Response to Referee #2

Dear referee, thank you very much for reviewing our manuscript and adding your comments and input. We considered all your comments and responded to each of them as specified below.

Line 109: trailing e
Response: Corrected. Thank you!

Line 165: It is unclear what fire disturbance is here
Response: This was a mistake. This sentence was meant to written as "This model framework enables the simulation of global vegetation dynamics, including the influence of fire disturbance". It was corrected.

Line 429: why is era interim used for evaporation and not the more recent era5? This is only a small comment and if the authors have good reason there is no need to do additional work to change this as it does not impact the results in a meaningful sense (only figure S9 I suppose)
Response: Thank you very much for your comment! We updated our ET validation to ERA5 (Hersbach, H., Bell, B., Berrisford, P., Hirahara, S., Horányi, A., Muñoz-Sabater, J., Nicolas, J., Peubey, C., Radu, R., Schepers, D., Simmons, A., Soci, C., Abdalla, S., Abellan, X., Balsamo, G., Bechtold, P., Biavati, G., Bidlot, J., Bonavita, M., … Thépaut, J. N: The ERA5 global reanalysis. Q J R Meteorol Soc., 146, 1999 2049. https://doi.org/10.1002/qj.3803, 2020). There were no changes in the comparison between simulations and validation.

Lines 444-445: not clear to me what is meant here, is it same thing as what is explained in line 446-448?
Response: Thank you for your comment. In our simulation, we didn't model human-managed land, only natural vegetation. However, our validation product for fire (MapBiomas Fogo) also considers fires occurring in human-used lands. To account for this, we weighed our model output and the validation from MapBiomas Fogo by a human use fraction created from MapBiomas land use cover product. As you pointed out, it's a process similar to what we did with our monthly burned area comparison for Cerrado. The

difference is that, in the monthly burned area, we weighed the fire product by the human use fraction of the corresponding year, and the mean burned area maps were weighed using the mean human use fraction for the 30-year time series we analyzed.

Lines 462-466: the fraction of raingreen trees also seems reduced in the savanna simulation, it might not be very important as it only covers very small fractions in the default run as well but is there any reason for this?
Response: Thank you for your comment. The PFT establishment in the LPJmL model is based on competition. Each PFT has specific settings that make it more or less competitive in a range of environmental conditions. In our run without the Savanna PFT, the raingreen trees were able to establish themselves in a few areas in central Brazil. However, when the Savanna PFT was introduced, it outcompeted the raingreen tress in those areas due to its competitiveness in drier environments.

Lines 523-524: this phrase was quite unclear to me when I first read it, after reading the discussion it became clear to me but please avoid vague statements such as referring to 'real motivations' here.
Response: Thank you for your comment. The phrase was rewritten as “With the inclusion of the new TrBS PFT, the burned area estimates in the Cerrado increased, surpassing the values recorded in the MapBiomas Fogo in central Cerrado, but still underestimating burned area in the northern region of Cerrado and in the Amazon (Fig. 6)”.

Lines 556-557: unclear what spatial burned area patterns implies here, could you clarify? I would assume the model has more spatially concentrated and intense fires than observations, is that was is implied here, please be more specific.
Response: Thank you for your comment. The phrase was rewritten to be clearer. “In the Cerrado, fire-related emissions were overestimated in the Savanna scenario, particularly in the central part of the biome, reflecting the spatial patterns of burned area.”