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*Supplement of*

**Large fluxes and rapid turnover of mineral-associated carbon across topographic gradients in a humid tropical forest: insights from paired  $^{14}\text{C}$  analysis**

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## 2 Introduction

3 These data tables provide detailed information on the biogeochemical characteristics of individual soil samples; summaries of these  
4 data are presented in the figures and tables of the main text. Table 1 provides chemical extraction, fine root, and texture data from the  
5 2012 samples. Table 2 provides modeled C turnover estimates and  $^{14}\text{C}$  content from the 2012 samples. Table 3 provides C fraction  
6 data and  $^{14}\text{C}$  content of the 1988 samples.

## 7 Supplemental Table 1

8 Radiocarbon content and modeled decomposition rates, residence times, and the fraction of mineral-associated C comprised by the  
9 slow pool for each sample. Steady state C inputs to the slow pool are calculated as the product of the heavy fraction C stock, the  
10 fraction of heavy fraction C in the slow pool, and the modeled decomposition rate of the slow pool. Standard deviations for  
11 decomposition rate constants and fraction slow pool (shown in parentheses) were determined using a Monte Carlo approach as  
12 described in Section 2.4.

Sample	Depth	Position	C content (%)	Heavy fraction C stock ( $\text{g m}^{-2}$ )	$\Delta^{14}\text{C}$ (‰)	Decomposition rate constant, k ( $\text{y}^{-1}$ , slow pool)	Residence time (y, slow pool, no lag)	Residence time (y, slow pool, 3 y lag)	Fraction slow pool (no lag)	Fraction slow pool (3 y lag)	Steady state C input to slow pool ( $\text{g m}^{-3}$ , no lag)	Steady state C input to slow pool ( $\text{g m}^{-3}$ , 3 y lag)
1	0 - 10 cm	Valley	3.48	2436	73.4	0.057 (0.009)	18 (3)	16 (2)	0.74 (0.05)	0.69 (0.05)	100 (18)	102 (18)
2	10 - 20 cm	Valley	2.69	2196	84.7	0.049 (0.007)	21 (4)	19 (3)	0.77 (0.04)	0.71 (0.04)	81 (16)	82 (15)
3	0 - 10 cm	Valley	3.18	1875	75.5	0.055 (0.008)	18 (3)	17 (2)	0.75 (0.05)	0.69 (0.05)	78 (14)	77 (13)

4	10 - 20 cm	Valley	2.5	1489	80	0.052 (0.008)	19 (4)	18 (3)	0.76 (0.04)	0.7 (0.04)	60 (13)	58 (10)
5	0 - 10 cm	Valley	3.48	2606	100	0.04 (0.007)	26 (4)	23 (4)	0.82 (0.03)	0.76 (0.04)	82 (13)	85 (19)
6	10 - 20 cm	Valley	2.94	2181	85.6	0.048 (0.007)	21 (4)	19 (3)	0.77 (0.04)	0.71 (0.04)	80 (16)	81 (15)
7	0 - 10 cm	Valley	3.99	3027	73.8	0.057 (0.009)	18 (3)	17 (2)	0.74 (0.05)	0.69 (0.05)	124 (22)	126 (22)
8	10 - 20 cm	Valley	3.23	2677	82.8	0.05 (0.008)	20 (4)	19 (3)	0.76 (0.04)	0.71 (0.04)	102 (21)	102 (19)
9	0 - 10 cm	Valley	2.64	1793	84	0.049 (0.007)	20 (4)	19 (3)	0.76 (0.04)	0.71 (0.04)	68 (14)	67 (12)
10	10 - 20 cm	Valley	1.94	1641	97.7	0.041 (0.007)	25 (4)	23 (3)	0.81 (0.03)	0.75 (0.04)	53 (9)	55 (12)
11	0 - 10 cm	Slope	2.78	1889	93.4	0.044 (0.007)	23 (4)	21 (3)	0.79 (0.04)	0.74 (0.04)	65 (12)	65 (13)
12	10 - 20 cm	Slope	1.61	1225	51	0.09 (0.017)	9 (5)	11 (2)	0.75 (0.06)	0.67 (0.06)	102 (57)	73 (18)
13	0 - 10 cm	Slope	3.82	2496	73.9	0.057 (0.009)	18 (3)	17 (2)	0.74 (0.05)	0.69 (0.05)	103 (18)	104 (18)
14	10 - 20 cm	Slope	1.67	1395	30.5	--	--	--	0.49 (0.09)	0.46 (0.08)	36 (36)	35 (28)
15	0 - 10 cm	Slope	3.79	1988	66.2	0.064 (0.01)	16 (4)	15 (2)	0.74 (0.05)	0.68 (0.05)	92 (24)	91 (17)
16	10 - 20 cm	Slope	1.8	1453	23.9	--	--	--	0.45 (0.09)	0.43 (0.09)	34 (13)	34 (29)
17	0 - 10 cm	Slope	4.03	2667	109.4	0.035 (0.006)	29 (5)	26 (4)	0.86 (0.03)	0.79 (0.03)	79 (14)	81 (21)
18	10 - 20 cm	Slope	4.28	2842	89.6	0.046 (0.007)	22 (4)	20 (3)	0.78 (0.04)	0.73 (0.04)	101 (19)	101 (20)
19	0 - 10 cm	Slope	2.29	2029	28.5	--	--	--	0.48 (0.09)	0.45 (0.08)	51 (19)	50 (41)
20	10 - 20 cm	Slope	1.68	1458	5.7	--	--	--	0.35 (0.1)	0.33 (0.1)	27 (11)	27 (29)
21	0 - 10 cm	Ridge	5.17	2562	78.5	0.053 (0.008)	19 (4)	18 (3)	0.75 (0.05)	0.7 (0.04)	101 (22)	101 (18)
22	10 - 20 cm	Ridge	3.3	1730	62.7	0.068 (0.012)	14 (5)	14 (2)	0.74 (0.05)	0.68 (0.05)	91 (33)	82 (16)
23	0 - 10 cm	Ridge	4.48	2334	72.8	0.058 (0.009)	18 (3)	16 (2)	0.74 (0.05)	0.69 (0.05)	96 (17)	98 (17)
24	10 - 20 cm	Ridge	3.21	2278	57.4	0.076 (0.014)	11 (6)	13 (2)	0.74 (0.05)	0.67 (0.05)	153 (84)	118 (27)
25	0 - 10 cm	Ridge	4.38	2155	78.4	0.053 (0.008)	19 (4)	18 (3)	0.75 (0.05)	0.7 (0.04)	85 (19)	85 (15)
26	10 - 20 cm	Ridge	2.3	1440	28.2	--	--	--	0.48 (0.09)	0.45 (0.08)	36 (13)	35 (29)
27	0 - 10 cm	Ridge	4.98	2120	95.8	0.042 (0.007)	24 (4)	22 (3)	0.8 (0.04)	0.74 (0.04)	71 (12)	72 (15)
28	10 - 20 cm	Ridge	3.96	3033	97.6	0.041 (0.007)	25 (4)	23 (3)	0.81 (0.03)	0.75 (0.04)	98 (16)	101 (22)
29	0 - 10 cm	Ridge	5.29	2976	78.2	0.053 (0.008)	19 (4)	18 (3)	0.75 (0.05)	0.7 (0.04)	117 (26)	118 (21)
30	10 - 20 cm	Ridge	3.16	2403	72	0.058 (0.009)	17 (3)	16 (2)	0.74 (0.05)	0.69 (0.05)	105 (20)	102 (18)

14 **Supplemental Table 2**

15 Carbon content by density fraction and  $^{14}\text{C}$  from four 1988 samples (0 – 10 cm depth). See Section 2 for further details.

Position	Free light fraction C (%)	Occluded light fraction C (%)	Heavy fraction C (%)	Free light fraction C (mg g <sup>-1</sup> )	Occluded light fraction C (mg g <sup>-1</sup> )	Heavy fraction C (mg g <sup>-1</sup> )	Mineral- associated $\Delta^{14}\text{C}$ (‰)
Slope	34.1	31.7	1.7	3.9	4.7	16.9	182.2
Slope	29.6	27.8	2.8	2.9	1.5	28.0	169.2
Riparian Valley	28.1	28.1	2.5	2.2	5.3	24.0	216.3
Riparian Valley	31.7	35.7	1.4	2.8	3.7	14.1	178.0

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23 **Supplemental Table 3**

24 Soil characteristics for each sample, listed by depth and topographic position. See Section 2.2 for variable abbreviations and details of  
 25 soil analyses. These data were used to generate Table 2 in the main text.

Sample	Depth	Position	Fe <sub>ca</sub> (field extraction, mg g <sup>-1</sup> )	Fe <sub>ca</sub> (dried heavy fraction, mg g <sup>-1</sup> )	Fe <sub>ox</sub> (dried heavy fraction, mg g <sup>-1</sup> )	Fe(III)HCl (field extraction, mg g <sup>-1</sup> )	Fe(II)HCl (field extraction, mg g <sup>-1</sup> )	Al <sub>ca</sub> (field extraction, mg g <sup>-1</sup> )	Al <sub>ca</sub> (dried heavy fraction, mg g <sup>-1</sup> )	Al <sub>ox</sub> (dried heavy fraction, mg g <sup>-1</sup> )	Dead fine roots (mg cm <sup>-3</sup> )	Live fine roots (mg cm <sup>-3</sup> )	Clay (%)	Sand (%)	Silt (%)
1	0 - 10 cm	Valley	8.29	0.99	7.16	1.79	1.16	1.39	0.1	1.42	0.67	1.19	22.59	22.24	55.17
2	10 - 20 cm	Valley	7.52	1.29	8.21	1.44	1.89	1.11	0.11	1.31	0.03	0	17.58	36.76	45.66
3	0 - 10 cm	Valley	10.13	1.48	7.42	1.57	0.25	2.14	0.2	1.5	--	--	27.07	15.63	57.3
4	10 - 20 cm	Valley	9.98	1.09	7.93	0.8	0.55	2.04	0.15	1.76	1.47	0.56	33.69	16.3	50
5	0 - 10 cm	Valley	9.5	0.81	6.34	1.24	0.45	1.94	0.11	1.44	0.48	0.74	22.67	20.93	56.4
6	10 - 20 cm	Valley	8.84	0.81	9.14	1.16	0.5	1.83	0.11	2.04	0.29	0.61	17.53	34.91	47.55
7	0 - 10 cm	Valley	14.16	1.06	8.8	1.37	0.11	3.9	0.26	2.08	0.32	1.1	26.43	21.43	52.14
8	10 - 20 cm	Valley	14.57	1.17	8.57	1.2	0.83	3.81	0.22	2.31	0.3	1.26	26.83	21.32	51.85
9	0 - 10 cm	Valley	7.59	0.68	7.1	0.99	0.22	1.65	0.1	1.4	0.41	0.24	17.13	50.72	32.15
10	10 - 20 cm	Valley	6.81	0.57	7.65	0.55	0.39	1.43	0.08	1.53	0.19	0.52	21.61	47.42	30.97
11	0 - 10 cm	Slope	14.14	0.81	6.84	1.65	0.05	3.8	0.13	1.47	0.85	0.63	25.3	18.25	56.45
12	10 - 20 cm	Slope	12.82	0.81	5.49	0.97	0.02	3.09	0.12	1.5	0.56	0.95	32.48	13.33	54.19
13	0 - 10 cm	Slope	18.51	1.27	9.4	2.56	0.09	3.84	0.15	1.45	0.34	0.44	43.97	7.99	48.03
14	10 - 20 cm	Slope	17.19	1.14	6.86	1.5	0.04	3.05	0.17	1.5	0.13	0.37	43.52	21.92	34.57
15	0 - 10 cm	Slope	18.08	1.2	9.1	3.98	0.45	4.38	0.17	1.63	0.77	2.31	37.55	7.78	54.67
16	10 - 20 cm	Slope	12.7	0.82	5.02	1.39	0.11	3.05	0.13	1.7	0.3	0.66	39.25	9	51.75
17	0 - 10 cm	Slope	22.14	1.47	12.94	7.5	3.87	6.29	0.14	1.53	0.71	2.16	23.13	8.93	67.94
18	10 - 20 cm	Slope	21.37	1.52	15.03	2.29	10.72	6.34	0.13	1.76	0.31	1.39	30.5	8.21	61.3
19	0 - 10 cm	Slope	9.21	0.78	4.57	0.48	0.06	2.09	0.1	1.25	0.74	2.08	53.02	7.58	39.4
20	10 - 20 cm	Slope	4.58	0.58	3.96	0.3	0.03	1.54	0.1	1.51	0.12	0.35	47.8	10.84	41.36
21	0 - 10 cm	Ridge	21.78	1.11	7.07	2.17	0.37	8.51	0.29	3.08	1	2.51	41.13	15.63	43.23

22	10 - 20 cm	Ridge	21.36	1.25	6.34	0.82	0.11	5.81	0.15	1.57	0.71	2.45	58.4	10.01	31.59
23	0 - 10 cm	Ridge	29.87	1.22	9.54	3.44	0.3	8.18	0.16	1.68	0.75	4.3	43.92	13.03	43.05
24	10 - 20 cm	Ridge	27.53	1.19	7.08	1.36	0.13	8.65	0.18	1.65	0.24	1.53	50.71	6.71	42.58
25	0 - 10 cm	Ridge	29.4	1.5	11.51	5.36	0.46	9.19	0.21	1.89	0.56	0.71	45.96	9.11	44.93
26	10 - 20 cm	Ridge	27.36	1.49	9.89	1.91	0.18	7.36	0.21	2.07	0.68	1.16	56.38	8.87	34.75
27	0 - 10 cm	Ridge	26.23	1.14	8.81	1.15	0.23	12.53	0.22	2.02	1.59	3.4	35.77	5.74	58.49
28	10 - 20 cm	Ridge	24.85	1.18	7.95	1.33	0.14	10.33	0.22	1.84	1.08	1.52	45.51	7.59	46.9
29	0 - 10 cm	Ridge	22.28	1.07	7.5	0.69	0.19	10.82	0.33	3.28	0.37	1.77	25.23	11.16	63.61
30	10 - 20 cm	Ridge	19.11	0.99	6.83	0.63	0.11	8.15	0.28	2.52	0.38	0.38	34.01	7.74	58.25