

## ***Interactive comment on “Seasonal variations of belowground carbon transfer assessed by in situ $^{13}\text{C}$ CO<sub>2</sub> pulse labelling of trees” by D. Epron et al.***

**D. Epron et al.**

daniel.epron@sbiol.uhp-nancy.fr

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We would like first to thank you for your positive comments on our paper. The main point you have addressed concerns the way we calculated residence time that appeared misleading in the manuscript. We were really using a four pool models with rate constant of carbon transfer between these pools in the mathematical formulation of the model but we didn't give any values for these individual rate constants. The reason for that is that we are aware that the model is oversimplified and, as we should have stated more clearly in the text, we used it an empirical model that fit rather well the data rather than a mechanistic one. Because it is an oversimplified description of the tree-soil complex systems, the rate constants we can derived between these four pools for our model don't have strong mechanistic meaning. For this reason, we didn't calcu-

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lated residence time in each virtual compartment (as you might have expected) but we computed a half residence time in the whole system, which is not derived from  $k_{CB1}$  as you might have misunderstood, but from the fitted kinetic of cumulative label recovered in soil CO<sub>2</sub> efflux. In order to make the point clearer, we have reformulated this part of section in the revised manuscript: “We are aware that our model is oversimplified and that it does not describe the complexity of the fate of carbon belowground. We therefore considered this model as an empirical one acknowledging that the B1 and B2 compartments are virtual pools, and that calculating half residence time of label within each pools from the adjusted rate constants will have been misleading. We therefore used the model for estimating seasonal variation in the amount of carbon allocated to soil CO<sub>2</sub> efflux and we calculated the half residence time of soil respired <sup>13</sup>C into the whole plant-soil system ( $t_{1/2}$ ) as the time needed to reach 50% of CLRFS( $\infty$ )”. In addition, we have added the best fitted rate constants for the example shown in figure 1 in the legend of this figure. We hope these changes will make our approach more clear avoiding misunderstanding for Biogeosciences readers. In order to account also for your minor comments, we made now reference to our previous work regarding differences in velocities of carbon transport in the phloem between broadleaved and coniferous species to strengthen our first hypothesis. We rewrote the two sentences in section 4.1 as suggested. We appreciate the paper of Lisa Wingate and we have mentioned this work at several places in the discussion that seems (at least to us) more appropriate that the one you suggest.

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