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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Laboratory measurements of stomatal NO_2 deposition to native California trees and the role of forests in the NO_x cycle" *by* Erin R. Delaria et al.

Anonymous Referee #2

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The mansucript of Delaria et al. investigates the potential effect of NO2 stomatal deposition to several native California tree species by using the branch enclosure techniques. They measure NO2 fluxes, deposition velocities and stomatal conductance by adding water vapor and NO2 to a gas stream passing through the branch enclosure. Additionally the effects on mesophyllic processes and foliar deposition of NO2 from excess soil nitrogen and drought stress are determined. The authors also provide some basic modeling approach to investigate the potential impact on the NOx budget in the region of California.

The methods and the results are presented more or less clearly in the manuscript

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Discussion paper

however some important aspects are still missing and are addressed in the comments below. I also have the impression that too many aspects are tried to discuss in the paper and that overall the paper would benefit in a more clear structure to guide the reader through the different aspects. Overall the results and implications are potentially important to understand the effect trees can have on the NOx burden in the atmosphere and determining if trees are sink and/or sources for NOx. Therefore the manuscript fits the scope of ACP and I recommend publications after the following comments are addressed.

General comments

Since the accurate determination of the flux of NO2 and the deposition velocity depends on the measurement of the concentration of the ingoing and outgoing air of the branch enclosure I miss a more detailed assessment how leak tight the chamber actually was. It is only stated that the chamber was operated at a slight over pressure to ensure lab air contamination. However what about leaks through which NO2 could escape? Additionally if you have higher relative humidity, how much water might condense on the Teflon wall? Might the potential water deposition on the walls depended of the mole fraction of water vapor in the chamber? What really would be beneficial to add measurements of an empty branch enclosure and measuring if and potentially how much NO2 and water vapor are lost due to leakage and/or wall losses.

Specific comments

Line 221ff and figure 2: “Some experiments were excluded (shown in red in Fig. 2), as they were determined to be outliers by a generalized extreme studentized deviate test for outliers.” I am confused on how this approach was really applied to the data. While the data for P. contorta, P. menziesii, A. menziesii, A. macrophyllum, Q. agrifolia, and Q. douglasii show outliers which seem to have strangely also a linear correlation in themselves, no outliers could be found for C. decurrens and S. sempervirens. If the outliers would a result of what the authors state “most likely due to systematic error in

calibration of the Licor-7000 instrument" then I would expect the outliers to be more random and found for all data sets since I guess the Licor data was taken on the same days for all plants with one calibration applied. The finding and excluding of the outliers (which would have quite an impact if taken into account for the fitting of the measured vs. predicted fluxes (e.g. strongly for P.contorte)) needs to be discussed in more detail as to why the outliers are not more randomly distributed and seem to have a correlation in themselves.

Line 264: you examine the correlation of the total conductance vs. the slope of measured vs predicted fluxes. Why do you not provide the correlation graphs (e.g. in the supplement) as well? Seeing the correlation graphs with the fits derived from it are more instructive than just giving the numbers.

Line 268: "All tree species except for C. decurrens, Q. agrifolia, and Q. douglasii show statistically signiïňĄcant correlations (α = 0.05) (Table 2)." I have difficulties to reconcile this with Table 2. The footnote "c" indicates statistically relevant correlations however the marked values do not correspond with the tree species mentioned in the text. To restate my previous comment also to estimate this the reader would very much benefit from being able to see the correlation plots for g_t vs. slope themselves.

Line 410: In the discussion only the comparable lifetime is mentioned. However comparing Fig. 7 and Fig. 8 one also sees that the flux predicted by the model is significantly lower than during the day. So the total loss even with similar lifetime during the day will not be as much as during day time. That should be also mentioned in the discussion as well and in general the modelling of the night time fluxes and NO2 lifetime is so shortly presented and discussed that it almost appear as if an addendum. The discussion should be extended.

Line 425: "large and important" form the comments mentioned before I don't see that yet this statement can be made without at least summing up what this is based on here again.

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Technical comments

Line 27: The sentence “Although the role. . .” is very hard to follow. I would suggest splitting the sentence in two shorter ones.

Line 159: I assume that in the sentence “100, 200, 100, and 500 μL of 0.2 M citrate, 5 mM nitroprusside,. . .” the second “100” is actually meant to be either 300 or 400? Otherwise is it not clear to me why the 100 is repeated.

Line 409: “The lifetimes to deposition during the day. . .” should read “night”

Table 2: the footnotes have two times the indicator “e”. The first “e” should maybe be a “d” but the description would also not fit to the “max Vd” in the table. Please correct.

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