

Interactive
Comment

***Interactive comment on* “Transpiration in an oil palm landscape: effects of palm age” by A. Röhl et al.**

Anonymous Referee #1

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General comments

The authors investigated the effect of age and micro-meteorological conditions on transpiration of oil palms in a humid tropical lowland in Indonesia. The authors investigated palms stands varying in age between 2 and 25 years. Medium ages stands had a 12-fold higher transpiration than 2 year old stands. This is a valuable dataset and interesting for the readership of Biogeosciences. The major weak point of this study, however, is that most of the 3-weeks sap flow measurements were not performed simultaneously but were conducted successively and thus under varying weather conditions. To get rid of this methodological problem the authors limited their data evaluation for each stand to the average of three comparably sunny and dry days. Therefore, I wonder how the authors come at the end to the conclusion that the temporal variability of oil palm

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transpiration is rather low. I do not agree with this conclusion. First of all, the statement itself is misleading. Over the day there is of course a huge temporal variation in transpiration. What the authors probably mean that the diurnal course of transpiration did not vary much among the three days and the stands. Secondly, to come up with such a conclusion it is not sufficient to evaluate three sunny, dry days. It would require a more sophisticated evaluation of the entire three weeks under contrasting weather conditions and the three plots (BO3, PA, PTPN6) that were monitored over longer periods in parallel. With regard to this aspect it would be very helpful if the authors could present some selected 3-week time series of transpiration. Another point that was somewhat disappointing for me as a reader is that the authors announced that their study will “. . . shed first light on some of the hydrological consequences of the continuing expansion of oil palm plantations . . .”. Unfortunately, this very interesting aspect is not lighted at all, and it would strengthen the manuscript if the authors would add one or two paragraphs in the Discussion about this issue.

Specific comments

p. 9209: The title does not clearly reflect the content of the paper. The title does not reflect the aspect of micro-meteorological drivers, which is a substantial part of the manuscript.

p. 9216, line 10: Please add some additional information how the eddy covariance data were processed. Did you gap fill the data? If yes, how did you do that? Did you use quality flags to filter the data or did you use all data? What's about the energy balance closure of the EC flux data. It would help to assess the quality of the EC flux data if the authors could add some data about the energy balance closure. Did you apply any method to post-close the energy balance (e.g. Bowen ratio method) or did you use the raw latent heat flux data?

p. 9220, line 5: Please introduce the Hill function or give at least a reference to this function.

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p. 9220, line 16-17: "... There was no significant relationship between water use and radiation ...". Firstly, this finding is very surprising, because evapotranspiration must be a function of radiation, and secondly this statement contradicts the results that the authors show in Fig. 5b. There, the authors found, at least for the sites BO3, PTPN6 and HAR_old, a pronounced linear relationship between leaf water use and radiation. Please explain!

p. 9220, line 23-26: I do not agree with the argumentation that the dynamics of leaf water use is buffered. I think it would help a lot if the authors would discuss their result more in the light of plant physiological aspect (e.g. light and temperature response curve, stomatal conductance, photosynthesis etc.). If the light response curve, for example, reaches already at low radiation its maximum than any further increase in radiation would not increase transpiration but this does not mean that the response of the water use is buffered.

Chapter 3.3: Why did you limit your analysis of the environmental drivers to VPD and radiation? Evapotranspiration also depends heavily on wind speed, temperature and atmospheric stability. Did you have also a look on these drivers? Please explain and discuss it in the text!

p. 9222, line 14-26: This is a Result part, and please describe in the Material and Methods which statistical method you applied to get these numbers.

p. 9223, line 9-15: Please avoid to repeat too many results in the Discussion. Pick up shortly the main finding and then discuss it.

p. 9228: The Conclusions section is in large parts a summary and not a conclusion. Please revise it and put the focus on your conclusions.

Figure 3: Please plot the Hill function. That helps to assess the quality of the fit.

Figure 5: It would facilitate the interpretation of the figure if the authors would add the slope of the regression to the plots.

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Technical corrections

p. 9214, line 17: Please state the manufacturer and give some more information about the probe type.

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