

Hydrol. Earth Syst. Sci. Discuss., referee comment RC2  
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## **Comment on hess-2021-602**

Anonymous Referee #2

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Referee comment on "Modelling evaporation with local, regional and global BROOK90 frameworks: importance of parameterization and forcing" by Ivan Vorobevskii et al., Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2021-602-RC2>, 2022

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### General comments

The proposed manuscript "Modelling evaporation with local, regional and global BROOK90 frameworks: importance of parameterization and forcing" refers to an important problem in evapotranspiration modelling in assessing the impact of input data and parameter selection on model output. The paper uses input data sets in different levels of detail, the physically based hydrological model Brook90, and as validation dataset eddy-flux measurements from 5 different sites. This setup makes the manuscript a valuable contribution. It addresses relevant scientific questions within the scope of HESS.

Nevertheless, the manuscript holds some shortcomings which should be solved before publication.

Parameter selection and parametrization is a central issue in the paper, but information about the parameters is mainly lacking. The cited literature for GBR90 (Vorobewskii et al. 2020) and for EXTR (Luong et al. 2020) list various sources for parameter groups without stating parameter values, too. Please include a table with the relevant parameters and their values which differ due to different soil and landcover input.

The final values of the calibrated parameters and for comparison, the parameter values for the other model set-ups are lacking.

The concept of uncertainties in the paper is not clear. The reader would expect as a result confidence limits for the parameters and model outcome, which is not given. The authors should make clearer what they intent.

In the discussion section main parts of the results, e.g., parametrization, are not discussed and new results are presented instead. The discussion nearly comes out without referring results from other researchers; therefore, the authors do not give proper credit to related work.

The paper needs to be elaborated:

- The abstract does not contain results and a final outcome of the paper
- Elaborating the introduction, work out a hypothesis and state it at the end of the introduction (and not within the method section)
- Reorganize Data & Methods. Why not using traditional Material & methods – section? I suggest lifting “2.1 Eddy-covariance measurements” in the hierarchy and to do not subsume it under “Data”, it is a central issue of the paper. When you have a data section, all datasets should be mentioned there.
- The content of the results section and discussion section is not clearly separated. In the results section results are discussed and, in the discussion, new results are presented. Put the results from the discussion in the results section, and if necessary, give a description in the methods section.

Specific comments

Abstract

Line 17: I suggest deleting “...and various goodness of fit criteria”, because the reader can assume that you do this, when you validate something.

Introduction

Line 25: “...yields approximately  $\hat{\alpha}$  of the total precipitation” Please add a source for this statement.

Line 25 -26: “However, with the need of higher spatial and temporal resolution, evaporation exposes larger variability” The context to the preceding lines is not clear to me. Please reword. I suggest adding some sentences to improve the readability.

Line 34: “eddy-covariance lysimeter” to “eddy-covariance and lysimeter”?

Line 34: "Bowen ratio, gradient, experimental water balance watershed", please be more specific.

Line 36 - 37: "...a space of scale and time. This footprint...", please check your wording. For the eddy flux community, the context is maybe clear, for other readers maybe not. I think some part of the explanation from line 118-119 should be stated here.

Line 54: "and evaporation measurements themselves" Do you mean the uncertainty of evaporation measurements used for validation? Please change the wording.

## Material and methods

Line 68: "Data" - The section data does not contain information about many input datasets, which are quoted in "3.1. BROOK90 setups".

Line 72 - 73: "The average temperature varies between -15 °C and +15 °C in summer month", are you sure with -15 in summer month? Why could it be colder in summer than in winter?

Line 81: yarrow to common yarrow? I suggest using Latin names.

Line 87: Are some of the sites affected by groundwater? How did you solve that problem with Brook90?

Line 100 - 101: Do you have a citation for the carbon budget?

Line 172: "can be set easily (as location or slope)" I can't imagine that it is easy to set values for 100 parameters. Or did you use in most cases the default parameters provided by Brook90? In that case, please note it.

Line 183-184: How did you represent forest floor vegetation in the model? Or does it not play a significant role in the three forests, in contradiction e.g., to Scots pine forests?

Line 192-193: Please specify sources for the datasets

Line 192: If I correctly understood the Amazon Web Service Terrain Tiles is a web service which chooses the best available DEM for a specific location. So please indicate which DEM was used for saxony.

Line 199-200: Please specify a source for CORINE, BodenKarte50, Open Sensor Web. It is confusing: From 2.2 I expected that you use RaKliDa – Metdata, but here you state, that you use Open Sensor Web. Please clarify.

Line 205: Please specify a source for the DEM

Line 215 - 216: "Our main hypothesis is that the goodness of fit of the setups decreases from global to local scale (for both parameterization and forcing)." I would expect the opposite: that the goodness of fit would increase from global to local scale, because local measurements of evapotranspiration should fit better to local measured input data. Please give an explanation how you come to that hypothesis. Furthermore, I suggest stating your hypothesis at the end of the introduction.

Line 226: I suggest deleting: "Since all the proposed metrics are well known, we omit formulas in main text and list them in"

Line 236 – 241: Please give a table of the 20 Parameters with their final values. Please include in that table also the parameter values from the other model setups. I suggest including that table in the main body of the manuscript.

## Results

Line 251: "Before discussing...", delete, because it is the results section.

Line 259: "which got worse ..." I suggest to reword.

Line 263-264: "It was relatively difficult to achieve good timing for the vegetation period even on a monthly scale" I don't understand what you mean with "achieve"?

Line 267 "good BIAS", change it to low bias?

Line 281 "variance errors" Please use a consistent nomenclature for the statistics throughout the manuscript.

Line 308 – 309 "not so well" "distinctly worse" I suggest describing the results without judgmental adjectives.

Line 311-321: This paragraph contains many aspects of a discussion. I suggest to restrict the results section to a description of the results and discussing the results in the discussion section.

Line 322-327: I'm not sure if estimating the uncertainties of KGE by "resampled time-series" contributes significantly to the manuscript. I think this aspect could be omitted, or make clear, why these results are important, at least discuss it in the discussion.

Line 340: "bias and variability are, on the other side, overestimated" What does it mean?

Line 355 – 356: Please shift this information to the introduction or discussion.

## Discussion

Line 389 – 402: this paragraph contains a lot of information which should be shifted to the results section.

Line 412: "solar elevation" to solar elevation angle?

Line 414 – 430: this paragraph contains a lot of information which should be shifted to the results section.

Line 419: "After obtaining a persistent positive BIAS in the forests" BIAS for which variable?

Line 431: I'm sure that this is not the first paper which deals with uncertainties of eddy-

flux measurements. Maybe some references will help to enhance this section.

Technical comments

Shouldn't be citations within the text ordered by date?

Line 52: "Allen et al., 1998, p.56; Miralles et al., 2016, p.2" Check if this form of citation is correct.

Line 114: correct: "6.90C"

Line 166 & 189: check the citations.