

# ***Interactive comment on “Environmental controls on seasonal ecosystem evapotranspiration/potential evapotranspiration ratio as determined by the global eddy flux measurements” by C. Liu et al.***

## **Anonymous Referee #2**

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### General comments

The authors use flux data to calibrate a simple empirical model of the actual to potential evapotranspiration ratio that can be used to calculate AET for other parts of the world, which is a subject appropriate for HESS. I have, however, some doubts about some parts of the methodology and the authors don't really show the potential of the model by applying it. Therefore, I think a major revision is needed.

I get the impression that crop methods (e.g. L 71) are applied to other ecosystems without proper consideration of how the different structure and other properties of those

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systems should affect the methods. Eq 2 is constructed for crop and I think it is fine to apply it to other ecosystems for a reference, but it is not correct to use the wind speed at 2 m height measured within closed forest canopies for that calculation. You need to in some way transform the wind data for those sites to open field wind speed or use another parameterization and wind speed at a higher level. As it is done now  $ET_0$  is underestimated and  $K_c$  is overestimated for the forest sites. For the within land-cover type evaluation it might not make a big difference but in the comparison of  $K_c$  levels between ecosystem (e.g. L 166-167) it will matter.

## Specific comments

To call latitude an environmental factor (L 102) is questionable though it has a direct connection to the variation of the day length and incoming radiation over the year. Other environmental variables like temperature have some relationship to latitude and it would be better to use those or at least acknowledge that latitude is a proxy for those. This is somewhat done in the discussion (L 231-232), but it should be more clear and stated earlier.

You have some southern hemisphere sites but it seems that you have treated them such as they were expected to have the same monthly variation as the other sites, is that correct?

How were seasonal and yearly  $K_c$  calculated,  $(\text{Sum of ET over months})/(\text{Sum of } ET_0 \text{ over months})$  or average of monthly  $K_c$  values? In my opinion the first method is correct.

In the discussion it would be good to discuss lag effects. There is e.g. a lag between precipitation and soil moisture that can be up to some months. And low soil moisture can lead to a loss of LAI and the low LAI can sustain for a longer period. Precipitation and LAI is included in the environmental variables but not soil moisture but  $K_c$  is partly expected to be explained by soil moisture.

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It would really have helped the conclusions if the model of KC developed here was applied and verified for AET. The whole conclusion is based around AET estimates but it has not been done. Some year or sites could e.g. been excluded from the calibration and used for validation.

Technical corrections

Be careful to use the same format (italic, subscript) for all the letters in your abbreviations in text, equations, tables and figures. E.g. Kc in L 100, Eq 2 and Fig 2-7.

L 108. Should be “land-cover specific” not “land cover-specific”.

L 112. Why do you have an F in all forest abbreviations but not for DB?

L 140. “is slope vapour pressure curve” please write proper English.

L 175. Zeros instead of circular degree symbols are used.

L 187-188. I suggest revising to something like “In addition to growing season, site latitude and monthly precipitation leaf area index affected the monthly Kc” if I understand what you want to say.

L 190-191. I suggest “The LAI range was up to 6 in most land covers, while it only reached 3-4 in OS and CRO”.

L 193. “was” not “were”.

L 201-202. I would put the numbers within parenthesis in this sentence.

L 206. Delete the first “are”.

L 232. “increased” should be replaced by “will in most cases increase” (see specific comment above).

L 267 “for a” not “fora”

Fig 1. Maybe increase symbol size, especially ENF is hard to see.

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Fig 2-4. Tell that you are showing mean and standard deviation.

Fig 3. You have not specified what months are included in the different seasons.

Fig 5. Use proper degree sign.

Fig 5 legend. "Variation of annual  $K_c$  at . . ." might be better.

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