We thank the reviewer for their insightful and helpful feedback. We have addressed the comments and incorporated the suggestions into our manuscript. In the text below, answers to the reviewer´s comments are written in italics, and changes made to the manuscript text are underlined.

Reviewer 2 comments (16 Feb 2024):

Thank you for taking the time to address my comments. I appreciate that you include some model statistics in your revisions. However, what the RMSE and bias values do not show is that, based on my assessment, the fuel stick moisture model does not have any predictive skill when it comes to simulating the observed wood block moisture values. Using the data and scripts in the github repo, I was able to reproduce Figure 3a. I then calculated the Nash-Sutcliffe efficiency metric for each site individually. The values were all below zero, which indicates that the model does not do any better than a simple mean value. As well, I ran linear regressions between the simulated and observed data for each site individually and found that the p-values were all larger than 10%. Finally, I did a single regression of simulated and observed data across all sites and found that the R^2 value for the simulated moisture is less than when you regress the observed data against the intra-site averages. This analysis suggests to me that the model has no real skill in modelling the block moisture. So I would suggest that it is inappropriate to use the model output as the basis of the rest of your analysis. If desired, I can provide the R-code I used to undertake this analysis.

Upon further review of our analyses, we found a typo in our code that caused the rain flux to be too low (see line 174 from forcing_minutes_wood.m file). Additionally, to better represent the moisture content of wood blocks in the field, we changed the geometry from cylinders to blocks, adjusting some of the equations for heat and water transfer applicable to block geometry (see fuel_model_wood.m and forcing_minutes_wood.m files). After correction and recalibration of the models, the wood moisture simulations based on the fuel moisture stick simulations improved both visually (see Figure 3) and quantitatively based on the Nash–Sutcliffe efficiency metric (Table S2) suggested by the reviewer. Four out of five sites performed at least as well as the mean value of the observations, and only one site had a negative Nash-Sutcliffe score. This suggests that the model simulations and further conclusions are robust.

We acknowledge that the Nash–Sutcliffe efficiency metric is an interesting way to assess model performance for time series. However, we note that this metric is typically used for assumptions in hydrological problems and not for such a dynamic variable as CO_2. Therefore, it may not be the most appropriate metric for our exercise, especially given the sparse number of data points. Nonetheless, we computed the metric, showing that our model simulations have the potential to perform better than the site mean of the observations. More importantly, we would like to emphasize that the benefits of our mechanistic model extend beyond its predictive capacity. It responds to climatic variables, which allows us to understand CO_2 temporal and spatial dynamics at an hourly resolution. With sufficient data, our approach can be applied in various scenarios, such as seasonal comparisons across sites—something that the simpler mean value approach cannot provide.

Because the new calibration step slightly changed the subsequent analysis, we have updated the figures and the interpretation accordingly. For example, our new results suggested a more rapid degradation of wood in the wet rainforest and for some native species. However, the overall patterns and conclusions remain the same. Please see the manuscript with the highlighted changes.