

Interactive comment on “Parameter optimisation for a better representation of drought by LSMs: inverse modelling vs. sequential data assimilation” by H el ene Dewaele et al.

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RESPONSE TO REVIEWER #2

The authors thank anonymous reviewer 2 for his/her review of the manuscript and for the fruitful comments.

2.1 [As of now the authors validate the drought representation of the model by comparing the annual maximum above-ground biomass (Bag) and straw cereal grain yield (GY) values only. In my opinion for better drought representation, it is also important to see how the selection of MaxAWC influences drought representation in terms of

C1

water balance (ET, Runoff, Soil Moisture). This would also provide an independent criterion for model evaluation for drought representation. The authors may want to use observations such as streamflow, satellite based SM or ET for the evaluation purposes.]

Response 2.1:

Using independent satellite-derived products for validation is a very good idea but some limitations have to be considered. We made an attempt to use the GLEAM evapotranspiration product (Miralles et al., 2011) but very poor correlations were obtained for most d epartements (median R2 values less than 0.06). Using streamflow observations would require the coupling with an hydrological model. This is out of the scope of this study. On the other hand, good correlations were found for the Gross Primary Production (GPP) FLUXNET-MTE product described in Jung et al. (2009). With respect to basic ISBA simulations, GPP RMSE is nearly systematically improved by the original LDAS simulations, and LDAS tuning drastically reduces the largest RMSE values. A new Figure presenting these results will be added.

References:

Jung, M., Reichstein, M., and Bondeau, A.: Towards global empirical upscaling of FLUXNET eddy covariance observations: validation of a model tree ensemble approach using a biosphere model, *Biogeosciences*, 6, 2001–2013, doi:10.5194/bg-6-2001-2009, 2009.

Miralles, D. G., Holmes, T. R. H., De Jeu, R. A. M., Gash, J. H., Meesters, A. G. C. A., and Dolman, A. J.: Global land-surface evaporation estimated from satellite-based observations, *Hydrology and Earth System Sciences*, 15, 453–469, doi:10.5194/hess-15-453-2011, 2011.

2.2 [The introduction section needs to be improved by ensuring a better connection between the focus of a paragraph with the one following it. For example, as of now the paragraph two (starting on line 5 page 2) seems out of place. The paragraphs before

C2

and after it discuss the influence of MaxAWC and this one discusses the influence of climate variability. Likewise, the discussion of data assimilation starting on line 30 page 2, also seems to be out of place.]

Response 2.2:

Yes. Paragraph 2 was moved before the first paragraph. Data assimilation is now introduced before as: "Using satellite observations and data assimilation techniques could be a solution to this problem."

2.3 [(1) Line 23 (page 1): Not just due to climate change, but in the context of natural climate variability too.]

Response 2.3:

Agreed.

2.4 [(2) Line 2 (page 2): Almost all regions are affected by drought, it's just some are more sensitive/vulnerable to drought risks exposure than the others.]

Response 2.4:

Yes. "In regions affected by drought" was replaced by "In regions vulnerable to drought risk exposure,"

2.5 [(3) Page 2, Line 5: "Assigning agricultural..." rephrase this sentence for better clarity, please.]

Response 2.5:

Yes. "Assigning" was replaced by "Comparing".

2.6 [(4) Page 2 Line 8: "Li et al. (2010) showed: : :." Please provide an estimate of the scales here]

Response 2.6:

C3

Yes. This sentence was changed to: "Li et al. (2010) showed that air temperature tends to influence mean crop yields at small scales (400 to 600 km) whereas rainfall drives crop yields at larger scales (50 to 300 km)".

2.7 [(5) Page 2 Line 12: Please change this sentence to: "Soil characteristic influence the vegetation response to..."]

Response 2.7:

Agreed.

2.8 [(6) Page 2 line 12: Please change "In the model benchmarking study of Eitzinger et al. (2004)," to "In a model benchmarking study, Eitzinger et al., (2004) ..."]

Response 2.8:

Agreed.

2.9 [(7) Page 2, Line 14: Please change "differing" to "that differ".]

Response 2.9:

Agreed.

2.10 [(8) Page 2, Line 17: Please change "taking into account soil type" to "taking into account of soil type".]

Response 2.10:

Agreed.

2.11 [(9) Page 8, Line 2, "Of" is missing in "relevance the".]

Response 2.11:

Yes. this was corrected.

2.12 [(10) Page 8, Line 11: Please change "consists in" to "consists of".]

C4

Response 2.12:

Agreed.

2.13 [(11) Caption of Figure 4: "Dark" should be "black".]

Response 2.13:

Agreed.

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