Interactive comment on "Quantifying impacts of the drought 2018 on European ecosystems in comparison to 2003" *by* Allan Buras et al.

Anonymous Referee #2

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This is a well-written study comparing the European heatwaves of 2003 and 2018. Comparison of climatological data and vegetation indices lead to the conclusion that the 2018 heatwave was more severe than the 2003 heatwave. However, substantial regional differences occur. The idea behind this study is interesting, but the study misses out on several aspects needed to support the conclusions. Especially the lack of the temporal patterns in weather data makes it hard to evaluate the results. No time series for temperature, precipitation or drought indices are shown to illustrate the heatwave patterns of both years. Moreover, end of July was chosen as the study period for the impact on vegetation, hence ignoring any change that took place in August (e.g. the massive forest fires in Portugal early August 2018).

Specific comments: l.96ff: I suggest to simply argue that you focused on March-Oct

because that is the period of interest for vegetation dynamics and leaving out winter helps avoiding artefacts (e.g. snow cover, but also defoliation in deciduous systems). l104-105: interpolation may create artefacts when searching for anomalies – especially when there are gaps during the drought episode under study. I suppose this is of minor importance for this study, because gaps are less likely during periods of drought (i.e., no clouds), but I wonder if the interpolation can be avoided. If not, the possibility for such artefacts should at least be discussed. l.119ff: NDVI and EVI are mainly greenness indicators. They may reflect photosynthesis, but not if photosynthesis changes without changing greenness. This is particularly relevant for drought. In this sense, EVI is better than NDVI (see Vicca et al 2016, Scientific Reports). I therefore advise to use the EVI results rather than the NDVI in this manuscript. It should also be clearly indicated what these VIs can reflect (and what not!). This is completely missing from the discussion of the current manuscript, but needs to be discussed (i.e., are we looking at green biomass/browning/defoliation. . . and what are the implications for e.g. legacy effects). l.141-142: awkward phrasing: Subsequently, we for 2003 and 2018 determined . . . should be: Subsequently, we determined the difference between 2003 and 2018 for the respective metric. . . l.149ff: the timing of the heatwaves should be demonstrated with data to justify the choice to focus on end of July. Time series of temperature and CWB for e.g. France, Germany (which suffered from the heat in both 2003 and 2018), or even for the different regions (N, W, S, Central Europe). How sensitive is your analysis to the time choice? Are results similar if the analyses were repeated for end of August for example? l.150-151: VIs cannot be lower than 0. (anomalies can) l.159: What was done with pixels where land cover changed between 2003 and 2018? Was that even considered? (I don't think it will have a big impact on the analyses, but it's worth a mention). l.191: 0.55 should be 55% I suppose. Fig.1: why was the timing April-July chosen for these figure? This is not motivated in the text I think. A time series with weather data would be very helpful to evaluate this choice (see earlier comment). I noticed that this is briefly mentioned in the discussion (l. 320), but data are not shown. Please do show these data. Fig.4: It is unclear where VI-deviations

from the mean were significant. Please clarify, also in the text. l.240ff: A map with vegetation types is missing to illustrate where the different vegetation types occur and how the differences in impact for the different vegetation types correspond with the regional differences (e.g. Scandinavia being dominated by conifer forests). Fig.6: consider moving to appendix, adding instead a figure with time series for weather data. l.251: Fig. 7 shows EVI, not NDVI. The text is about NDVI. (I suggest to focus on EVI for in the main document and move NDVI to appendix – see earlier comment). l.328ff: Portugal suffered from severe wildfires in 2018. This is not included in the analyses because the fires occurred mostly in August and the analyses are only for April-July. Other important events may be missed out because of the choice for April-July. l.340ff: I suggest to include in this part of the discussion some text on the relationship between ecosystem types and climatic regions and how this may/may not influence the interpretation (see also earlier suggestion for figure addition). l.358: public news references are not appropriate for this statement.

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