

# ***Interactive comment on “Evapotranspiration at four sites representing land-use and height gradient in the Eastern Ore Mountains (Germany)” by Uta Moderow et al.***

## **Anonymous Referee #1**

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The study focuses on assessment of different variants of ET estimates that represent different correction schemes for surface energy imbalance. Finding the proper correction scheme for this imbalance represents a long-standing unresolved scientific problem. It builds on impressive dataset of eleven years of measurements at 4 sites that also represent 3 different land uses and 3 different elevations. Extent of the yearly differences among the ET correction variants are discussed in respect to yearly sums of precipitation and within the Budyko (1974) framework. Authors evaluate the seasonal changes in ET response to driving variables using principal component analysis. Unfortunately, in contrast with the manuscript name, land-use and height gradient are not the leading topics of the manuscript and this context is barely mentioned within the whole

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manuscript. Instead the authors chose to discuss the energy balance closure (EBC) fractions and its implications for LE estimates without explicitly discussing implications for sensible heat (H) fluxes. This is understandable due to the focus of the journal and the special issue. However, this approach does not allow for a thorough discussion of EBC problem, neither are the study claims supported by an independent ET estimate using modeling or other measurement technique. All three ET estimates actually represent typical EBC correction schemes, where ET\_uncorr implies attribution of EBC residual solely to H flux and they can be considered as the ET uncertainty range due to the surface energy imbalance (ET\_uncorr, ET\_residual) and a central value (ET\_corr). Therefore, these estimates should be discussed more as the ET variants than different ET estimates that suggest application of different measurement techniques. As discussed in review Mauder et al. (2020; <https://doi.org/10.1007/s10546-020-00529-6>), there are sites for which attribution of EBC residual almost completely to either energy flux (H or LE; here corresponding to ET\_uncorr and ET\_residual) shows the best match with independent estimates of energy fluxes or modelling results. Attribution of EBC residual based on bowen ratio (here ET\_corr) seems to be a pragmatic solution adopted also by FLUXNET as this approach was shown to give the best results for most of the sites that focused on such evaluations. Thus, I see as the main flaw of the study that the authors focused on a research question that cannot be answered using the applied methods and this aim is not reflected in the manuscript title. Although Budyko framework is a good tool to evaluate the potential ET, it can be hardly used to validate any of the ET variants. In their recommendation for application of ET\_corr authors mainly rely on existing literature. Authors provide an analysis of ET response to environmental variables with an interesting result. However, why is ET itself used as one of the driving variables in the PCA analysis is unclear to me. One of the results that DE-Obe site shows higher ET than DE-Tha positioned in lower elevation could be interesting if developed more and it could also provide results towards the focus advertised by the manuscript title. However, authors here resort to assumption (hypothesis) about interception that is not supported by the data. Authors could evaluate

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e.g. differences in available energy, its partitioning into H and LE (bowen ratio), albedo or surface conductance. An impression on interception importance could be obtained by evaluation of Priestley-Taylor coefficient. But to my understanding the differences in ET of both sites are not that large and could be simply explained by differences in annual precipitation. The manuscript is written in rather loose language and this impacts also definitions in the text. Most importantly, though central to the focus of the study, description of LE\_corr estimation is practically omitted in the methods. The only mention is “LE correction follows the FLUXNET procedure (FLUXNET 2017)”, while all variants represent a certain correction for lack of EBC. This makes the description ambiguous as well as some other examples in the text (“LE determined as a residual of the energy balance (ET\_residual)”). Text could be also more compacted as some parts of sections are repetitions. Summarizing the above, the manuscript addresses the topic relevant for the HESS audience but instead of focusing on better understanding of the processes, it assesses different EBC corrections and documents the extent of the EBC problem. This assessment could not reach a conclusive answer due to the lack of independent ET estimates. In this respect I suggest to reject the submitted manuscript.

Minor comments: I would suggest to avoid evaluation of ET correction schemes and instead adopt the ET\_corr after justification based on literature review. Differences among land-use types and elevations could be than evaluated. Authors could additionally discuss runoff. What are the typical bowen ratios at the sites? Title: “representing land-use and height gradient” -> representing different land-use and elevation gradient (land-use gradient does not applicable) Short summary: “we recommend using a distinct ET estimate” What is distinct ET? “water temporally stored on plant surfaces should receive more attention” -> Relaxed language. I believe that you propose that evaporation of intercepted water should be studied more.

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