Stem and Branch Respiration of Trees in Elevated CO2 Environments

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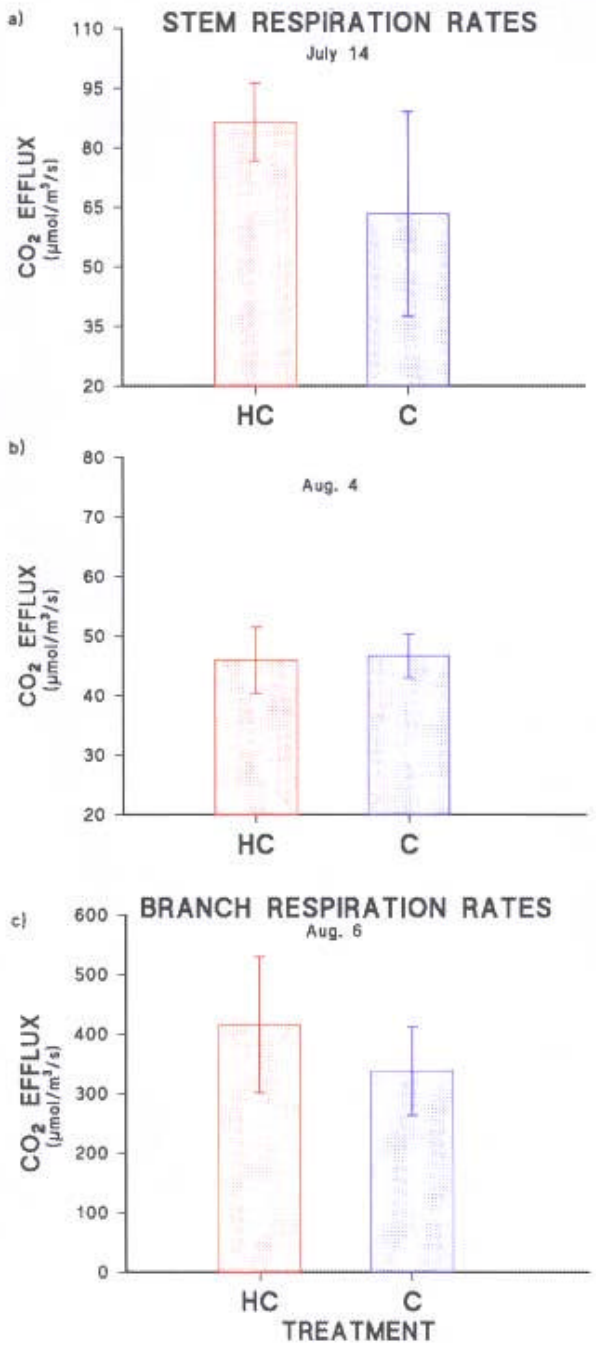
This is a picture showing how the elevated CO2 system distributes the CO2 in an open chamber. The sir is released through holes in the suspended pipes. The controlled rings also have these pipes, but there is simply no CO2 added to the air.



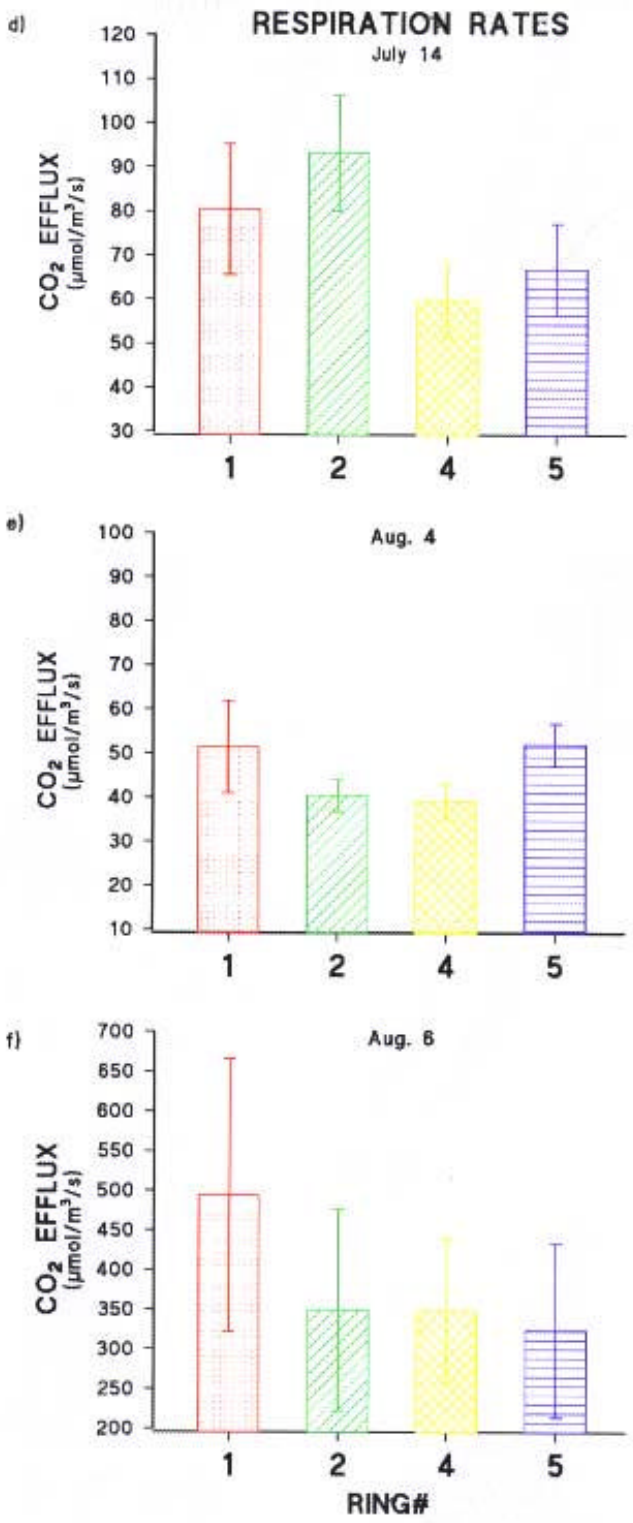
Respiration rates of trees averaged by treatment.

a) The High CO2 trees show a distinctively higher resp. rate than those in the Controlled.
b) On this graph the two treatments show no apparent difference in resp. rates at all. This is caused by separate circumstances. Several days before the July 14 readings were taken, the system which delivers the elevated CO2 was working fine. However,

the week preceding the Aug. 4 readings there had been a storm which knocked out the system. There is also the fact that the CO2 was off while we were taking the readings on July 14, and on while we were taking readings on Aug. 4. As expected the higher CO2 on Aug. 4 lowered the rates due to diffusion gradients.

c) The branches in the readings had an average diameter of approximately 10 mm. This data taken two days after the Aug. 4 readings still shows the impact of the system being down for several days.

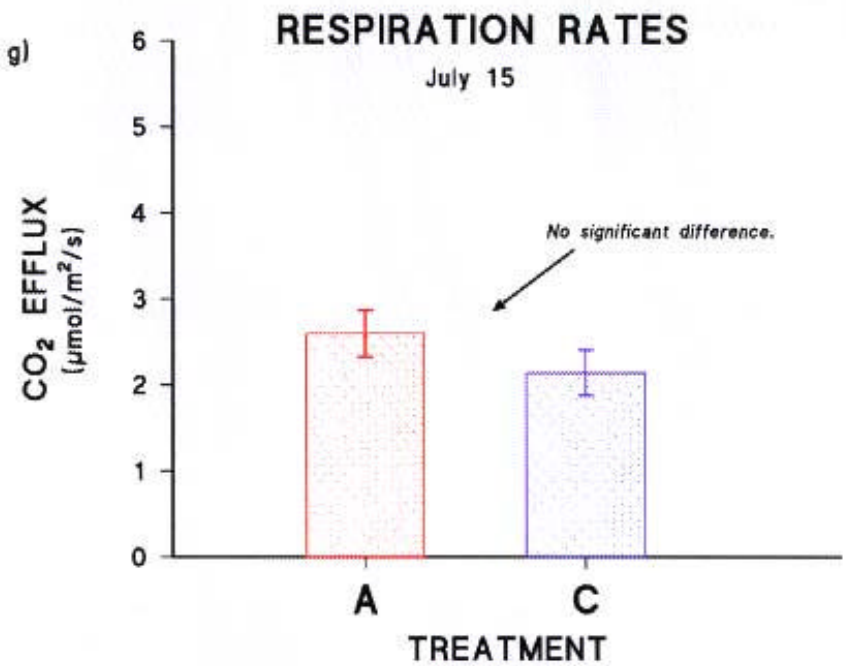
This is me HARD at work. I have attached the Licor tubing to the automated system's chamber, and continued to enter the information necessary to take a reading.

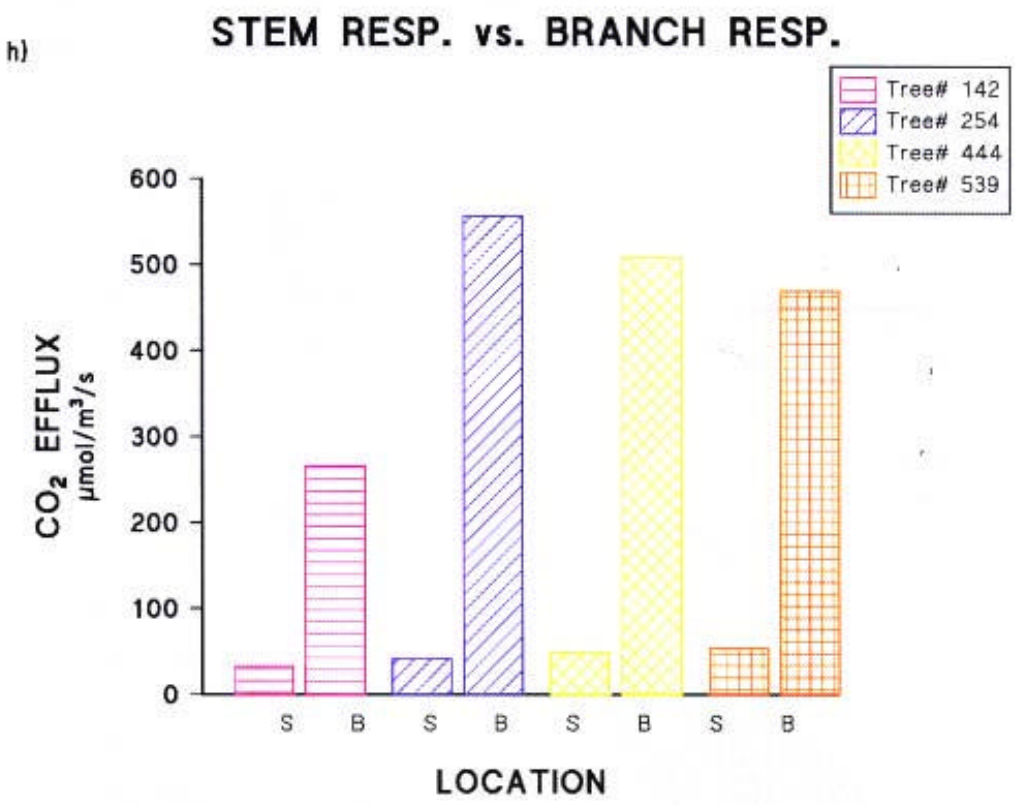

d)
RESPIRATION RATES
July 14
CO_2 EFFLUX ($\mu mol/m^3/s$)
120
110
100
90
80
70
60
50
40
30
1
2
4
5
e)
Aug. 4
CO_2 EFFLUX ($\mu mol/m^3/s$)
100
90
80
70
60
50
40
30
20
10
1
2
4
5
f)
Aug. 6
CO_2 EFFLUX ($\mu mol/m^3/s$)
700
650
600
550
500
450
400
350
300
250
200
1
2
4
5
RING#

d) e) f) Same data as shown in graphs a, b, and c, except averaged by ring# not treatment. Rings 1 & 2 are in an elevated CO2 environment and Rings 4 & 5 are in a controlled environment.

STEM AND BRANCH RESPIRATION OF TREES IN ELEVATED CO_2 ENVIRONMENTS

The primary objective of this research was to monitor the effects of increased [CO_2] concentrations on tree respiration. The studies were conducted on the Free Air Carbon Dioxide Enrichment (FACE) site. A Licor (portable photosynthesis system) was used to monitor the respiration in the tree bole and branches. Increases in CO_2 were recorded four times every twenty seconds at each reading. Other factors, such as air temperature, stem temperature and time of day were also monitored. Readings on several different occasions showed the trees in rings one and two (high CO_2) were respiring at a higher rate than those in four and five (controlled), and there were no significant differences between the ambient and controlled rings. It also showed respiration rates were higher in branch samples, which may be linked to an increase in living tissue. This study is only a glimpse of the big picture. It must be considered with similar studies on other tree physiological processes, such as photosynthesis.



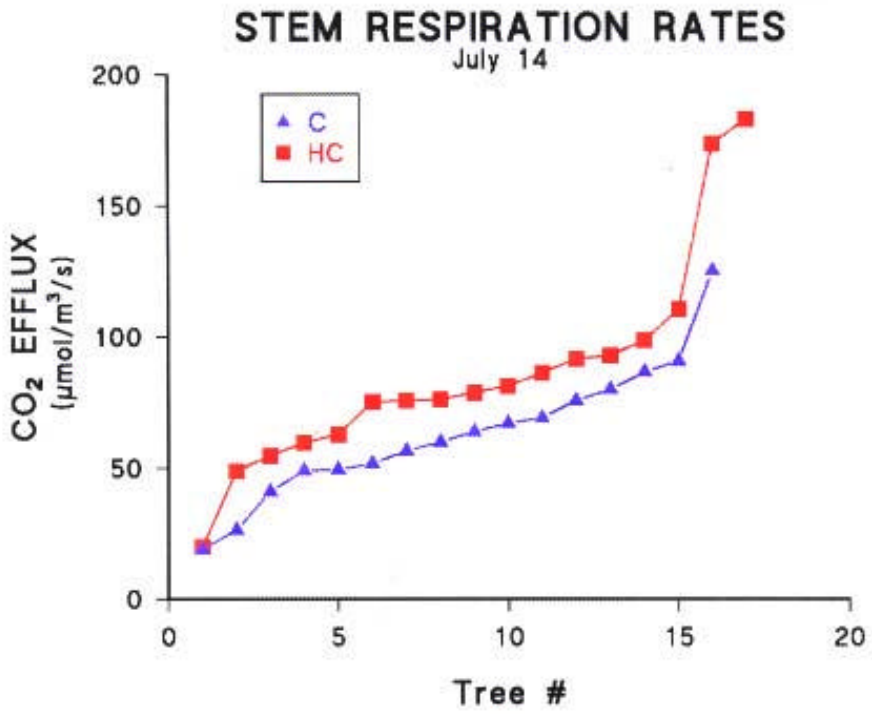


g) Shows that there were no significant differences between the ambient rings and the controlled rings.

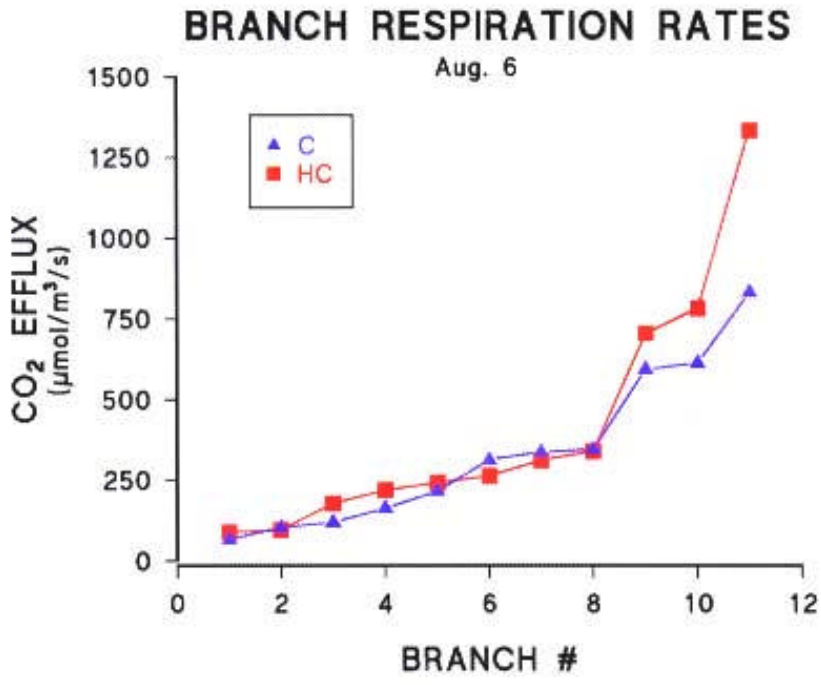
h) Compares the rates of the same tree but at different heights. The “S” stands for the Stem and the “B” stands for the Branches.

This picture shows a close up of the automated system we have been working on. When perfected, this automated system will provide readings throughout the day without requiring anyone's presence.

i)



j)



i) j) Each tree/branch is plotted as a data point. The graphs show High CO2 (square symbol) versus Controlled (triangle symbol).

This picture was taken from the lift in Ring# 1 while I was in the lift in Ring# 2.

ACKNOWLEDGEMENTS

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