

Interactive comment on “Mechanisms of methane transport through *Populus trichocarpa*” by Ellyne Kutschera et al.

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Thank you for your comments. The reply to each comment is enumerated below:

(1) (i) There is variation in the size of the *Populus trichocarpa* saplings (although in each group of trees the saplings are the same age). Measurements of CH₄ flux were taken for the canopy since we were testing for a relationship in general between flux and temperature and flux and isotopic fractionation. Higher flux can be due to larger tree size, but in that case, there is still a significant relationship between higher fluxes and temperature and higher fluxes and smaller fractionation. We suggest that this may be explained by the presence of different transport mechanisms, which could change with the maturity and size of the tree. Regardless, the relationship holds.

(ii) The volume variation of the Tedlar bag is addressed in lines 32-33. We calculated

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the volume variation of the bag and found that it was not significant compared to the variation in CH₄ flux. That is, a +/- 10 L variation in bag volume would lead to a +/- difference of 0.15 ppm, which is well within +/- one standard deviation of the flux (0.42 ppm to 2.0 ppm).

(2) (i) The water temperature of the test chamber would have been in thermal equilibrium with the environment, as it was allowed to be in the greenhouse for 3-4 hours before the experiment. The temperature inside the tedlar bag may have varied; however, a difference in temperature between the green house and the interior of the bag during an experiment would have increased over time if they were initially at the same temperature. If this had a significant effect on flux, we should not have measured a generally linear relationship between CH₄ concentration in the bag and time.

(ii) We did combine our data sets and in spite of any physiological differences in the trees, the relationships between flux and temperature and fractionation held. This may demonstrate that these relationships are indeed independent of some physiological differences or genetic variation.

(3) (i) There is indeed a decrease of CH₄ flux with height of the main tree stem. Our estimation of total stem flux is an order of magnitude approximation to see if the canopy flux we measured with the Tedlar bag is comparable, since we were not able to measure flux from the entire stem. The order of magnitude is similar between the two, but we offer this only to suggest that our flux measurements could be explained by stem flux alone, not as proof.

(ii) Our calculations indicated that we should not be able to measure flux per leaf, as it would be below detection limits. Our trials with the leaf cuvette simply confirmed that no flux was in fact detectable, and were an auxiliary experiment.

(iii) The error shown for each data point in Fig. 3 is for the flux measurement. That is, each gas sample was divided into three parts run separately in the IRMS. The standard error is shown for each sample.

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