

Interactive comment on “Modeling forest evapotranspiration and water balance at stand and catchment scales: a spatial approach” by Samuli Launiainen et al.

Anonymous Referee #2

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Comments for hss-2019-45: Modeling forest evapotranspiration and water balance at stand and catchment scales: a spatial approach by Launiainen et al.

The authors presented a hydrological model combining processes from canopy to top soil and below, and validation of the model performance for spatially-averaged ET (and its components), moisture, SWE and discharge was carried out for both forest stands and catchments. The usefulness of enriched open GIS database of soil, vegetation and land use etc. was particularly mentioned. The advantages of the model are that it incorporates the available dataset to well reproduce the major hydrological measurements almost at all forests and catchments at a fairly high resolution, and it proves that

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the parameter transferability from stand to catchment scales is possible. Although the high sensitivity of ET and its components to LAI is not surprising. In conclusion, the work is worth doing and publishing.

With these said, the m/s really gave me headache to read it through and read it again, because it is badly written in terms of flow of logic, structure of the subsections, and confusion of main points for discussion. It seems the authors have a chaotic design for the m/s, for example when Fig 3 is talked about in page 12 the authors suddenly refers to Fig 10, and then jump back to Fig 4; another example is on page 14 about soil moisture variability description, the fig 7- fig 8- fig7 loop. I understand these processes have connections but it is the authors' responsibility to make the connections in a clear order. I think the manuscript needs substantial rework before it can be published.

Specific comments for the authors' reference: Page 4 Line 25 and 28: in the two equations, two symbols for the same leaf area index are used.

Page 5 in the eq.6, describe how the threshold parameter is determined, based on measurements or calibrated? Line 20: since f_s is an important stress function in eq.4, it would be better to explicitly write it out, otherwise the readers have to find it by themselves in the literature cited. Note also the math express: at some places you used the form of $y = \exp(x)$, while at others you used $y = e^x$. Be consistent.

Page 7: symbol beta is used in both eq.16 and eq.19, but with different meanings.

Page 9 Line 8-10: delete – it is a repetition of page 8 Line 18-20. Also write in the 2.6.2 section clearly what a larger μ and σ infers, otherwise when it comes to Results 3.1 and the relevant table, it is hard to comprehend.

Page 11: The section 2.6 is 'Model validation at stand and catchment scales', but 2.6.3 is GIS preprocessing, and 2.6.4 is calibrating Topmodel. I don't think they are appropriately positioned. 2.6.3 is better fitted in Model input section, and 2.6.4 merged with parameter sensitivity section.

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Page 14: paragraph starting from Line 4 can be written better by reorganizing a few sentences. The last sentence is important but the plot is not shown. Better show at least an example in one sub-slot either within the plot or next to the plot in Fig 6. Since this will be an important support for your argument.

Page 14: 3.4.1- This part does not read well. I see you want to explain the temporal and spatial variability of soil moisture, and relate the variability with drainage and/or ET and its components. However, the current writing mixes them badly. Suggestion: describe Fig 7 well first for temporal variability, and Fig 8 second for spatial variability. For Fig 9 because you talk about it in the next section, so I suggest not to mention it here. Just describe the plots. All explanations can be moved to Discussion. Line 27-28: Fig 9 is the long-term averaged values, cannot tell anything in between these years, like day 180. Line 30 – to support the rainfall effect, you must plot the rainfall bars in Fig 7.

Page 15: paragraph about SWE - move SWE to the last paragraph, i.e. describe fig 9 before fig 10, avoid mix them for mind-jumping

Page 16: Discussion – it is difficult to follow and digest, simply because it was badly organized. Currently it gives the impression of no logic of flow. Confusion is caused about what the main points are under discussion. Apparently, the proposed model has the capability to simulate hydrological processes across stand and catchment scales, and sensitivity analysis shows it only has a limited number of parameters significantly influencing the modeling results; Open GIS database application in hydrological model is also mentioned and discussed. Some features that the model has not developed are mentioned in Discussion which I think is unnecessary; and the reason why spatial validation of moisture, ET or SWE should be mentioned in Method validation section, not here. In one word, I would like the authors to think carefully about what they want to discuss or what are the main take-home messages they want to readers to get?

Page 18: first paragraph in 4.1.1 can be deleted. Part of the potential applicability of

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the model has already been mentioned in the previous paragraphs.

I hope the authors notice that there are many NOT SHOWN in the m/s, which makes the m/s sound incomplete.

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