

Interactive comment on “Towards quantifying the increase of rainfall interception during secondary forest succession” by B. Zimmermann et al.

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General comments

The paper by Zimmermann et al is a very interesting paper. It encompasses a statistical analysis to determine those forest indicators that can be used to estimate throughfall (and interception) during secondary forest succession. The authors compare throughfall data from the developing ASP-sites with the mature BCI-forests. They assume that the interception values of the BCI-forests can be used as a benchmark to determine whether the interception rates at the ASP-sites are ‘stabilized’ to the value of a mature forest. This is a valid assumption as long as the BCI and ASP have (or will have in time) a similar vegetation type. The paper does not discuss whether this is a

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valid assumption or not.

Furthermore, the title refers to rainfall interception, while throughout the entire paper throughfall is analysed. Although interception and throughfall are directly correlated ($ic = 1 - tr$), it might be good to either change the title to ‘throughfall’, or show interception results.

The paper is well written and well structured. Only the section where the Bayesian Model Averaging is explained should be clarified in such way that it is better understandable for non-Bayesian experts. Hence it is recommended to explain the jargon and restructure this section. This also holds for description of the BMA-results.

The statistical analysis is innovative and helps to unravel the dominant forest descriptors to estimate interception. However, the authors could elaborate on the limitations of their study. For example, what is the effect of only looking at linear relations between throughfall and the forest descriptors? The study is based on a two-month measuring period in the rainy season, how does this relation hold in the dry season?

Specific comments

P8003 L14: Fig1a => 1b.

P8003 L25-26: For clarity add that the 95 forest inventory plots are called ‘prediction sites’ and the 20 plots ‘throughfall plots’ (see Fig 1d-f).

P8005 L4: How can you make 5x5m quadrants (i.e. 4 parts) when the plots have a size of 20x5m or 30x60m?

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P8005 L18: You took the average rainfall for the five collectors? Please clarify.

P8006 L20-21: Does 'long-term' refer to the two months measuring period?

Eq 1: I would recommend changing this equation into

$$i_c = 100 - t_r = \frac{T(x_i)}{R(x_1)} \cdot 100 \quad (1)$$

P8007 L11: Please explain the Shannon diversity index.

P8007 L16: Anticipated => hypothesized.

P8008 L8: Did the authors also look at e.g., the Nash-Sutcliffe and/or log(Nash-Sutcliffe) performance? These two error measures are especially sensitive for the high and low values, respectively.

P8008 L10-12: Explain what is the calibration and the validation period. Also explain the leave-one-out cross validation method.

Sect2.3.4: I don't understand this. Please explain in a different way. What is meant by 'model', 'completely flat prior' (P8009 L6), 'hyper-g-prior' (P8009 L11). Why do you have two models (an explanatory variable is included in the model or not, i.e. two possibilities)? What are the explanatory variables? You seem to use 8 explanatory variables? Are these the ten listed in Table 2 minus BA1, BA5? Please, explain and restructure this section.

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P8009 L27: Which forest inventory data is used? All ten as shown in Table 2? Please explain.

P8010 L6-10: I don't understand what we can learn/benefit from this analysis. Please clarify.

P8010 L23-25: What is the sense of the skewness? Please clarify.

P8022: Explain how SE (σ/\sqrt{n} ?) and CV (σ/μ ?) are calculated. Then CV is dimensionless.

P8023: I am a bit surprised by some of the results. I would expect that openness, BA_1 , BA_5 , SD_1 , SD_5 , and BA_{ratio} would be positively correlated to t_r , but BA_5 , SD_5 are negatively correlated. How is this possible? Please, elaborate. Same holds for the correlation between openness and SD_1 and SD_5 . I would expect them to be positively correlated.

P8011 L16-22: For clearness, add that this analysis has been done on the 20 (or 16 plots).

P8024: Why is the openness log-transformed? In the text this is not mentioned.

P8028: How should I interpret this figure? What is the meaning of the 'sign' (also in Table 4). Please clarify.

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P8012: Table 4 and Figure 3 have very much overlap. Maybe combine the two.

P8013 L3-7: As mentioned before: I don't understand what we learn from this analysis. Please clarify.

P8014 L1-15: I think it is also important to mention the effect of transpiration on stand age. As correctly mentioned interception is lower at young stand compared to mature stands, however transpiration shows an inverse pattern (see e.g, Kuczera, 1987; Shiklomanov et al, 1988): young stands have high transpiration rates compared to mature stands. Please elaborate on this.

P8016 L5-6: This can not be concluded from this study. Please remove.

P8026: I would also plot forest age vs t_r for the 20 plots.

Used references

Kuczera, G.: Prediction of Water Yield Reductions Following a Bushfire in Ash-Mixed Species Eucalypt Forest, *J. Hydrol.*, 94, 215–236, 1987.

Shiklomanov, I. A. and Krestovsky, O. I.: The influence of forests and forest reclamation practice on streamflow and water balance, In: E.R.C. Reynolds and F.B. Thompson, Editors, *Forests, Climate, and Hydrology: Regional Impacts*, United Nations University, Tokyo, 78–116, 1988

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