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Biogeosciences Discussions

# *Interactive comment on* "Large-scale biospheric drought response intensifies linearly with drought duration" *by* René Orth et al.

**René Orth et al.**

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Review for bg-2019-442 Title: Large-scale biospheric drought response intensifies linearly with drought duration This study investigated the impacts of soil moisture droughts on several variables (NDVI, GPP, ET and crop yield) to infer the vegetation drought response. And the authors found a linear relationship between drought duration and these variables. The contents are well-organized and the evidences supporting the findings are strong. In general, this paper is already well-written.

A1: We thank the reviewer for this encouraging evaluation.

The reviewer only has a few minor concerns and suggestions for the authors to consider. (1) For GPP and ET, how many machine learning products did you use? It will



benefit readers' understanding if you can add a table listing the name, spatial resolution, temporal resolution and temporal coverage of all the datasets used in this study.

A2: We thank the reviewer for this suggestion, and have implemented it by introducing a respective table into the manuscript in line 495.

(2) You categorized machine learning GPP and ET as observations (Figure 4 and method part), and GLEAM ET as model results. In fact, both machine learning ET and remote sensing based ET are observation-based ET estimates. I suggest you to change the terminology, change "Obs, ET" (Figure. 4a) to "ML, ET".

A3: We agree with the reviewer and have replaced 'Obs' with 'Reference' within Figure 4. Further, we have updated the caption of Figure 4 in lines 515-519:

"Figure 4: Drought duration control on biospheric drought response in observations and models. Response of drought-integrated biospheric anomalies across observation-based reference data (ET, NDVI, and GPP as displayed in Fig. 3), as well as for modelled ET (GLEAM and Earth2Observe models)."

(3) Line 105, what is the unit of the aridity index used in your study?

A4: It is unitless, and we clarify this point in lines 105-107:

"This unitless index is derived by dividing the mean net radiation over the entire study period by the corresponding unit-adjusted precipitation mean."

(4) Line 185, how was the power of drought duration calculated? I suggest you to add it in method.

A5: We have added a sentence on this in lines 187-189:

"It is computed as the correlation between the drought-integrated GPP anomalies and the respective drought metric values from the droughts across all grid cells of a particular aridity class."

(5) Line 187-189, “Other. . .days.” However, according to Figure S6, the explanatory power of “number of dry days” is larger than that of “drought duration”. Can you explain it?

A6: We added a sentence to clarify this point in lines 195-197:

“Only the number of dry days (within the soil moisture-diagnosed drought duration) yields slightly higher correlations as in the case of drought duration, which results from the additional, precipitation-based information contained in the number of dry days.”

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