

Interactive comment on “Revisiting the First ISLSCP Field Experiment to evaluate water stress in JULESv5.0” by Karina E. Williams et al.

Anonymous Referee #3

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The authors present three simulations of FIFE Site 4439 (Konza Prairie, Kansas) utilizing three configurations of JULES, from Cox et al. 1998, Harper et al. 2016, and a third developed for this manuscript.

The parameterizations are compared for sensitivity to changes in root-zone soil water, light availability, leaf temperature as well as for the relationship between intercellular CO₂ and net assimilation. The results show that the two literature-based configurations may not capture observed relationships in site-level data (e.g. Polley et al. 1992, Knapp 1985).

The simulations are next confronted with observation-based data of GPP, net assimilation, and latent heat flux from 8 days during 1987. Generally speaking, the Cox et al. simulation output tends to provide the best fit to these data. Lastly the authors present

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parameter sensitivity results (of GPP) for four "tune-leaf" parameters.

Strengths: (1) The authors very clearly explain the process by which they developed the tune-leaf parameterization and its differences with the Harper and Cox parameterizations. This includes Figures 3-5,7, which effectively demonstrate the fit provided to leaf-level data by the three parameterizations. (2) The authors show, across a small subset of observational data, that utilizing field-derived parameter values tend to degrade model performance (Figs8-10). This is an important (and not unexpected) finding that will merit further study.

Weaknesses: (1) Conclusions are not strongly based in the specific work conducted within this study. See comments. (2) The scope of the study does not match the ambitions of the introduction. Page 2, Line 31 states: "This effort requires a large amount of data to evaluate against, covering a wide variety of climate and vegetation conditions". Yet within this study only one site is analyzed. The authors might consider better contextualizing the current status of progress towards such a dataset. (3) The authors do not acknowledge the mismatch between the leaf level scale and the eddy covariance / ESM gridcells. A short discussion of the challenges of reconciling leaf level parameters with the effective large scale parameters would be merited. (4) Observational data record is extremely short (8 days). Are there other data available (remote sensing or flux tower) that could be used to evaluate the different model configurations? Why is only one year of the FIFE data used? (5) Many statements based on literature review are presented without citation in the results and conclusions sections. The relevant citations should be repeated, or the reader should be referred to the specific section where the citations can be found.

Specific Comments:

P15: Consider moving figure 6 to supplementary

Figures 8-10: would be interesting to see summary statistics on the goodness of fit for the various parameterizations.

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P2.L31: There is a significant disconnect between the first five sentences of this paragraph and the single-site nature of this study.

P17.L24: "Other studies have argued that the dry period diurnal cycle at this site can be captured via an explicit dependence on leaf water potential". I understand this is covered in Section 2.3.2, but I think you should either repeat the citations or refer back to Section 2.3.2.

P26.L2-3: "JULES is not currently able to capture the diurnal cycle of net canopy photosynthesis at this C4 grass site", unclear which model configuration you are referring to.

P26.L2-3: "JULES is not currently able to capture the diurnal cycle of net canopy photosynthesis at this C4 grass site, due to the lack of a strong dependence on the canopy vapour pressure deficit (indirectly or directly)." Second clause needs citation. Not shown within this study.

P26.L4-5: "The temperature response of V_{cmax} can be tuned to compensate for this, but it is more desirable for the model to respond to high temperature stress and high water stress individually." This is not very well contextualized, perhaps instead you could more specifically say that repro-cox still manages a reasonable diurnal cycle, but likely due to compensating errors, and then refer back to the section where you discuss that in greater detail.

P26.L5-6: "These runs also showed how the default water stress parameterisation can result in large reductions in photosynthesis during periods that are not considered water-limiting at the site." I am not sure which figure you are referring to or which time period specifically.

P26.L10-11: "These have been extensively studied at FIFE in independent investigations and yet still show a wide spread, leading to large modelling uncertainties" needs citation.

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P26.L12: "The FIFE data also indicates ..." How exactly does the FIFE data indicate that JULES should represent leaf rolling and senescence?

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