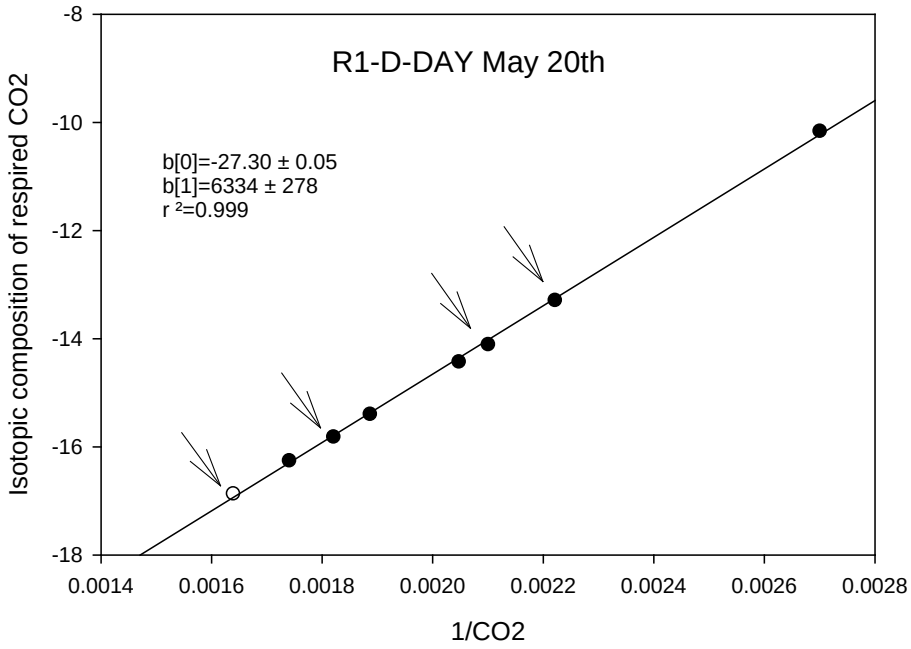
Fig 1. The comparison between Keeling plots of soil respired CO_2 in an ambient (R1) and elevated plot (R4) using one collar (arrows) or different collars within a soil sector (D or H) to prevent disturbance effects during sample collections. May was selected for these trials because respiration rates were the lowest and therefore effects caused by sample extraction on CO_2 soil profiles may be larger. Arrows denote samples taken from the same collar and show no differences in intercept with respect to the other collars. Points with no arrows are taken each from a different collar. These trials validated the use of different collars to obtain Keeling plots.



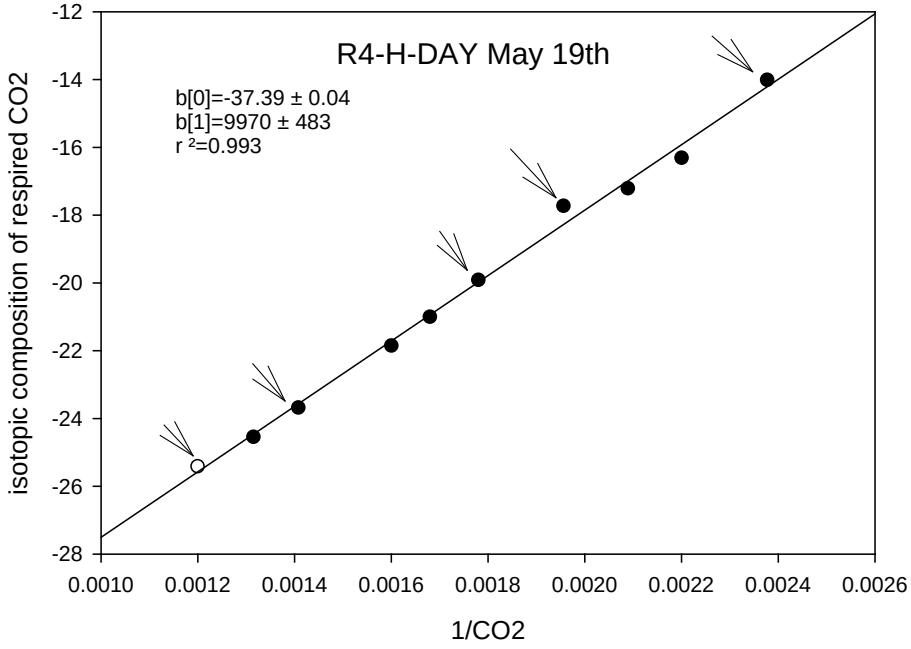


Fig 2. The temperature sensitivity of daytime and nighttime root/rhizosphere respiration to seasonal changes in temperature.

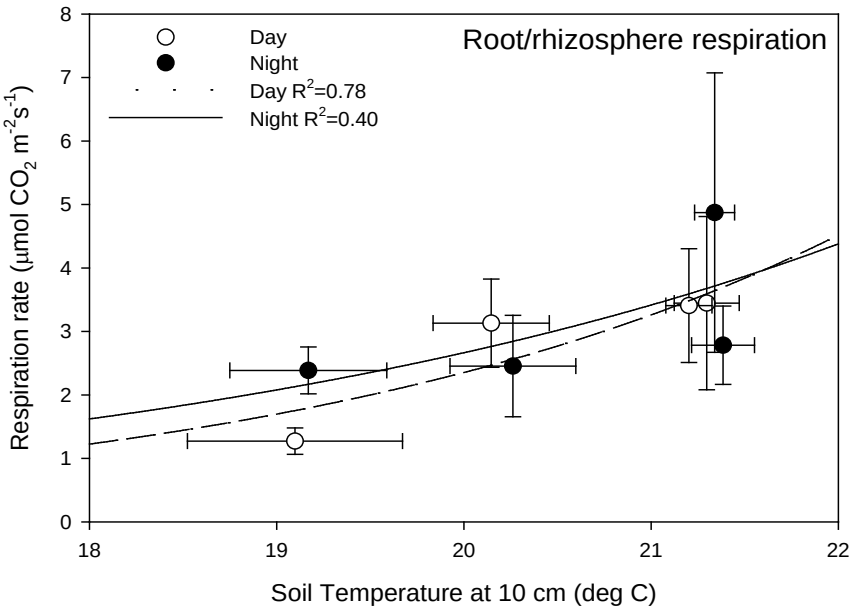


Fig 3. The temperature sensitivity of daytime and nighttime respiration from soil organic matter to seasonal changes in temperature.

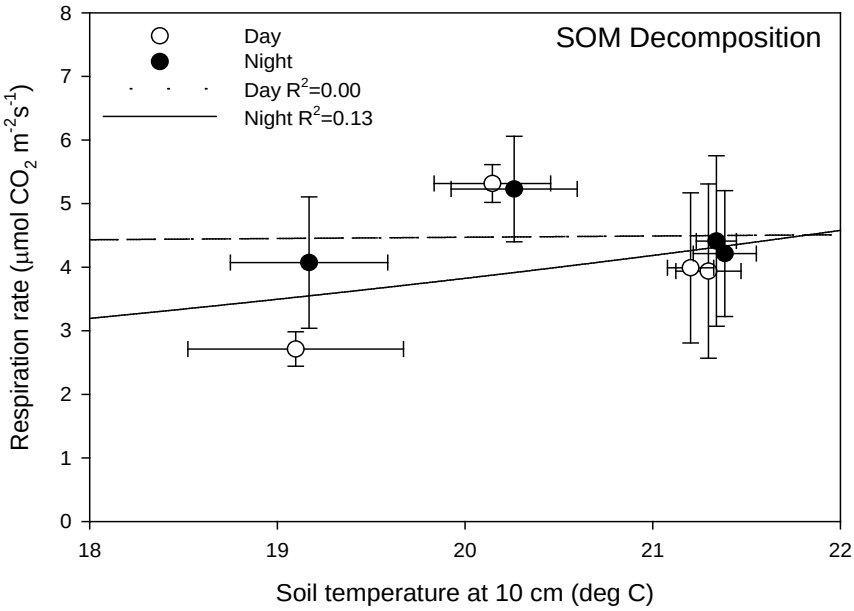


Fig 4.The temperature sensitivity of daytime and nighttime forest floor litter respiration to seasonal changes in temperature.

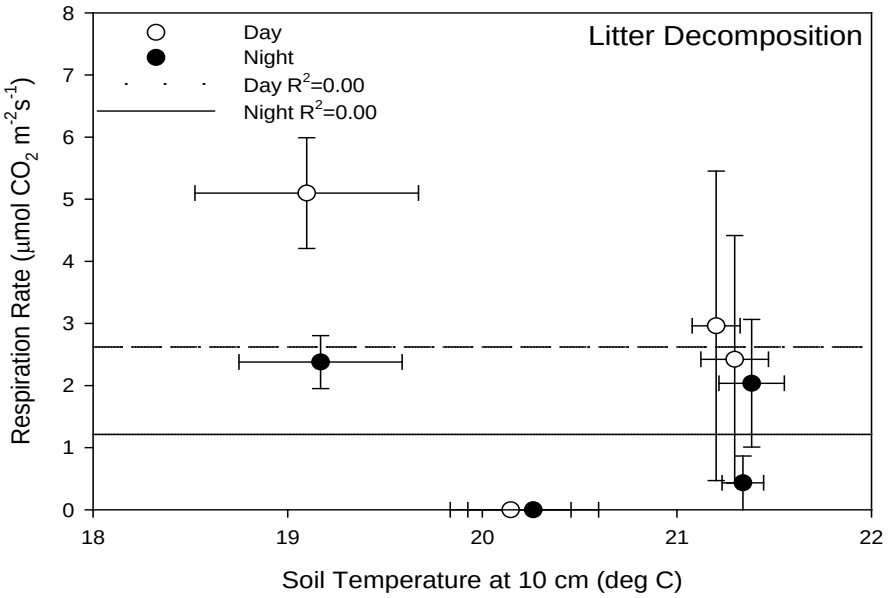
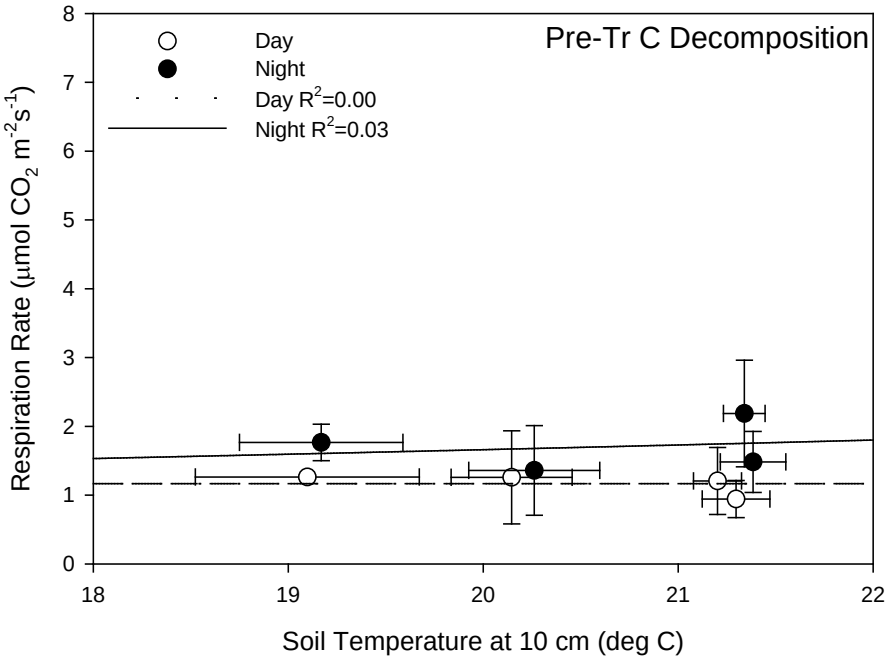


Fig. 5 The temperature sensitivity of daytime and nighttime pre-treatment C respiration to seasonal changes in temperature.



STATISTICAL ANALYSES FOR SEASONAL PATTERNS FOR ROOT AND NON-ROOT COMPONENTS OF SOIL RESPIRATION

For this analysis, both root and non-root respiration rates are included as outcomes in a single regression model using "doubly-repeated measures" because the data has multiple or repeated measures at each point (both root and non-root respiration) and also within each ring. Observations were clustered for each pair of observations; root and non-root respiration, and pairs of observations were clustered within rings. To get root respiration, each observation for the proportion of root respiration is multiplied by each corresponding month, ring and time-of-day observation for respiration rate (rings 2, 3 and 4, 2004 only) resulting in 204 total observations. The rate of non-root respiration (respiration from the oxidation of organic matter $-R_{SOM}$- and litter decomposition $-R_L$-) is obtained the same way as for root respiration.

Using this method we tested the hypothesis of whether "an increase in root/rhizosphere respiration is the main cause of an increase in the total (root + non-root) soil respiration during summer". If the following three conditions are satisfied, the above hypothesis will be supported: (1) Total soil respiration is higher in summer. (2) The root respiration component of soil respiration is higher in summer. (3) The non-root respiration is not higher in summer.

Table 1. Month and time-of-day effect estimates from regression model with interaction

	Root respiration				
	Estimate	Standard Error	DF	t Value	Pr > |t|
Day-time July & August to June & September	1.26	0.35	196	3.58	0.0004
Night-time July & August to June & September	0.99	0.36	196	2.77	0.0062
Day and Night July & August to June & September	1.13	0.25	196	4.50	<0.0001

	Non-root respiration				
	Estimate	Standard Error	DF	t Value	Pr > |t|
Day-time July & August to June & September	-0.09	0.35	196	-0.25	0.8064
Night-time July & August to June & September	0.46	0.36	196	1.28	0.2022
Day and Night July & August to June & September	0.19	0.25	196	0.74	0.4578

	Total (Root + Non-root) respiration				
	Estimate	Standard Error	DF	t Value	Pr > |t|
Day-time July & August to June & September	1.18	0.60	196	1.97	0.0505
Night-time July & August to June & September	1.45	0.60	196	2.40	0.0173
Day and Night July & August to June & September	1.31	0.42	196	3.11	0.0022

1. Is total R_S higher in July-August compared to June or September?

    Daytime: Marginally

    Night-time: Yes

    Overall: Yes

2. Is root respiration (R_R) higher in July-August compared to June or September?

    Daytime: Yes

    Night-time: Yes

    Overall: Yes

3. Is non-root respiration (R_{SOM}+R_L) higher in July-August compared to June or September?

    Daytime: ns

    Night-time: ns

    Overall: ns

Therefore the hypothesis that R_R is a significant dominant driver of seasonal changes in daytime and nighttime total R_S is accepted.