

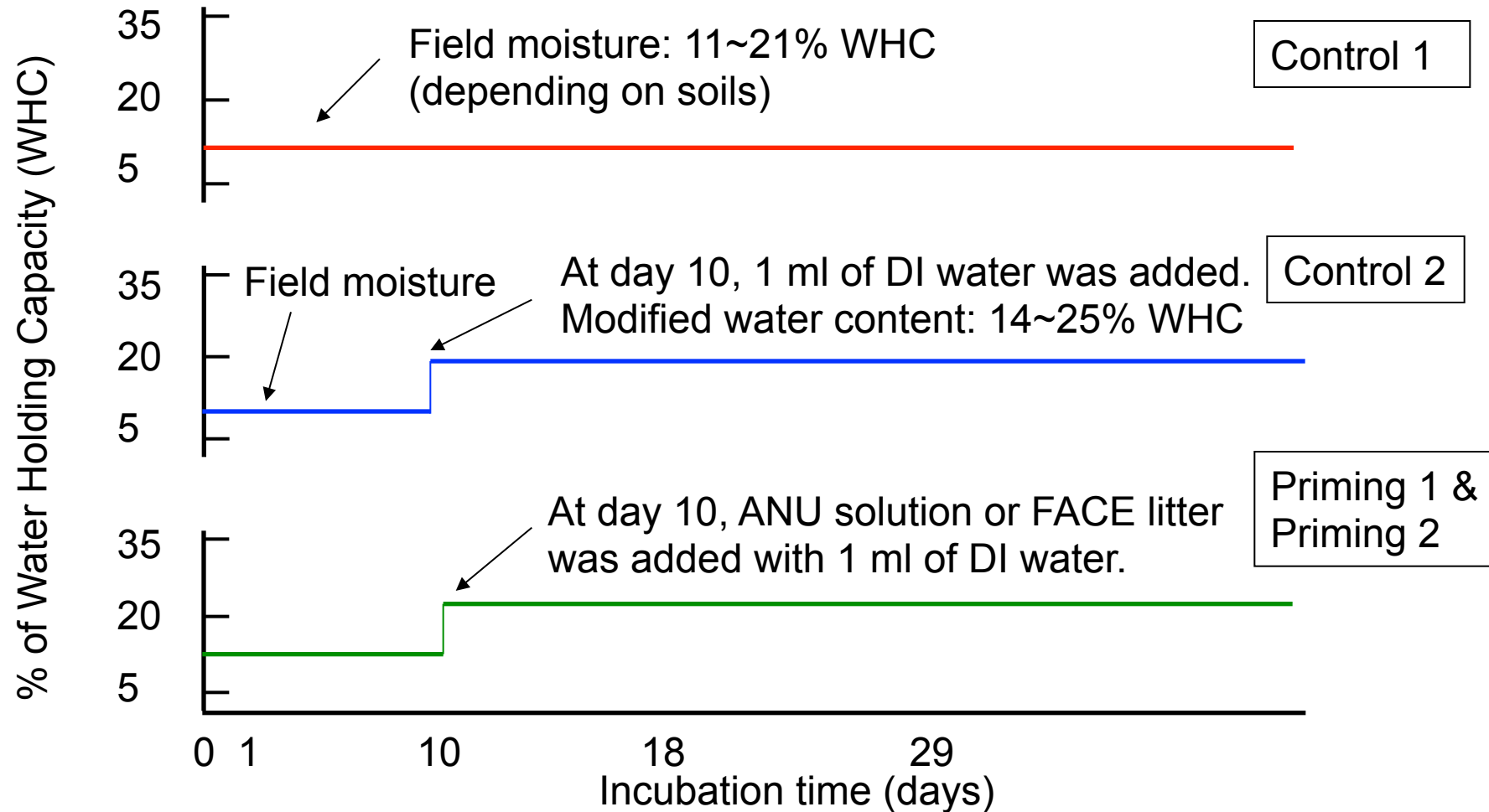
# Sierra soil incubation (priming effect)

## Methods (incubation)

- Soil samples were collected from A and B horizons of the Musick and the Shaver sites in August 2009 (Musick A: MA, Musick B: MB, Shaver A: SA, Shaver B: SB)
- The soils were sieved with 4-mm mesh, and then the remaining visible roots were removed by hand. (The root-picking time was ~15 min to prevent the soils from drying.)
- The soils (50g and 60g dry weight equivalent for A and B horizons respectively) were put into a cups, and placed in 0.5 L mason jars that have a wetted glass beads layer on the bottom.
- The incubation temperature was ~24°C (lab temperature).
- Two priming treatments were made:
  - (P1) Adding 1 mL of ANU sucrose (42%C,  $\delta^{13}\text{C}=-10.25\text{‰}$ ,  $\Delta^{14}\text{C}=485.9\text{‰}$ ) solution
  - (P2) Adding FACE litter (40.7%C,  $\delta^{13}\text{C}=-41.13\text{‰}$ ,  $\Delta^{14}\text{C}=-314\text{‰}$ ) onto the soil with 1 mL of DI water
- Two controls included:
  - (C1) Incubation at field moisture
  - (C2) Adding 1 mL of DI water
- The amount of substrate-C added in the priming treatments corresponded to 0.2% of total soil C, assuming that 10% of microbial biomass C estimated as 2% of total soil C. Thus, the amount of substrate-C was different among the sites and horizons.
- Three replicates for each soil horizon and treatment.

# Methods (incubation)

- Incubation and sampling schedule.



Enclosed period	1-10	10-18	18-29	29-??
$\delta^{13}\text{C}$ meas.	○	○	○	
$\Delta^{14}\text{C}$ meas.	3 per horizon	2 of 3 replicates	×	
CO <sub>2</sub> conc.	Several times during each enclosure.			

## Methods (soil properties)

- Bulk density and gravel (>2mm) content, using bulk core samples.
- Water holding capacity, by filling a furnace with <2mm soil.
- %C, %N, and C/N ratio of bulk soil.
- $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  of bulk soil.
- C isotopes of density separated fractions (LF: <2.0 g cm<sup>-3</sup>, HF: >2.0 g cm<sup>-3</sup>).

## Results (soil properties)

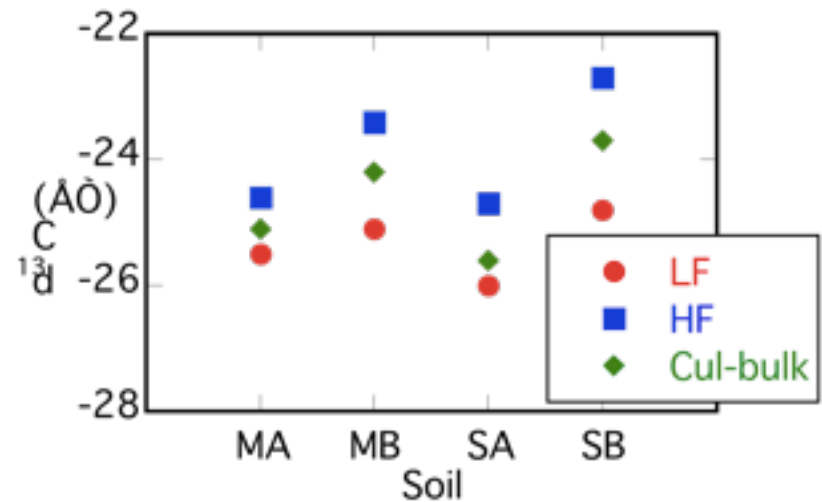
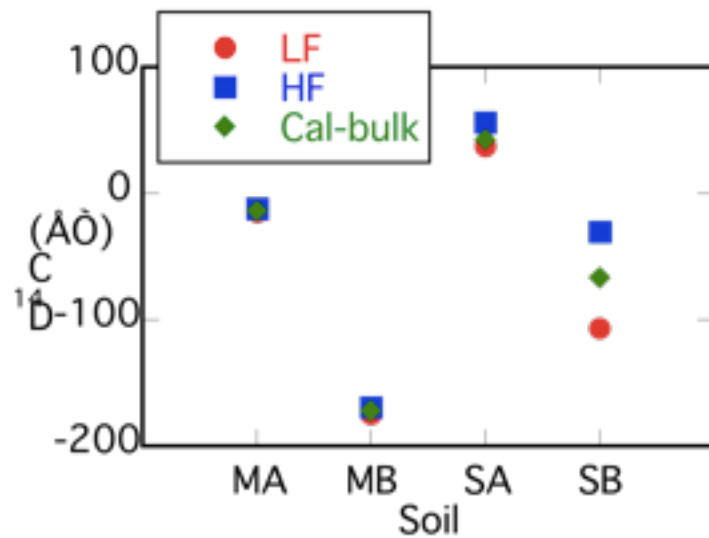
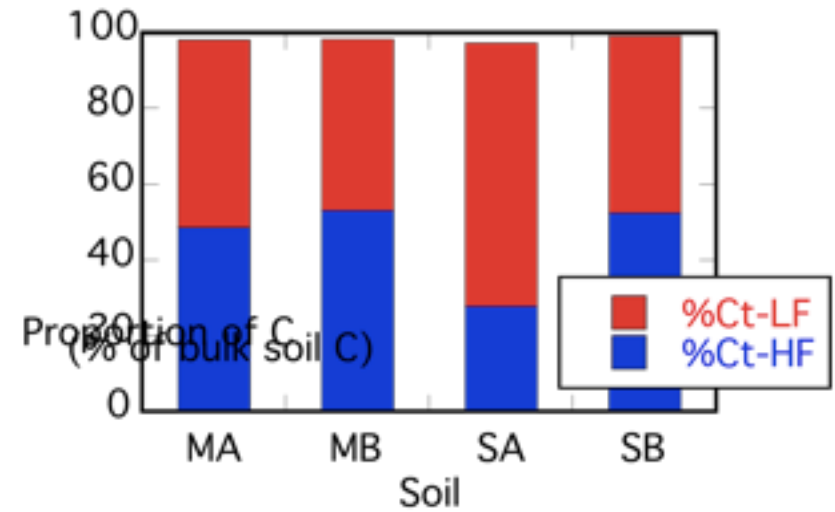
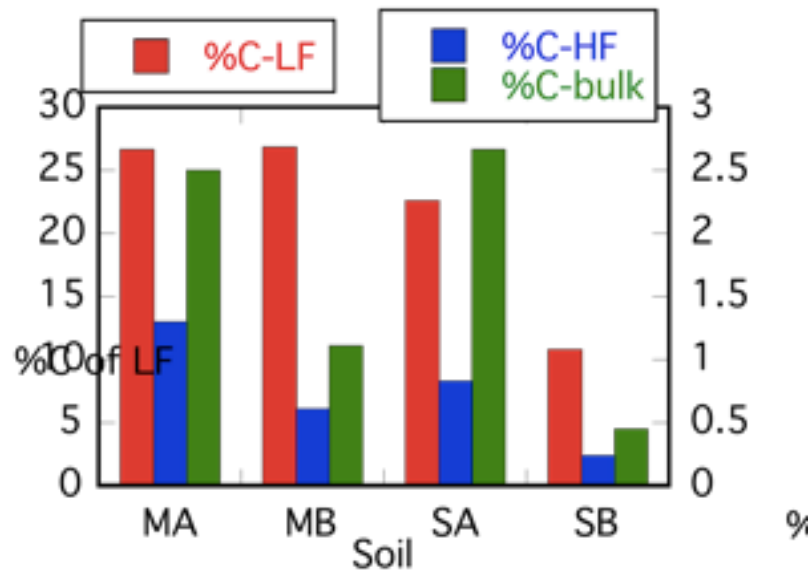
- Bulk density and water content

Soil	MA	MB	SA	SB
Depth (cm)	5-20	55-70	5-20	40-60
Bulk density (g cm <sup>-3</sup> )	0.88	1.15	0.84	1.17
Gravel (>2mm) content (wt%)	7.2	7.9	12.6	9.0
Water content (wt% of dry soil)	6.9	8.1	6.6	6.0
WHC (g water/100g dry soil)	61.3	38.4	58.8	41.8
Field moisture (%WHC)	11.2	21.1	11.1	14.4

- C, N,  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  of bulk soil

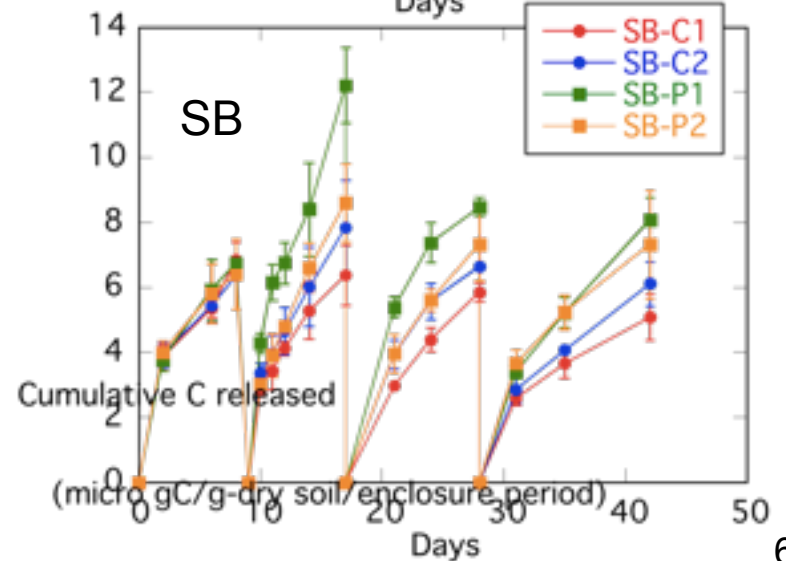
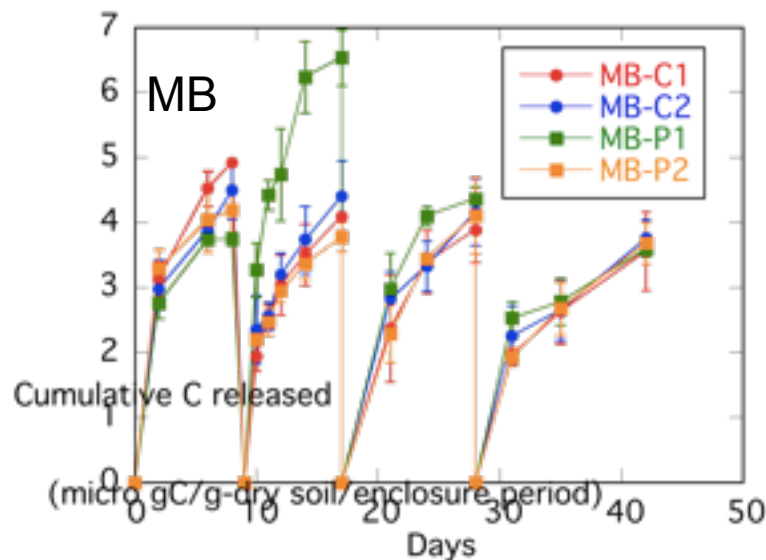
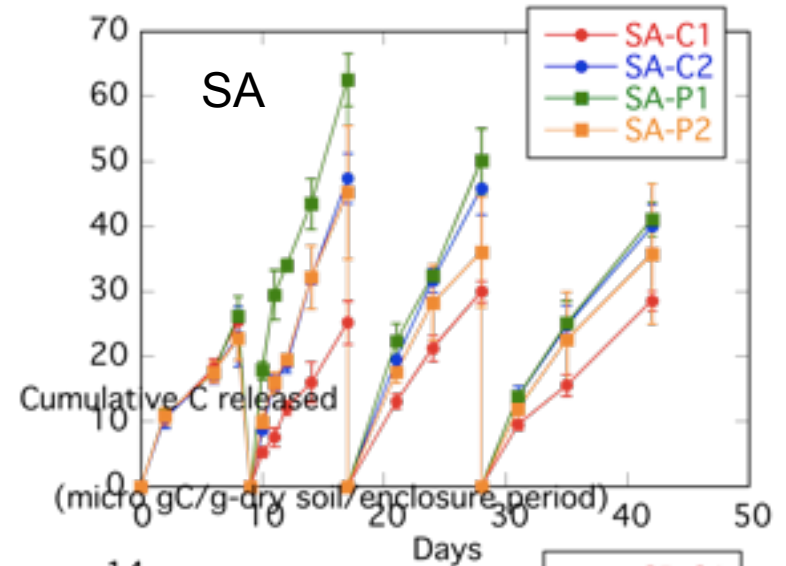
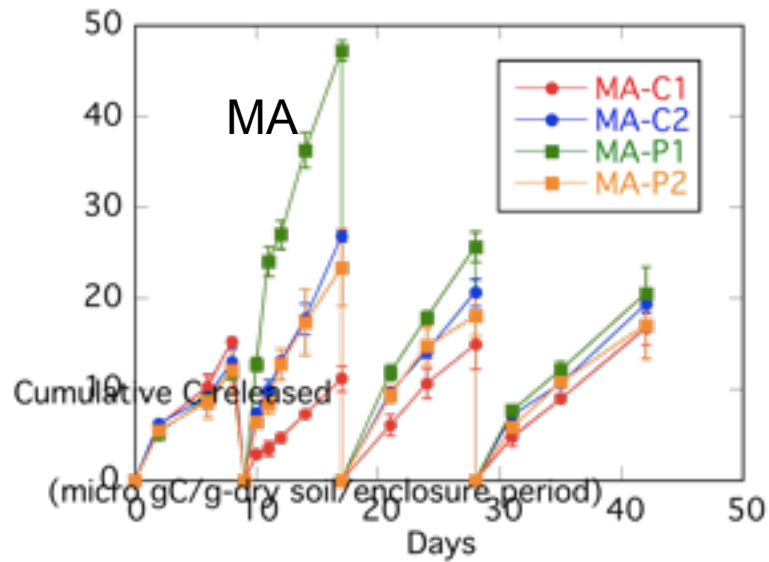
Soil	MA	MB	SA	SB
%C	2.71	0.98	2.33	0.55
%N	0.15	0.07	0.09	0.03
C/N	18.5	14.2	25.3	18.6
$\delta^{13}\text{C}$	-25.1	-24.2	-25.5	-23.8
$\delta^{15}\text{N}$	3.59	5.43	3.00	5.72

- C isotopes in density separated fractions.



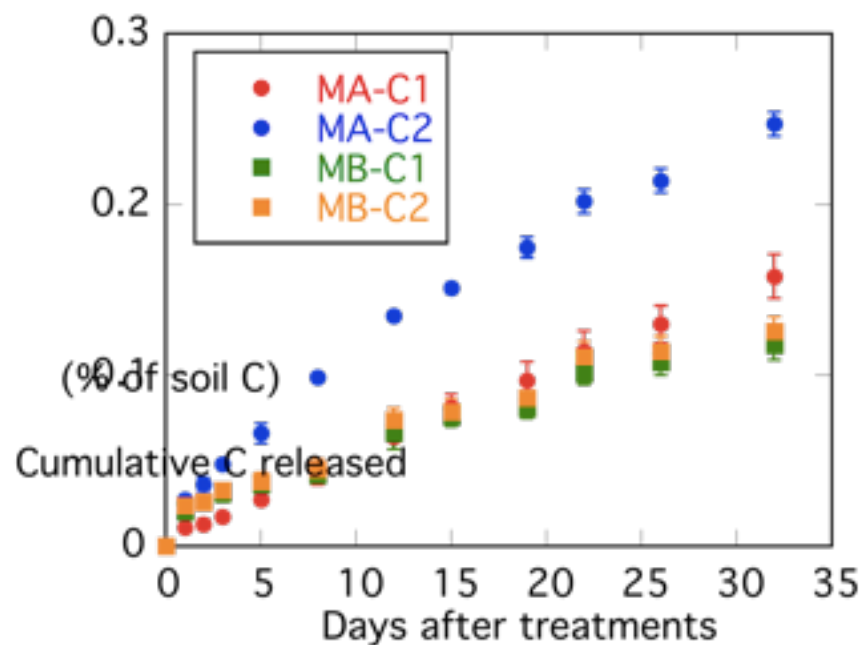
# Results (incubations)

- Cumulative C releases (as  $\mu\text{gC/g-dry soil}$ ) per enclosure

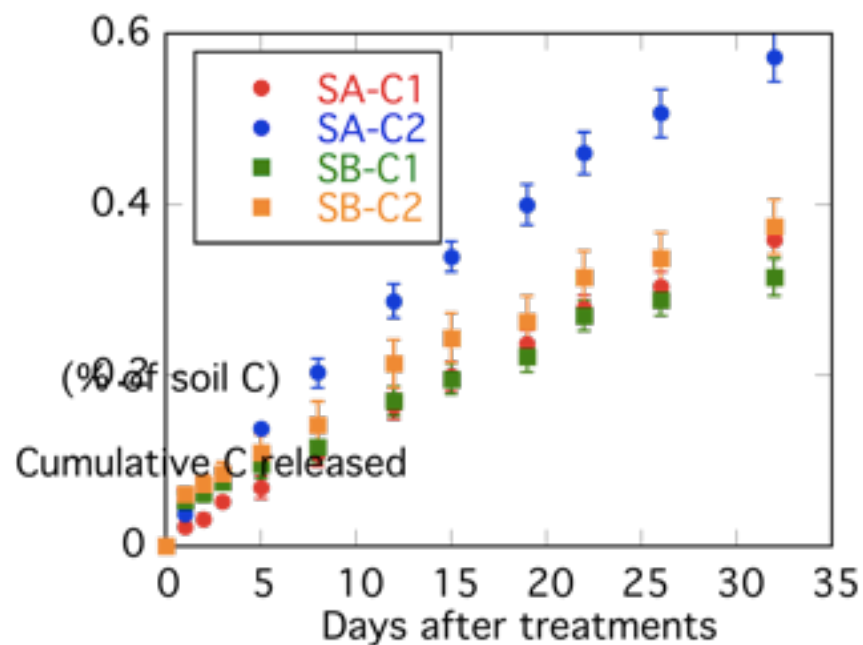


- Cumulative C releases (as % of soil C) from control soils

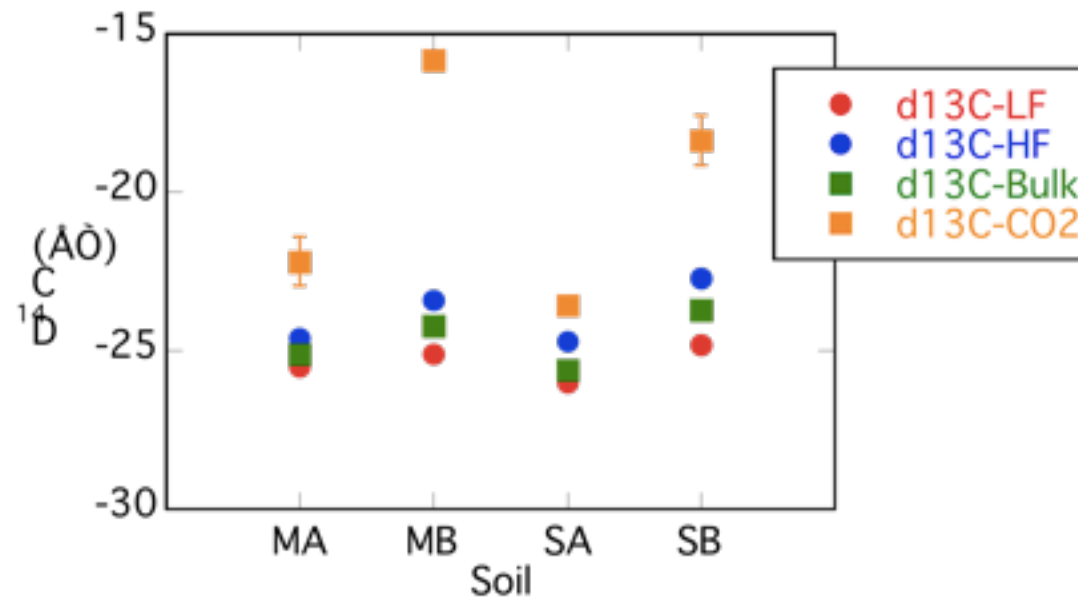
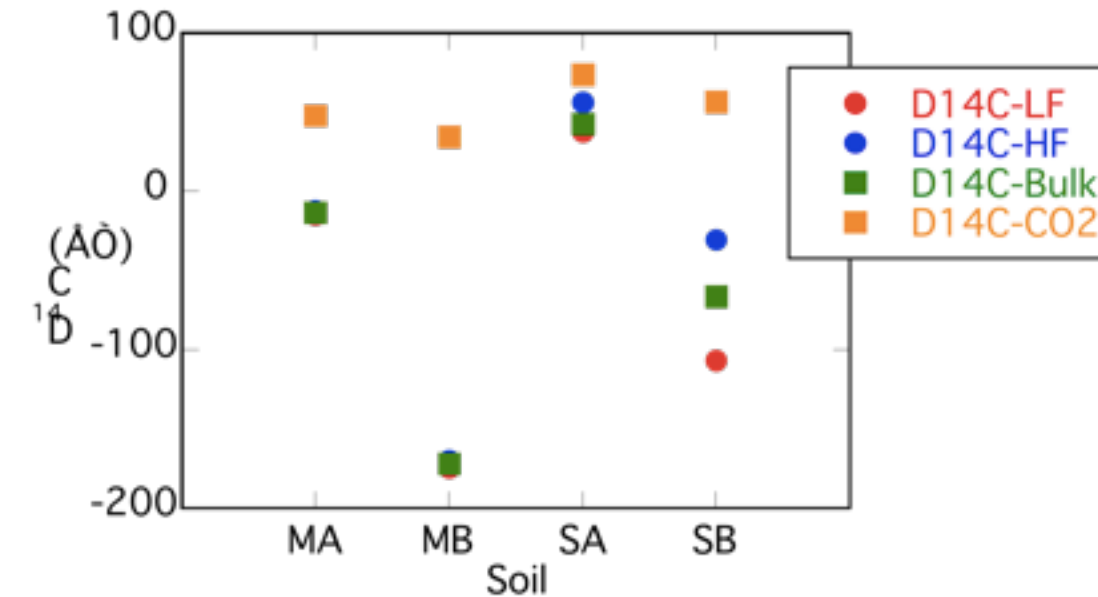
Musick



Shaver



- Isotopic signatures of CO<sub>2</sub> released during day 1-10 (pre-treatment period)





- Isotopic signatures of CO<sub>2</sub> released during day 10-18 (after priming treatment)

### *Priming 1 vs. Control 2*

#### (1) $\delta^{13}\text{C}$ (‰; n=2, 1STD in parenthesis)

	MA	MB	SA	SB
Control 2	-25.79 (0.05)	-17.18 (0.52)	-25.36 (0.17)	-20.32 (0.17)
Priming 1	-22.42 (0.02)	-16.68 (0.78)	-23.21 (0.33)	-20.33 (0.57)

#### (2) $\Delta^{14}\text{C}$ (‰; n=2, 1STD in parenthesis)

	MA	MB	SA	SB
Control 2	70.9 (9.9)	38.5 (5.2)	88.6 (3.3)	63.6 (3.3)
Priming 1	181.7 (3.3)	112.5 (6.1)	159.0 (1.8)	115.3 (2.5)

#### (3) Ratio of C from SOM decomposition in priming 1 (calculated by $\delta^{13}\text{C}$ signatures)

MA	MB	SA	SB
0.78 (0.01)	0.93 (0.07)	0.85 (0.01)	1.00 (0.02)

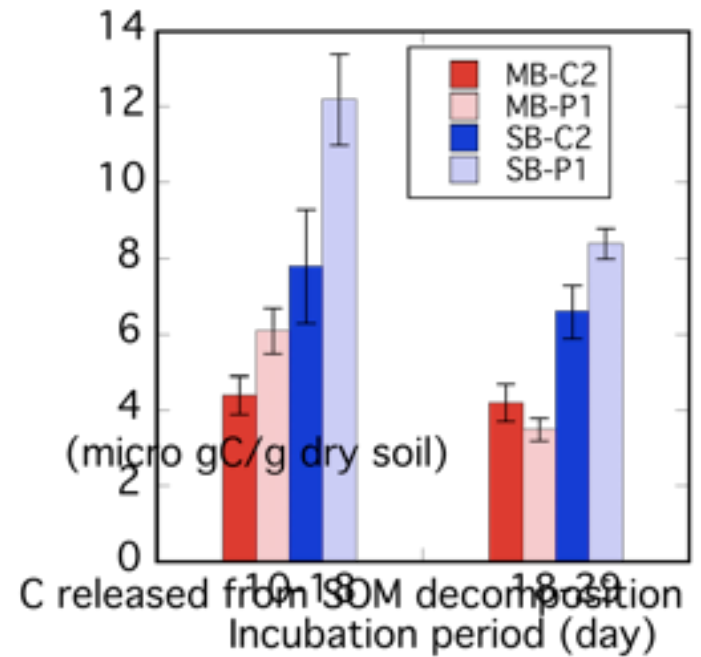
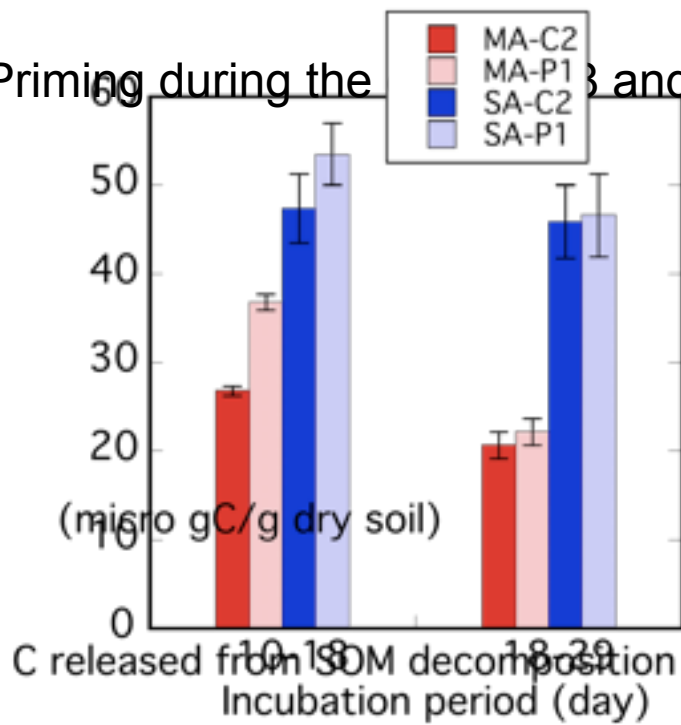
#### (4) Primed C in priming 1 ( $\mu\text{gC/g}$ dry soil/enclosure)

MA	MB	SA	SB
10.0 (1.1)	1.6 (0.8)	6.1 (5.3)	4.4 (1.9)

#### (5) Added substrate-C released (%)

MA	MB	SA	SB
19.1 (0.7)	2.4 (2.5)	19.5 (2.0)	-0.1 (2.3)

- Priming during the 10-18 and 18-29



- $^{14}\text{C}$  signatures of the C primed during day 10-18

