 (12)
10–20	70 (6)	0	10 (0)	5.4 (0.3)	5.5 (0.0)	247 (19)	549 (15)	204 (16)
20–30	59 (4)	0	10 (0)	4.3 (0.2)	5.7 (0.0)	240 (6)	550 (9)	210 (9)
30–40	49 (4)	0	10 (0)	3.6 (0.2)		251 (8)	542 (11)	207 (15)
40–50	31 (8)	0	11 (0)	2.4 (0.5)		333 (28)	497 (15)	170 (18)
50–60	21 (4)	0	10 (0)	1.7 (0.3)		370 (29)	482 (13)	148 (23)

Table A3 *continued*

Soil depth [cm]	OC [g kg ⁻¹]	IC	C/N	OC stock [kg C m ⁻²]	pH (H ₂ O)	Sand	Silt [g kg ⁻¹]	Clay
<i>Easter Bush, UK, grassland, 55° 52' N, 3° 10' W, 890 mm, Stagnic Cambisol</i>								
0–5	48 (2)	0	13 (0)	2.3 (0.1)	5.6 (0.1)	559 (8)	195 (8)	246 (5)
5–10	33 (3)	0	13 (0)	1.8 (0.1)	5.9 (0.0)	559 (38)	191 (7)	250 (33)
10–20	25 (1)	0	13 (0)	3.0 (0.2)	5.8 (0.0)	590 (13)	192 (7)	218 (8)
20–30	20 (1)	0	13 (0)	2.7 (0.2)	6.2 (0.0)	600 (11)	190 (5)	210 (8)
30–40	12 (1)	0	13 (0)	1.6 (0.2)		633 (16)	168 (7)	199 (12)
40–50	6 (2)	0	15 (0)	0.9 (0.2)				
50–60	6 (0)	0	15 (0)	0.7 (0.1)		553 (36)	206 (26)	241 (17)
<i>Carlow, Ireland, cropland, 52° 51' N, 6° 54' W, 804 mm, Eutric Cambisol</i>								
0–5	24 (2)	3 (2)	10 (0)	1.4 (0.1)	7.7 (0.0)	572 (21)	214 (17)	214 (9)
5–10	24 (2)	3 (2)	10 (0)	1.3 (0.1)	7.7 (0.0)	567 (20)	225 (14)	209 (12)
10–20	25 (2)	3 (2)	10 (0)	2.7 (0.1)	7.6 (0.1)	559 (21)	217 (11)	224 (12)
20–30	19 (2)	3 (1)	9 (0)	2.0 (0.1)	7.6 (0.1)	560 (23)	215 (11)	224 (14)
30–40	9 (1)	7 (6)	9 (1)	0.9 (0.1)		565 (40)	180 (20)	255 (29)
40–50	11 (2)	13 (11)	8 (1)	0.6 (0.2)				
50–60	4 (1)	26 (11)	7 (1)	0.4 (0.1)		552 (51)	163 (21)	285 (48)
<i>Gebesee, Germany, cropland, 51° 06' N, 10° 55' E, 470mm, Haplic Phaeozem</i>								
0–5	27 (1)	0 (0)	12 (0)	1.4 (0.1)	7.1 (0.0)	30 (2)	613 (12)	358 (12)
5–10	21 (0)	0 (0)	11 (0)	1.5 (0.1)	7.1 (0.1)	25 (1)	588 (12)	387 (12)
10–20	21 (1)	1 (0)	11 (0)	3.0 (0.1)	7.3 (0.0)	25 (1)	608 (13)	366 (13)
20–30	21 (1)	2 (0)	11 (0)	2.9 (0.1)	7.3 (0.0)	23 (0)	588 (21)	389 (21)
30–40	16 (1)	4 (2)	11 (0)	2.2 (0.1)		20 (1)	637 (12)	343 (13)
40–50	11 (1)	10 (2)	11 (0)	1.5 (0.1)				
50–60	7 (1)	19 (2)	10 (0)	0.9 (0.1)		16 (1)	686 (11)	298 (11)
<i>Grignon, France, cropland, 48° 51' N, 1° 58' E, 700 mm, Eutric Cambisol</i>								
0–5	22 (0)	1 (0)	12 (0)	1.5 (0.1)	7.7 (0.0)	80 (4)	581 (10)	339 (8)
5–10	21 (0)	1 (0)	12 (0)	1.6 (0.0)	7.7 (0.0)	79 (4)	581 (12)	340 (11)
10–20	20 (1)	1 (1)	11 (0)	3.0 (0.1)	7.7 (0.0)	82 (5)	580 (12)	338 (8)
20–30	17 (1)	1 (0)	12 (0)	2.7 (0.1)	7.8 (0.0)	76 (4)	572 (11)	352 (8)
30–40	12 (1)	0 (0)	11 (1)	1.9 (0.2)		67 (9)	587 (15)	346 (11)
40–50	7 (1)	0 (0)	9 (1)	1.1 (0.2)				
50–60	5 (0)	0 (0)	8 (0)	0.7 (0.1)		40 (4)	565 (18)	395 (16)
<i>Norunda, Sweden, coniferous forest, 60° 5' N, 17° 29' E, 527mm, Haplic Podzol</i>								
0–5	67 (7)	0	30 (2)	1.5 (0.2)	4.1 (0.0)	497 (53)	364 (38)	140 (32)
5–10	25 (4)	0	24 (2)	0.7 (0.1)	4.6 (0.0)	536 (58)	315 (47)	149 (27)
10–20	13 (2)	0	21 (2)	°	5.0 (0.0)	539 (64)	293 (41)	169 (42)
20–30	8 (1)	0	20 (2)	°	5.4 (0.1)	525 (92)	259 (38)	216 (75)
30–40	6 (1)	0	18 (2)	°		468 (98)	285 (54)	247 (83)

Table A3 *continued*

Soil depth [cm]	OC [g kg ⁻¹]	IC	C/N	OC stock [kg C m ⁻²]	pH (H ₂ O)	Sand	Silt [g kg ⁻¹]	Clay
<i>Wetzstein, Germany, coniferous forest, 50°27'N, 11°27'E, 840mm, Cambic Podzol</i>								
0–10	77 (5)	0	24 (1)	2.4 (0.3)	3.5 (0.0)	233 (25)	504 (16)	263 (23)
10–30	54 (6)	0	23 (1)	3.8 (0.2)	3.7 (0.0)	199 (14)	435 (22)	366 (21)
30–50	37 (4)	0	20 (1)	2.4 (0.2)	4.2 (0.0)	217 (19)	446 (15)	337 (16)
<i>Le Bray, France, coniferous forest, 44°43'N, 0°46'E, 900mm, Anthric Ortsteinic Podzol</i>								
0–5	42 (4)	0	24 (1)	2.0 (0.1)	4.2 (0.0)	860 (7)	59 (4)	82 (4)
5–10	30 (4)	0	23 (1)	1.8 (0.2)	4.2 (0.0)	874 (5)	50 (4)	76 (4)
10–20	40 (4)	0	23 (1)	4.4 (0.6)	4.2 (0.0)	863 (10)	59 (5)	77 (5)
20–30	28 (4)	0	23 (1)	3.7 (0.3)	4.2 (0.0)	884 (9)	52 (4)	64 (9)
30–40	19 (3)	0	23 (1)	2.9 (0.4)		904 (10)	35 (3)	61 (8)
40–50	14 (3)	0	21 (1)	2.2 (0.5)		915 (11)	23 (4)	62 (9)
50–60	9 (2)	0	19 (1)	1.5 (0.3)		938 (8)	15 (2)	47 (6)

^aFAO (2006), ^bN concentration too low, ^c no stone content available to determine stocks

