

## ***Interactive comment on “Spatial and temporal variations in plant Water Use Efficiency inferred from tree-ring, eddy covariance and atmospheric observations” by Margriet Groenendijk et al.***

**Anonymous Referee #1**

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This manuscript describes approaches to infer water use efficiency (WUE) across regions using different observations and shows that observations indicate a substantially greater increase in WUE than what is predicted by climate models. I found the manuscript straightforward, well-described, with highly important results and having highly relevant implications. So the manuscript should, eventually, be published.

The reason why I suggest major revisions is that the organization in its present form is disorganized and some valuable information is contained as supplementary information that could very well be placed in the main manuscript. The present form reminds me of a manuscript version that is submitted to journals like Nature or Science, and so it does not fit well into the organization of a normal journal manuscript. For instance,

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some of the methodology is described in the results section, and I also feel that the motivation could be improved in that it provides an outline of what is done with different data sources and climate models.

Minor comments:

line 33: The abstract would benefit from a final, concluding sentence.

line 68: Should this not be leaf temperature rather than surface temperature to be consistent?

line 153: What about the use of remote sensing and climate model output? This should be mentioned in the Materials and Methods section as well.

line 175: Perhaps mention that it is because  $a > 1$  that WUE increases faster than CO<sub>2</sub>?

line 189: It may also be the case that optimality theories on stomatal conductance miss some feedbacks with the atmosphere that are relevant for the optimization.

line 204: I think it would be useful to include Fig. S7 in the main text.

line 215: The text mentions Jung et al. 2011, but Figure 2 mentions Lin (et al. is missing). I am confused.

line 229ff: This should go to the methodology section.

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line 262: I could not find an animation, but I am sure that this could be done in the Copernicus system.

line 268: I may be missing something, but I cannot see a slower increase in WUE in the figure.

The references are sometimes incomplete (e.g., et al. instead of author names, page numbers are also missing for a couple of references).

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Figure 5: I am confused by the boxes in (b). These do not refer to panels D-F. Also, the labeling A-F is missing in the figure.

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