

## ***Interactive comment on “Leaf Area Index Changes Explain GPP Variation across an Amazon Drought Stress Gradient” by Sophie Flack-Prain et al.***

**Anonymous Referee #2**

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Review of Leaf area index changes explain GPP variation across an Amazon drought stress gradient by Flack-Prain et al, Biogeosciences, 2019. This paper describes how GPP changes along a gradient are explained by direct and indirect effects of climate forcing in Amazonia. The direct forcings include physiological responses while indirect responses include ecosystem structural and leaf trait responses. The authors use observations and a calibrated soil, plant, atmosphere model to single out the different responses. They find that indirect responses dominate the explanation of the spatial variation, whereas seasonal variation was dominated by response to global radiation, the strength of which depends on the level of drought. The paper is in general well written, well structured, concise and to the point. There are a few points that need attention: - In a few instances, which I will describe below, I found the formulation of

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sentences vague. - In my opinion research question 3 adds little value to the paper and the corresponding results are relatively shallow relative to the existing literature. The results are quite obvious. I suggest removing this question and the corresponding results. It will make the paper sharper and more to the point. - I miss a discussion on the temporal scale of the responses. The authors use ‘multiple’ (2) years of forcing data. They find that indirect responses dominate. I understand that the paper describes equilibrium responses to an existing drought stress gradient. Still indirect responses probably need some time to develop, while droughts are often intermittent. If I do not fully understand how the authors see this, it may indicate the need to discuss this issue explicitly. - The model methodology is explained insufficiently to allow for independent reproducibility of the results and for understanding what the authors really did. Specific comments - Line 90. Please explain on what time scale this evidence is valid. - Line 90. This paragraph is rather qualitative, therefore vague. Please explain how strong the responses are. - Line 104: understanding is limited. This is quite an empty sentence. Please make it more concrete by stating what understanding is missing exactly. - Line 127. We link . . . . Vague sentence. Additionally, 2 years is really the minimal number of multiple years. Couldn't you use a longer data set? This is relevant to how fast ecosystems respond to and recover from drought. How do you capture transient responses and how do you know those 2 years are representative for average (or not extreme) conditions? - Line 171. Please define MCWD precisely. - Line 208. How frequent were data gaps? - Line 222. . . . overestimation. . . please quantify. - Line 254. This sentence confused me initially, it sounds like you are only focussed on direct effects. Please rephrase. - Line 359. Please clarify how this can be seen in table 3. - Section 3.5.2. This section is difficult to read because of the many numbers. Is presenting them in a table of figures an option? After these points have been addressed, I advise positively to publish this paper in Biogeosciences as it is a valuable contribution to better understanding spatial and temporal variations in GPP in Amazonia and the carbon cycle in general.