Hydrology and
Earth System
Sciences
Discussions

Interactive comment on "Multi-variable evaluation of land surface processes in forced and coupled modes reveals new error sources to the simulated water cycle in the IPSL climate model" *by* Hiroki Mizuochi et al.

Anonymous Referee #2

Received and published: 19 December 2020

Mizuochi and co-authors present a multivariate evaluation of the IPSL climate model forced with and without coupling to GCM at the global scale. Number of independent products are used to evaluate the performance of four Essential Climate Variables plus precipitation between the coupled and uncoupled modes and assess their differences. Although I am not an expert in the ORCHIDEE/LSM modelling, the manuscript is mostly clearly written, storyline is nicely motivated. Some rearrangements are recommended (see further), to better quantity different model configurations (factor assessment) and their linkage. Overall, the presented topic is interesting and relevant to be the HESS

readership. Note that the model simulations are not available for reviewer assessment, which does not comply with Copernicus guidelines, see https://www.hydrology-and-earth-system-sciences.net/policies/data$_{policy.html for more details}$.

Main comments:

(1) I have missed some extensive quantification and discussion, how much precipitation differs between WFDEI and LMDZ6A atmospheric GCM (period, annual, seasonal values) at the beginning of your analysis. There is panel C in Figure 2 introduces "coupled precipitation bias", but it is not defined, what is the references for this bias. Is it WFDEI or GPCC? It might be also helpful to introduce, how much this error is in terms of the relative annual change, to get better feeling for their differences. Which one of the two is closer to reality?

(2) It is quite unusual that you introduce first three figures in the first paragraph of the Results section. Please, better explain the sequence of Figures and clearly explain, why you are showing all the figures. It is quite needed to make a better link between fig. 1 (depicting the factors) and following figures, especially the classes of Figures 6-8 need to be better linked. Current x-axes definitions of Fig. 6-8 is missing and need to be clearly linked to Table 2.

(3) There is positive bias for the coupled ET (see Figure 2E) in Amazonas, while the coupled precipitation bias (Figure 2C) shows large precipitation underestimation for the very same region. I don't understand, where this counter-intuitive behavior comes from. Please clarify.

(4) Figure 2 is already quite heavy, but it is really hard to spot the difference between left and right column. Would be nice to, say, provide the relative change between the forced and coupled runs.

Minor/Technical:

Remove reference in preparation

Line 264: spell out CC is correlation coefficient (Pearson I guess?)

Fig. 1D, not clear, why authors use do you use the ORCHIDEE variable in this reference overview figure and not an independent data source.

Fig. 1G, link types to Table 1.

Figure 3: I suggest, replace gray by white and then green by gray. Green takes too much attention, although that's non-significant pixels.