Supplemental information for Parent material and climate interact to control soil C dynamics through the development of poorly crystalline minerals

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10 Abstract

11 Lorem ipsum. . .

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Supplemental Information

Soil carbon

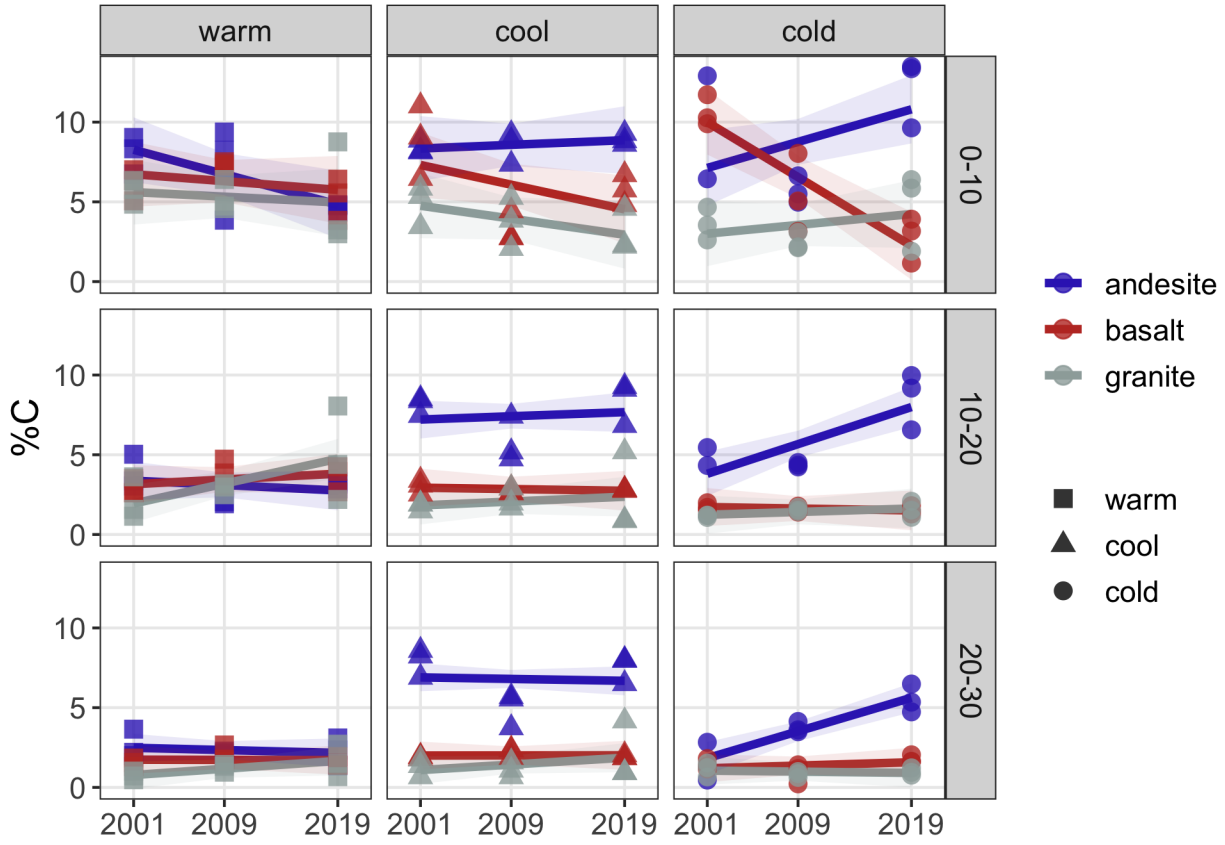

Figure 1. Change in soil C concentration over time. Points show replicate profiles (n = 3); lines show marginal mean estimates of linear trends in soil C concentration with time; ribbons show 95% CIs around trend estimates.

Radiocarbon depth profiles: 2001 data

Temporal trend contrast analysis

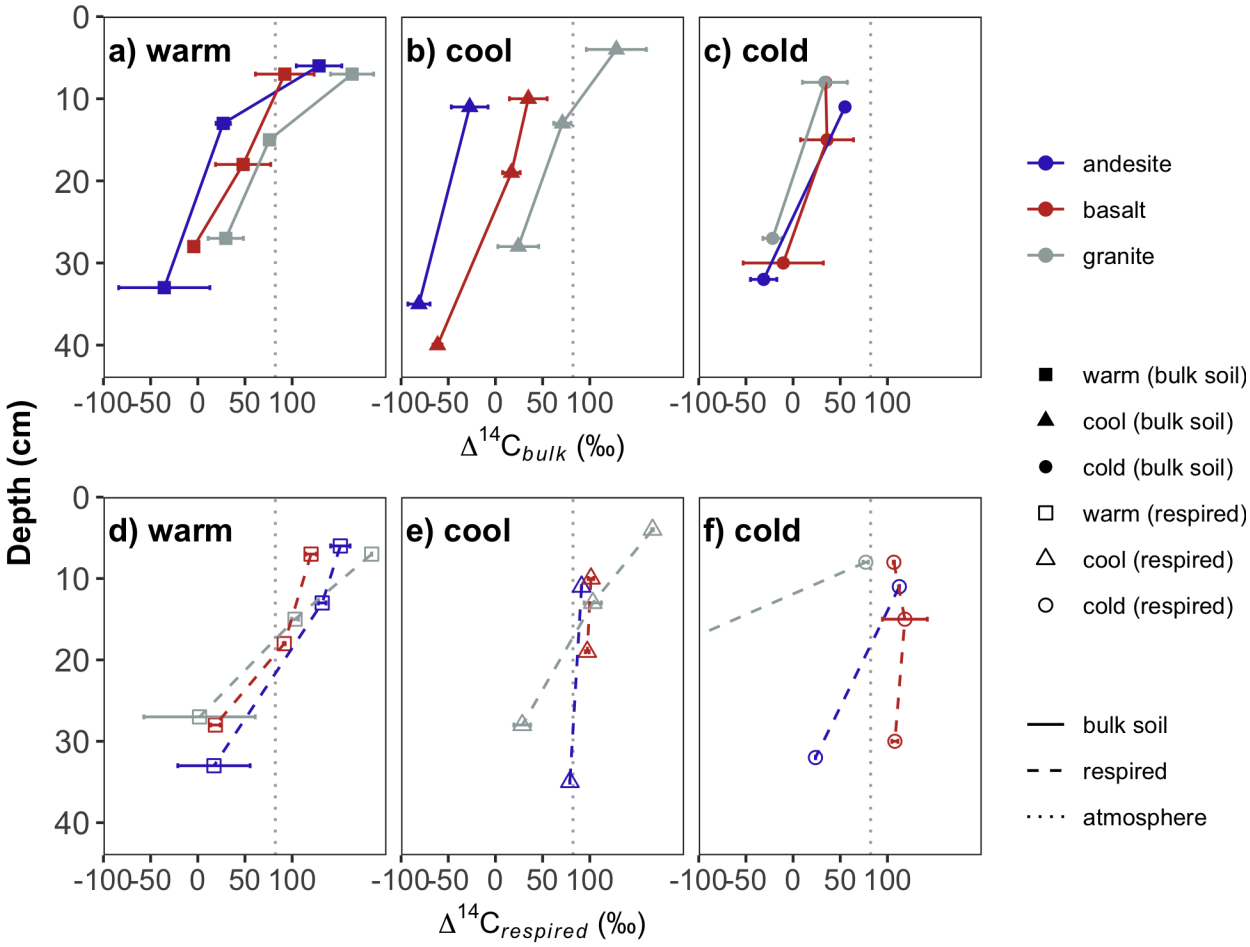

Figure 2. Depth profiles of $\Delta^{14}C_{bulk}$ and $\Delta^{14}C_{respired}$ for 2001 data. Top panels show bulk data, bottom panels respired data. Panels (a) and (d) show data from the warm climate sites, (b) and (e) from the cool climate sites, and (c) and (f) from the cold climate sites. Dotted vertical lines show $\Delta^{14}C$ of the atmosphere in the year of sampling. Points show the mean of three replicate profiles for bulk soil, and the mean of laboratory duplicates for respired CO_2. Error bars show ± 1 SD for bulk soils and the minimum and maximum for respired CO_2. Respired CO_2 from the cold granite site (panel c) was extremely depleted in $\Delta^{14}C$ and thus is excluded for display purposes.

Table 1

Change in $\Delta^{14}C_{\text{bulk}}$, 2001-2019. Degrees of freedom = 44; confidence level used = 0.95.

		0-10cm		10-20cm		20-30cm	
Climate	Parent material	Trend	*SE*	Trend	*SE*	Trend	*SE*
warm	andesite	**-5.9**	1.3	-2.1	1.2	1.2	1.2
	basalt	-1.9	1.3	-0.3	1.2	-1	1.2
	granite	**-2.8**	1.3	2.1	1.2	0.2	1.2
cool	andesite	0	1.3	0.4	1.2	0.3	1.2
	basalt	-2	1.3	**-3.5**	1.2	**-6.2**	1.2
	granite	**-4.9**	1.3	**-3.7**	1.2	**-3.7**	1.2
cold	andesite	-2.5	1.4	-1.2	1.3	0.1	1.3
	basalt	0.7	1.3	-0.5	1.2	1.5	1.2
	granite	-0.3	1.3	0.4	1.2	0.3	1.2

Table 2

Change in $\Delta^{14}C_{\text{respired}}$, 2001-2019. Degrees of freedom = 44; confidence level used = 0.95.

		0-10cm		10-20cm		20-30cm	
Climate	Parent material	Trend	*SE*	Trend	*SE*	Trend	*SE*
warm	andesite	**-6.2**	0.9	**-2.2**	0.9	1.3	1.7
	basalt	**-2.3**	0.9	-1.1	0.9	0.5	1.7
	granite	**-4.9**	0.9	1.4	0.9	2.8	1.7
cool	andesite	-1.4	0.9	-1	0.9	-1.5	1.7
	basalt	**-3.7**	0.9	**-5.9**	0.9	**-7.8**	1.7
	granite	**-3.1**	0.9	**-4.3**	0.9	0	1.7
cold	andesite	**-2.9**	0.9	-0.8	0.9	1.4	1.7
	basalt	**-3.9**	0.9	**-3.9**	0.9	-3.5	2.1
	granite	0.1	0.9	**4.8**	1.3	**9.7**	2.1

18 **Trend analysis.**

Table 3

Contrasts for bulk and respired $\Delta^{14}C$ temporal trends. P value adjustment: Tukey method for comparing a family of 3 estimates.

			Bulk			Respired		
Depth	Group	Contrast	Est.	*SE*	*p*	Est.	*SE*	*p*
0-10cm	warm	andesite - basalt	-4.0	1.8	0.075	-3.9	1.2	**0.014**
	cool	andesite - granite	4.9	1.8	**0.025**			
	cold	andesite - granite				-3.0	1.2	0.069
	cold	basalt - granite				-4.0	1.2	**0.012**
	andesite	warm - cool	-5.9	1.8	**0.005**	-4.8	1.2	**0.003**
	andesite	warm - cold				-3.3	1.2	**0.04**
	granite	warm - cold				-4.9	1.2	**0.002**
	granite	cool - cold	-4.6	1.8	**0.038**	-3.2	1.2	**0.048**
10-20cm	warm	andesite - granite	-4.2	1.7	**0.04**	-3.6	1.3	**0.028**
	cool	andesite - basalt	3.9	1.7	0.062	4.9	1.3	**0.004**
	cool	andesite - granite	4.1	1.7	0.05	3.3	1.3	**0.05**
	cold	andesite - basalt				3.1	1.3	0.061
	cold	andesite - granite				-5.6	1.5	**0.006**
	cold	basalt - granite				-8.7	1.5	**< .001**
	basalt	warm - cool				4.8	1.3	**0.004**
	basalt	warm - cold				2.9	1.3	0.092
	granite	warm - cool	5.8	1.7	**0.003**	5.7	1.3	**< .001**
	granite	cool - cold	-4.1	1.7	**0.046**	-9.1	1.5	**< .001**

Table 3

Contrasts for bulk and respired $\Delta^{14}C$ temporal trends. P value adjustment: Tukey method for comparing a family of 3 estimates. (continued)

			Bulk			Respired		
Depth	Group	Contrast	Est.	*SE*	*p*	Est.	*SE*	*p*
20-30cm	cool	andesite - basalt	6.5	1.7	**< .001**	6.3	2.5	0.054
	cool	andesite - granite	4.0	1.7	0.055			
	cool	basalt - granite				-7.8	2.5	**0.016**
	cold	andesite - granite				-8.2	2.8	**0.023**
	cold	basalt - granite				-13.2	3.0	**0.001**
	basalt	warm - cool	5.2	1.7	**0.008**	8.2	2.5	**0.011**
	basalt	cool - cold	-7.7	1.7	**< .001**			
	granite	warm - cool	3.9	1.7	0.063			
	granite	warm - cold				-6.9	2.8	0.06
	granite	cool - cold	-4.0	1.7	0.052	-9.6	2.8	**0.008**

19 **Trend contrasts.**

20 **Mineral assemblages**

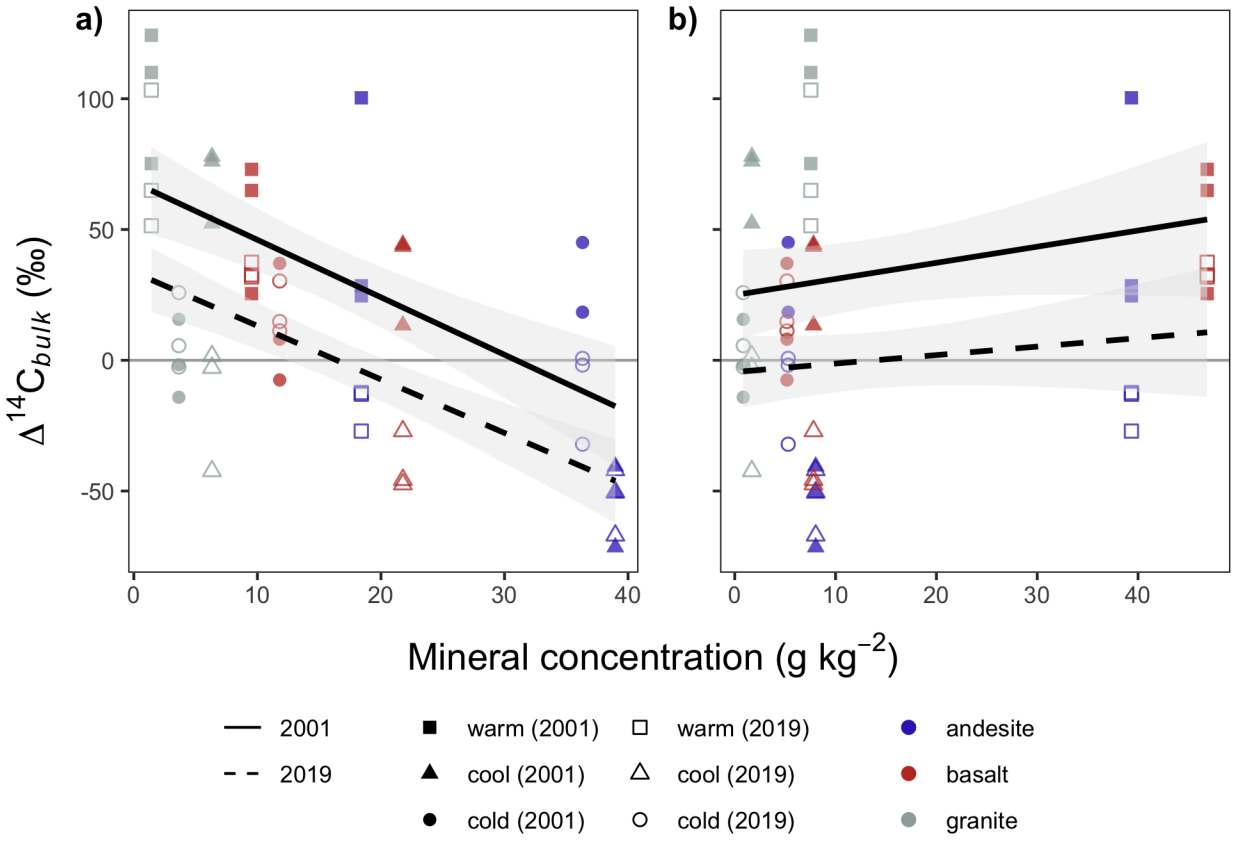

Figure 3. Relationship of poorly crystalline and crystalline minerals to $\Delta^{14}C_{bulk}$. [a)] Poorly crystalline mineral content (oxalate-extractable aluminum + 1/2 oxalate-extractable iron), [b)] Crystalline mineral content (dithionite-extractable iron - oxalate-extractable iron). Points show mass-weighted mineral concentrations and carbon-weighted values of $\Delta^{14}C_{bulk}$ for 0-30cm profiles. Lines show linear model fits from **Eq. 5**.

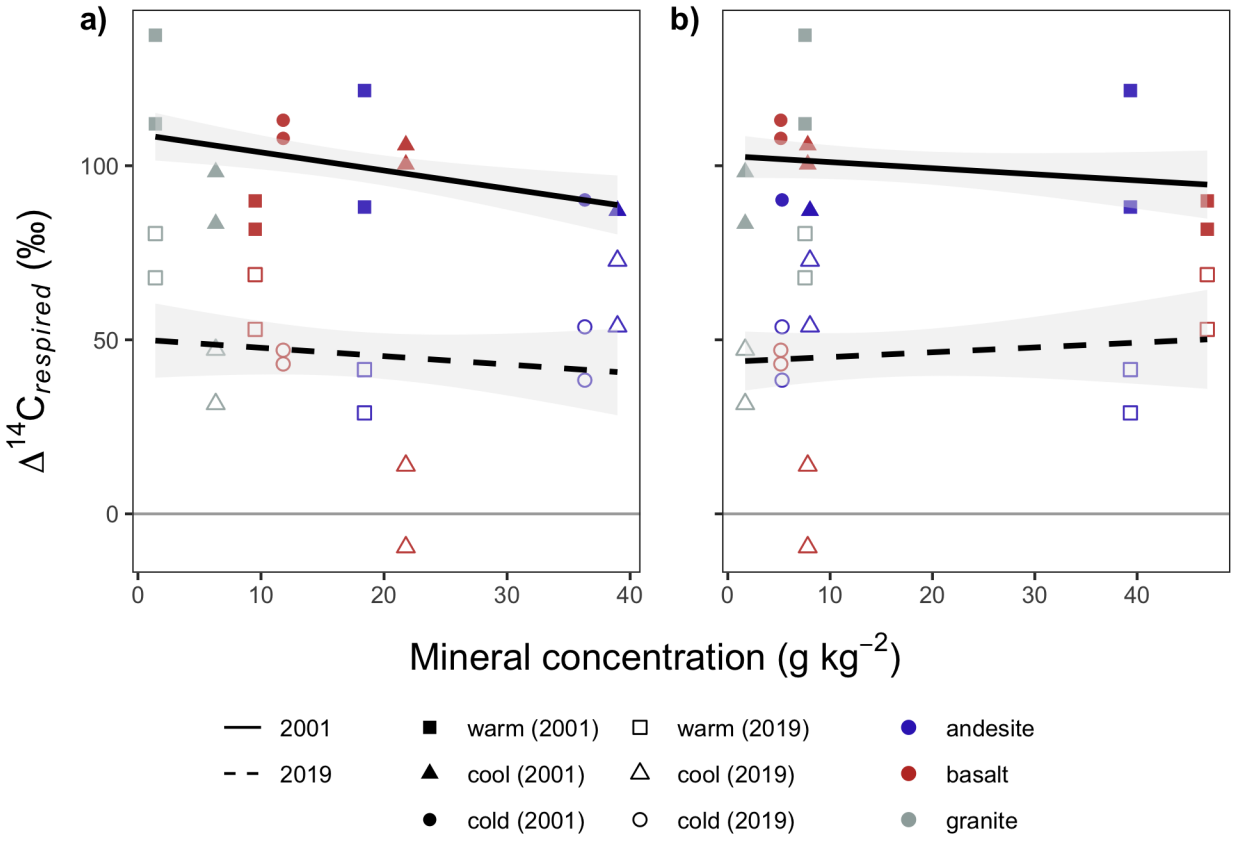

Figure 4. Relationship of poorly crystalline and crystalline minerals to $\Delta^{14}C_{respired}$. [a)] Poorly crystalline mineral content (oxalate-extractable aluminum + 1/2 oxalate-extractable iron), [b)] Crystalline mineral content (dithionite-extractable iron - oxalate-extractable iron). Points show mass-weighted mineral concentrations and carbon-weighted values of $\Delta^{14}C_{respired}$ for 0-30cm profiles. Lines show linear model fits from **Eq. 5**.