General comments:

Papastefanou et al. assessed the extent and severity of the 2005,2010, and 2015/2016 droughts over the Amazon basin using 10 precipitation data sources and 3 drought indexes (MCWD, scPDSI, and RAI) with different assumptions. The main results show an increasing disagreement across datasets for more severe drought signals (in terms of both frequency and location). PDSI which consider variable ET shows a much stronger drought impact in 2016 compared with MCWD while RAI based on dry season rainfall shows a weaker drought impact in 2016. In addition, the research explored the consequences of estimating biomass loss from uncertainty across different precipitation using an empirical drought-mortality relationship. The resultant uncertainty in total carbon loss can reach 1.4 PgC (1.3-2.7) for the 2015/2016 drought. The authors conclude with a recommendation of using an ensemble of precipitation data sets when assessing the impact of drought. Overall, I think the analysis is a useful contribution to the study of drought impacts over the Amazon or more generally the tropical forests. The research provides a comprehensive overview of the differences across rainfall datasets, an issue that any analysis or modeling studies over tropical drought will struggle with. I feel the key figures showing dataset agreement are helpful. However, I think the manuscript can benefit from more in-depth discussion and a stronger conclusion. Please see the below specific comments for details. Hopefully, they will help to improve the manuscript and make it more useful to the scientific community.

- *We thank the reviewer for his constructive feedback. We address all comments in detail in the sections below.*

Specific Comments:

1. The manuscript focuses on the disagreement among drought indices across different precipitation data sets, which are ultimately driven by the differences in precipitation. It would be helpful to show the difference (e.g. systematic biases and spatialtemporal correlation) across the raw precipitation data sets using paired scatter plots for each precipitation data combination (could be put in the supplementary). This can help to understand why there are disagreements in MCWD (is it just because of a systematic bias so certain data set generates lower MCWD or due to disagreement in the spatial distribution of rainfall, etc.) Such analyses can help to illustrate.

- *We agree with the reviewer that analysing the precipitation datasets in more detail will improve the understanding of the differences of MCWD. We will create additional scatterplots showing the differences across precipitation datasets to identify potential biases. The plots will be added to the supplementary material.*

A related point is how to compare different drought indices. Current categorization into moderate, severe, and extreme seems too subjective. Why not show the scatter plot between different drought indices across the drought (from selected precipitation dataset or averaged across all precipitation datasets), which can show the scaling between MCWD, scPDSI, and RAI and demonstrates their differences. Or maybe use percentile (e.g. lowest 5% to indicate extreme) to compare across indices?

- *We agree with the reviewer that our categorization is subjective. This was also pointed out by reviewer 2. We thus will change our analysis and use relative instead of absolute thresholds to enable better cross-comparison of the drought indices.*

2. I like the idea of translating uncertainty in MCWD into the uncertainty in AGB changes (ln 215). However, it should be acknowledged that the empirical relationship itself subjects to large uncertainty. For example, Feldpausch et al. (2016) find that the mortality-MCWD relationship identified in 2005 disappeared during the 2010 drought. Feldpausch T R, Phillips O L, Brienen R J W, Gloor E, Lloyd J, Lopez-Gonzalez G, Monteagudo-Mendoza A, Malhi Y, Alarcón A, Álvarez Dávila E, Alvarez-Loayza P, Andrade A, Aragao L E O C, Arroyo L, Aymard C. G A, Baker T R, Baraloto C, Barroso J, Bonal D, Castro W, Chama V, Chave J, Domingues T F, Fauset S, Groot N, Honorio Coronado E, Laurance S, Laurance W F, Lewis S L, Licona J C, Marimon B S, Marimon-Junior B H, Mendoza Bautista C, Neill D A, Oliveira E A, Oliveira dos Santos C, Pallqui Camacho N C, Pardo-Molina G, Prieto A, Quesada C A, Ramírez F, Ramírez-Angulo H, Réjou-Méchain M, Rudas A, Saiz G, Salomão R P, Silva-Espejo J E, Silveira M, ter Steege H, Stropp J, Terborgh J, Thomas-Caesar R, van der Heijden G M F, Vásquez Martinez R, Vilanova E and Vos V A 2016 Amazon forest response to repeated droughts Global Biogeochem. Cycles 30 964–82 Online: https://agupubs.onlinelibrary.wiley.com/doi/full/10.1002/2015GB005133 In addition, I am not sure whether directly plugging in MCWD based on different rainfall data set makes sense. eqn 2 was derived using a specific rainfall data set. I think it would make more sense to remove the systematic biases between the specific data set and all the data set used in this study before converting MCWD to AGB. One way to find the mapping between MCWD data sets is simple regressions between the data sets as suggested in my comment above. Will such cross-data set calibration reduce AGB uncertainty?

- *We thank the author for highlighting the Feldpausch et al. 2016 study which we missed when writing our manuscript and we agree that the linear relation between AGB and MCWD does not hold for 2010 and 2016. This was also pointed out by referee 2. We thus will remove the AGB loss estimates for 2010 and 2016.*
- *We appreciate the suggestion of the referee to deeper investigate the MCWD-AGB relation using multiple precipitation datasets and we would be happy to work on this together in a follow-up study.*

3. Current conclusion recommends using an ensemble of different rainfall data sets when analyzing drought impacts. However, is there strong evidence that the ensemble would perform better than individual data sets? I wonder whether there are ways to evaluate the performance of each rainfall data set in terms of estimating drought impact. For example, is it possible to compare the spatial and temporal patterns of AGB loss based on different rainfall data sets with the observed spatial-temporal patterns from microwave remote sensing data (Liu et al. 2015; Saatchi et al. 2013; Wigneron et al. 2020) or lidar data (Yang et al. 2018)? Some more detailed details on the potential biases of MCWD that do not include ET variability?

- *We thank the referee for these important remarks. While we do not want to state that an ensemble (collection of datasets) generally performs better than one single dataset, our point is that drought stress can differ substantially between datasets. So for studies assessing impacts of droughts on the Amazon rainforest it may be worth considering multiple datasets to test for climate uncertainty purely arising by the choice of precipitation dataset. We will reformulate our manuscript accordingly.*
- *We appreciate the reviewers idea regarding the comparisons to remote sensing data. While this would probably go beyond the scope of this study we think that it would be interesting to investigate in a follow-up study.*

Referees:

Liu Y Y, Van Dijk A I J M, De Jeu R A M, Canadell J G, McCabe M F, Evans J P and Wang G 2015 Recent reversal in loss of global terrestrial biomass Nat. Clim. Chang. 5 470–4 Online: http://dx.doi.org/10.1038/nclimate2581

Saatchi S, Asefi-Najafabady S, Malhi Y, Aragão L E O C, Anderson L O, Myneni R B and Nemani R 2013 Persistent effects of a severe drought on Amazonian forest canopy Proc. Natl. Acad. Sci. U. S. A. 110 565–70 Online: http://www.ncbi.nlm.nih.gov/pubmed/23267086

Wigneron J P, Fan L, Ciais P, Bastos A, Brandt M, Chave J, Saatchi S, Baccini A and Fensholt R 2020 Tropical forests did not recover from the strong 2015–2016 El Niño event Sci. Adv. 6 eaay4603 Online: https://advances.sciencemag.org/content/6/6/eaay4603

Yang Y, Saatchi S S, Xu L, Yu Y, Choi S, Phillips N, Kennedy R, Keller M, Knyazikhin Y and Myneni R B 2018 Post-drought decline of the Amazon carbon sink Nat. Commun. 9 3172 Online: http://www.nature.com/articles/s41467-018-05668-6 4.

In 369, I thought microwave data is mostly free from cloud cover effect, which mainly influence optical remote sensing products? I think some of the challenges are the limited penetration depth in the dense tropical forests (Chaparro et al. 2019) and the influences of vegetation water status (Xu et al. 2021)

Chaparro D, Duveiller G, Piles M, Cescatti A, Vall-llossera M, Camps A and Entekhabi D 2019 Sensitivity of L-band vegetation optical depth to carbon stocks in tropical forests: a comparison to higher frequencies and optical indices Remote Sens. Environ. 232 111303

Xu X, Konings A G, Longo M, Feldman A, Xu L, Saatchi S, Wu D, Wu J and Moorcroft P 2021 Leaf surface water, not plant water stress, drives diurnal variation in tropical forest canopy water content New Phytol. 5. ln 424-425, as I argued in my second comment, I am not sure whether it makes sense to directly apply MCWD based on variable ET onto a relationship based on MCWD based on fixed ET....

Stylistic Comments and Technical Corrections:

ln 63: 'altering the carbon cycle of the Amazon forest already today' -> 'already altering the carbon cycle of the Amazon forest'
ln 80-100: I wonder whether it is better to just briefly talk about the usage of ten different data sets here and move the details into Methods
ln 122: 0.6 Mio -> 0.6 million?
ln 402: 'In addition, also', the also is extra
ln 419: 'average annual carbon uptake' global or regional? Please specify I wonder whether Table 2 and Table 3 are more suitable for SI... Especially if additional figures on the difference across rainfall datasets are added in the revision.

- *We thank the reviewer for the detailed comments and corrections which we will fix accordingly.*