

Interactive comment on “Lagged effects dominate the inter-annual variability of the 2010–2015 tropical carbon balance” by A. Anthony Bloom et al.

Anonymous Referee #1

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The paper is generally interesting but it presents too much material, the writing is very dense and further clarity is needed to make it a useful contribution to the literature. I have two main points of criticism: 1) The conceptualisation into concurrent and lagged effects is attractive but also confusing. Only after reading the full manuscript, I actually think I now understand why. Basically, the wording is somehow counterintuitive and I never really understood this until I reached Figure 2. For you, lagged effects refer to the mean climatic effects within a given year while concurrent effects refer to the effects of climatic variability. And actually, both refer to the same year. However, from my initial understanding, probably one shared by many natural scientists, I assumed that the lagged effects are “from what has happened in the years before” and this usually

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refers to some strong drought or other extreme event that has longer lasting effects than just within the year itself. So “lagged” effects in this logic are driven by extreme events (such as our concurrent effects) but extending several years backwards. I am not sure if these are really fixed definitions but maybe you should clarify this at a point early in the manuscript and possibly change the naming of your concurrent and lagged effects. Maybe to avoid all that confusion, you could choose an example such as the 2010 Amazon drought and show the usefulness of your framework for this year? This would make the analysis more tangible and easier to follow your logic for the reader. Conceptual clarity would also help to clarify another potential source of confusion: To me it seems you integrate many things as “meteorology forced anomalies” even though things like fire are also influenced by many other, non weather-related factors and it is unclear how you account for that. 2) Related to the former point, I was wondering how meaningful is “lagged” in a 5-year dataset... and why only using 5 years if longer time series are available for most of the data you are using to constraint the model? Related to that, I do not understand why the year 2014 seems missing from the dataset?

Minor comments: L86: “likely critical” L110: i generally agree but this resides on the assumption of the model structure being correct L128: is implement the right word here? As far as I understand, you are using CARDAMOM data to constrain DALEC L131-133: Why is it so important to be consistent with the resolution of the GEOS-Chem modelling? The 4*5° boxes are rather large compared to other model evaluation studies happening at 1 to 0.5° grid resolution. L234: “consists of corresponding” unclear wording... L235: Can you really make this assumption of uncorrelated errors? I would assume that data like LAI, SIF etc have correlated errors? Can you back this up using some relevant literature? L299: word missing L616: better “accounts for a considerable part of NBE variability during” Figure 1: I find this figure rather confusing. Maybe the caption can be improved by clearly identifying and explaining all boxes? Figure 4: I do not understand here: Why is only one year withheld for validation? And why not using longer time series of the data to actually allow for a reasonable evaluation across years? Figure 5 also in my view clearly shows that for several regions the

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training period looks good but the evaluation datapoint is not really matched (e.g. SH, NH, Australia). This is not really discussed thoroughly in the manuscript. Figure 6: I would replace “total” with “concurrent + lagged” or sth like that. Table 3/4: I wonder if the lack of significance for the “CON” values should be further explained/discussed.

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