Response to Interactive comment on "Carbon and greenhouse gas balances in an age-sequence of temperate pine plantations" by M. Peichl et al.

We thank the reviewer for the constructive comments. Our responses to each of the comment follow below in bold font. Page and line numbers in our responses refer to the MS Word .doc/pdf version of the resubmitted manuscript.

Anonymous Referee #2
sorry I made a mistake in my previous review post. I used the wrong page and line numbers. Here are my comments again with the correct references:

The manuscript is overall very clear and well written. It discusses the GHG balance of a chronosequence of 4 pine forests in Southern Ontario, Canada. With the addition of the non-CO2 fluxes to the carbon balance the authors present a very valuable contribution to the research field. I recommend this manuscript for publication in Biogeosciences.

Here are a few minor comments:
1) P8233L20: give more detail on the site history, (eg recent thinnings if the sites were thinned).
We added the information that the oldest site, TP39, was thinned in 1983.

2) P8233L17: I don't understand how you can collect litter at a bi-annual interval with litter traps without the risk that part of the litter decomposes in between the collection dates. Please explain.
We have found in our previous work (Peichl and Arain 2006) that the majority (i.e. ~80%) of the needle litter falls within a few weeks in autumn. From 2004-2006, we sampled litter-fall bi-weekly during this peak autumn period and every three month for the rest of the year. In 2007-2008, we sampled once in autumn shortly after this peak litter-fall period and once in spring. During the winter, small amounts of litter were frozen and covered under snow inside the litter traps and sampled in spring shortly after snowmelt. Only small amounts of needles fell during the summer period. We are therefore confident that possible losses of needle litter due to decomposition are negligible and not affecting our main findings. We clarified the litter-fall sampling intervals in the revised manuscript (Section 2.2. Page 6 Ln 12-19).

3) P8234L3: Explain how you measured the woody debris pools.
Standing woody debris pools were quantified during the NFI sampling. Forest floor woody debris mass on an area basis was calculated using the Line Intersect Method (Van Wagner, 1968). We have added this information to the revised manuscript (Section 2.2. Page 6 Ln 7-9).

4) P8234L25: Give the measurement frequency for the DOC concentrations
DOC samples were collected at bi-weekly to monthly intervals and analyzed using a Shimadzu 5050 Analyzer (Section 2.3. Page 7 Ln 18-19).

5) P8234L18: Explain in more detail how you have calculated the biometric GPP estimates.
The biometric estimate of gross primary production (GPP) was estimated from NPP assuming NPP is a constant fraction (47%) of gross primary production (GPP) on the annual scale as suggested for coniferous forests by Waring et al. (1998) and previously

described by Peichl et al. (2010c). We have clarified this calculation step in the revised manuscript (Section 2.2. Page 6 Ln 30-31 and Page 7 Ln 1-2).

6) P8240L25: Is this only an effect of the water balance or do you also see differences in DOC concentration between the stands

It is the combination of both, a decrease in DOC concentration with stand age but also reduced water leaching in the older stands compared to the youngest stand (details are discussed in Peichl et al. 2007). We clarified this aspect in the revised manuscript (Section 4.1. Page 13 Ln 6-11).

7) P8241L22: This is not true (see fig 4), in both young and mature forests the contribution of non-CO2 fluxes is higher.

We have corrected this statement following this comment by the reviewer (Section 4.2. Page 14 Ln 6-20).

8) P8242L12: True, but this is mainly because of the lower NEP and not because of the higher contribution of non-CO2 components. I think you should clearly state this.

Yes, we agree. We have clarified this in the revised manuscript (Section 4.2. Page 14 Ln 32 and Page 15 Ln 1-3).

9) P8243L2: Again here you should add that this is mainly because of the lower NEP values.

Yes, we agree. We have clarified this in the revised manuscript (Conclusions Page 15 Ln 16-17).