Interactive comment on "Averaging over spatiotemporal heterogeneity substantially biases evapotranspiration rates in a mechanistic large-scale land evaporation model" *by* Elham Rouholahnejad Freund et al.

Anonymous Referee #1

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In their study, the authors adapt a general mathematical method that was published by them earlier (2017) that can be used to determine and correct the biases related to the spatial aggregation of modeled, gridded evapotranspiration fields. The method is exemplarily applied for Switzerland, based on the GLEAM evapotranspiration model. I consider the contribution as innovative and as relevant for the field of hydrometeorological modeling and I recommend its publication after the following points were adequately addressed:

General comments

Is it always that with higher resolution data models give more realistic estimates of ET? In the introduction you mainly address biases caused by rescaling of ET fields, but how does that rely to observations? Is there evidence in literature for the assumption that higher resolution data usually provides more realistic rates?

You use GLEAM to prove your concept. But looking at the comparisons of true and estimated biases in Fig. S2 and S3, it seems that your approach does not work well for resolutions smaller than $0.25°$ (which is the target resolution of GLEAM). So maybe GLEAM is kind of optimized to this resolution and is not too realistic for higher ones? How would you explain the increased scatter between true and estimated biases for the $1/32°$ and $1/16°$ resolutions?

Specific comments:

16: I would say that the drivers for droughts and heatwaves are precipitation, radiation, wind, temperature and soil moisture but not ET. Heatwaves occur because of the advection of warm and dry air. Droughts are caused by lacking precipitation.

42: Can you give a rough number (in percent) of typical deviations?

140: Priestley-Taylor was already cited before in L 101.

167-173: You should cite your 2017 paper here again, is is cited in the introduction but when I read the equations below a quick link to where they have been derived would be helping; also you should explain shortly the meaning of the variance and covariance terms here. They are only explained in L 246.

177-179: Eq. 8 is not a derivative

179-188: Why was the interception term of Eq. 6 been skipped in the derivative calculations?

221-230: What algorithm was used for averaging?

271-280: Are there dates where other variables than soil moisture have an increased

impact?

309, 390, 391: The section references seem to be broken.

Fig. S2a) / S3a), please put the 6 maps into two rows, the color key numbers are hard to read

References: unify format, many DOIs are missing, some are printed as links, some have no preceding "DOI" (pleas stick to HESS typesetting rules); Use en-dash for page ranges instead of simple dash 522: "Uber" -> "Über"

Minor:

15: feedbacks -> feedback 124: please change to "I is interception loss" or "I are interception losses" 367: two times "These biases can" maybe replace by "and"