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Interactive comment on "Abrupt seasonal transitions in land carbon uptake in 2015" *by* Chao Yue et al.

Chao Yue et al.

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We thank the reviewer for the constructive comments. Please find in the attached file our responses.

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Interactive comment on **"Abrupt seasonal transitions in land carbon uptake in 2015"** ***by*** **Chao Yue et al.**

Anonymous Referee #1

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The article "Abrupt seasonal transitions in land carbon uptake in 2015" by C. Yue and coauthors presents a detailed analysis of anomalies in carbon sinks and sources, climate and vegetation greenness during recent decades with an emphasis on the year 2015. Understanding the carbon cycle and its interaction with climate change is a highly relevant research topic, and the authors refer to state-of-the-art literature and datasets. The authors combine a number of observational datasets and model results, and my impression is that their methods and results are sound. The description of the work steps is clear and the data sources are well documented. In this regard, the article is good at what it does.

My major concern however is that it remains unclear what the authors are trying to achieve with this article. I would guess that the results might tell us something about how climate affects vegetation and the carbon cycle. What do the results imply about the relevant processes, about past climates and potential future developments, or about our potential to model these processes? The authors address such questions only briefly in the last paragraph of Sect. 4 and in the very short Sect. 5, stating that they go beyond the scope of the article.

[Response] We thank the general positive comments by the reviewer. We were originally aiming for two purposes in this article: (a) to diagnose the anomaly of large scale CO_2 fluxes for 2015 given the specific nature of that year, as a case study (high CO_2 growth rate, anomalously strong vegetation greenness and the historically highest annual temperature), using atmospheric inversion data, and (b) to diagnose whether abrupt transitions have occurred in terrestrial carbon uptake in 2015, and briefly infer the reasons for such transitions.

We agree with reviewer that the exploration of the general links among vegetation greenness, land carbon uptake dynamics and climate variations is necessary in order to put the 2015 case into a more general picture, to infer general patterns of land carbon dynamics that could be useful for future prediction of land carbon dynamics. We also add this point as one of the research aims of our paper. According changes are made in revised abstract, and the 3rd paragraph of the revised Introduction section.

We have extensively revised the manuscript to incorporate correlations of land carbon uptake anomalies with vegetation greenness anomalies and climate anomalies related with ENSO dynamics. Two new figures (Fig. 3, Fig. 4) are added in the main text, and three new figures (Fig. S4, S5, S7) are added in the Supplementary Material. Results and discussion sections are substantially expanded to include more discussions on the mechanisms underlying land carbon dynamics, and the relevance of this study.

I also wonder why the authors focus so much on the year 2015. What is so special about this year (apart from being relatively recent) that would justify this focus, and what can we learn from this case study that is valid in a greater context? If there is something I am overlooking, I suggest that the authors reframe their article to bring out their message more explicitly, and that they stress what the progress is compared to previous articles. I believe that this would improve the impact of their article. For example, the authors could systematically relate anomalies in climate, carbon fluxes and NDVI using the whole record, and not only focus on 2015. They should also consider to include the year 2016 (if possible) to capture the full recent El Nino event. It appears a bit arbitrary that they pick the year 2015 and one other previous El Nino event for their analysis, using the rest of their data only to calculate linear trends. A more comprehensive statistical analysis of the available data might allow more general conclusions without the need of running

Fig. 1.