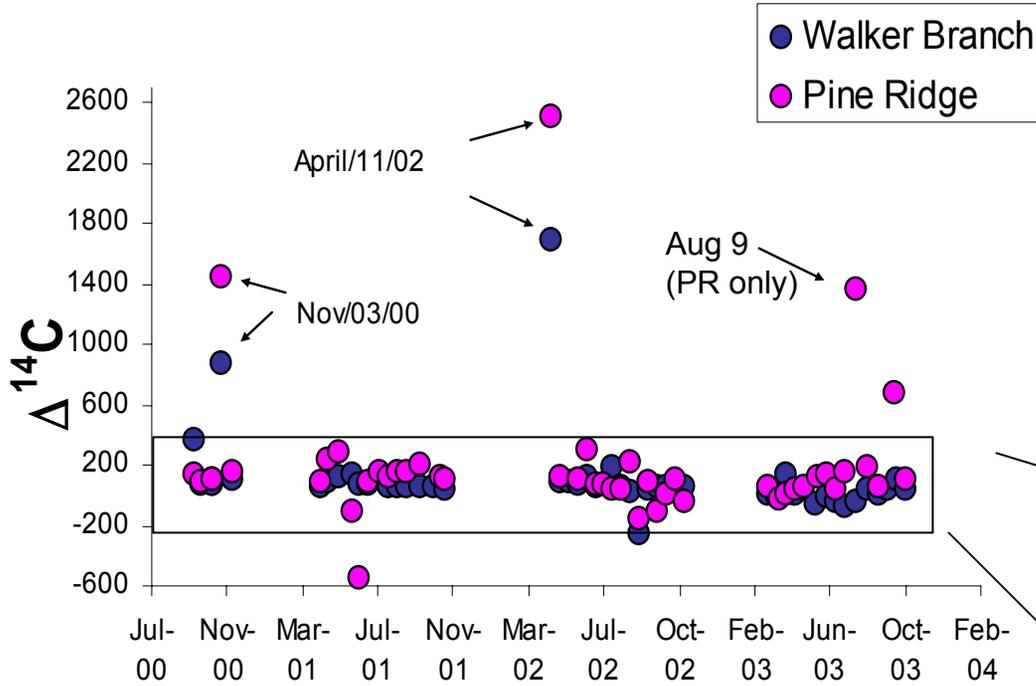
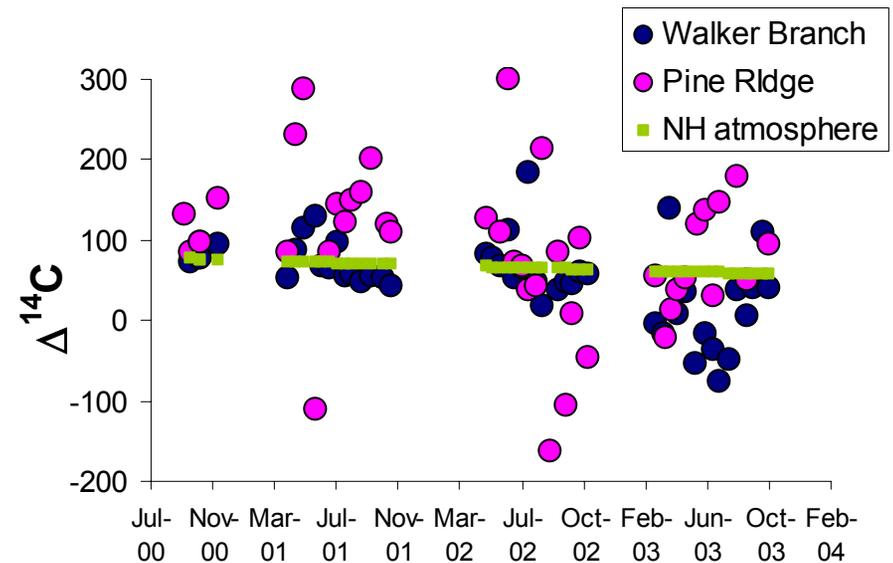
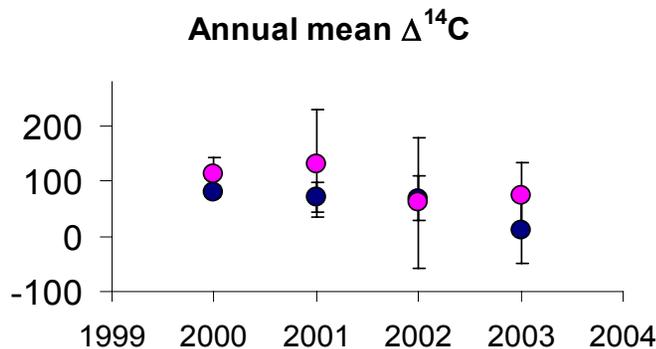


Air monitoring at ORR

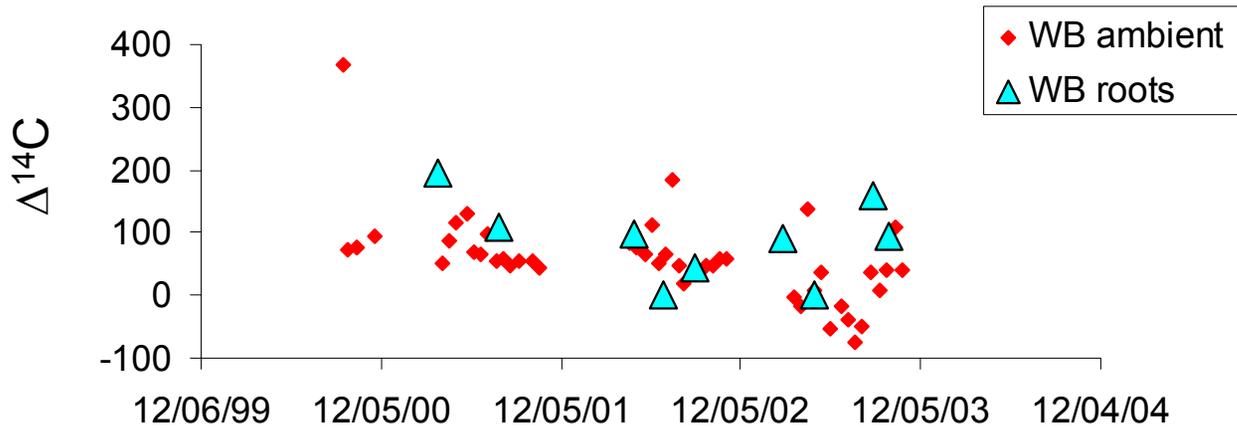


- Several releases since 1999; only late 2003 occurred in growing season (only observed in PR)

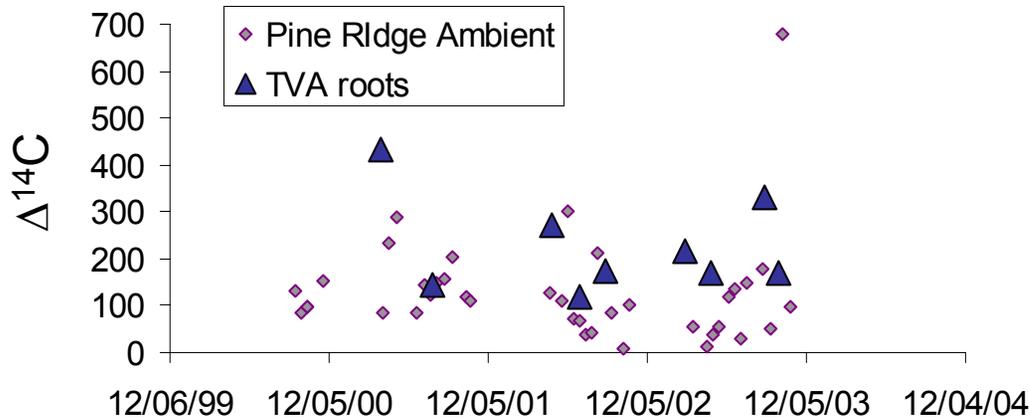
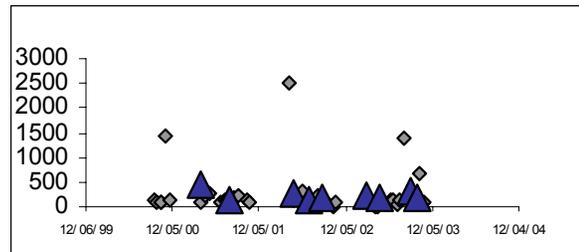
- PR continues on average with higher $\Delta^{14}\text{C}$ values than WB
- WB site seems affected by fossil fuel emissions



Root respiration vs. ambient air



- Root respiration isotopes might reflect variations in local air, although root respiration values at TVA appear higher than Pine Ridge air

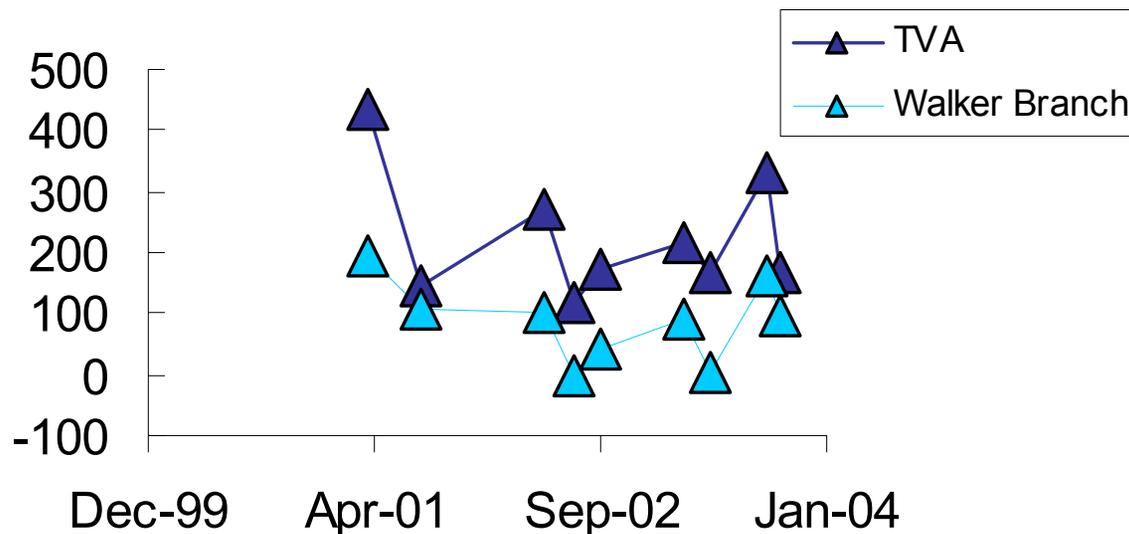


- The pattern in both sites is higher values in spring

^{14}C in root respiration – TVA vs. Walker Branch

- same pattern
- higher values in western ORR than eastern ORR – constancy of offset
- higher values in spring may reflect storage pools as the source of respired C
- significant increase in both sites in Sept'03 (but release only in PR..?)
- (-) values occasionally observed in WB

$\Delta^{14}\text{C}$ signature of root respiration



Conclusions

Time series of ^{14}C in air

- Subsequent releases – only one during growing season (2003) in Pine Ridge (it is unclear if this had an effect on the signature of root respiration)
- Always higher values on average in Pine Ridge
- Walker Branch site seems affected by fossil fuel emissions increasingly with time

Time series of ^{14}C in root respiration

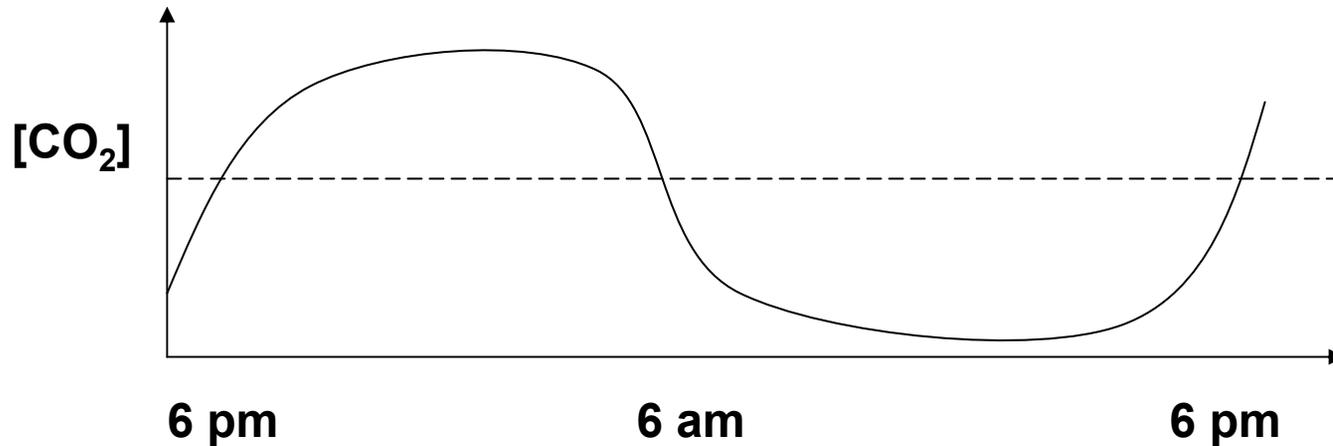
- ^{14}C signature of root respired CO_2 varies a lot with time. Same pattern is observed in both sites
- Reasons for the variation could be (1) shifting between use of stored carbohydrate to recent photosynthate; or (2) variations in ^{14}C of recent photosynthate linked to changing air ^{14}C

Variations in western and eastern ORR track each other well although air values do not; suggest (1) may be the more likely reason

Future work

To better determine the sources of root respired C,

- Continued monitoring of air - this time switch to monitoring of air in the canopy, and use controlled sampling so that only day-time air is sampled (24 hour averages are too skewed towards night-time inversions)



- Determination of the ¹⁴C signature in carbohydrates of roots
- Automated sampling of CO₂ from root respiration at same intervals as air sampling