Answer on Anonymous Referee #1

Dear Reviewer,

Thank you for your review and your enthusiasm about the study. Below we address the comments you made on the paper.

Main points:

"As mentioned in the description of several ecohydrological classes and sometimes in the interpretation of the results, spatial covariates like temperature play a role and will explain some of the patterns of correlations found, especially those with precipitation."

As the reviewer correctly describes, other covariates will play a role in the relation on vegetation growth (approximated with fPAR). In this study we chose to focus on water table depth and precipitation. By using the method of windowed correlation, we are looking at the growth from a local scale perspective, assuming the covariates to be homogenous within each window. In practice this assumption will not always hold, which will decrease the explanative power of WTD and P on fPAR and most likely yield lower correlation values. We are testing for the significance of the correlation values (with relatively low thresholds, more on that later). Therefore, we isolate the effect of WTD and P on the vegetation growth. The covariate that the reviewer specifically mentions is temperature, but vegetation age, species, soil type, salinity and slope aspect would in some cases be equally important. By looking specifically at temperature, it will be quite hard to separate its effect from that of precipitation and the water table depth directly (see Figure 1 and 2). Especially WTD and temperature show a very consistent pattern of correlation values. Without including temperature in the descriptions of the classes however, vegetation growth patterns in especially mountainous areas are hard to express. Especially in these areas P and T correlate very well. If you find these maps useful and illustrative we can add them to the discussion section of the paper.

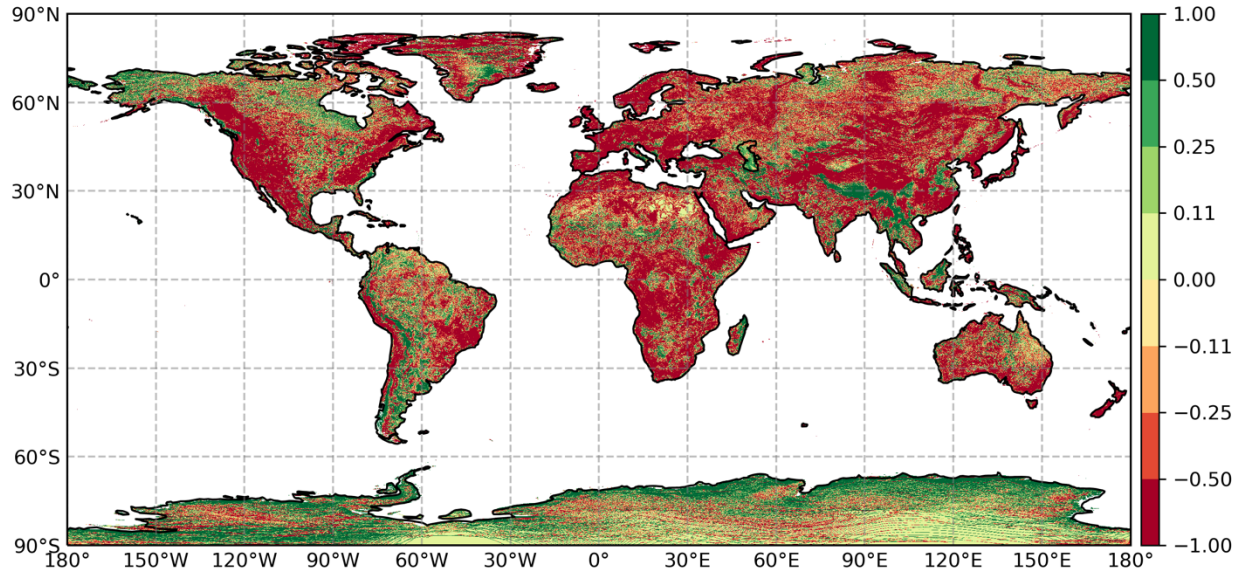

Figure 1: Correlation between P and T, created similarly to the correlation maps in the paper.

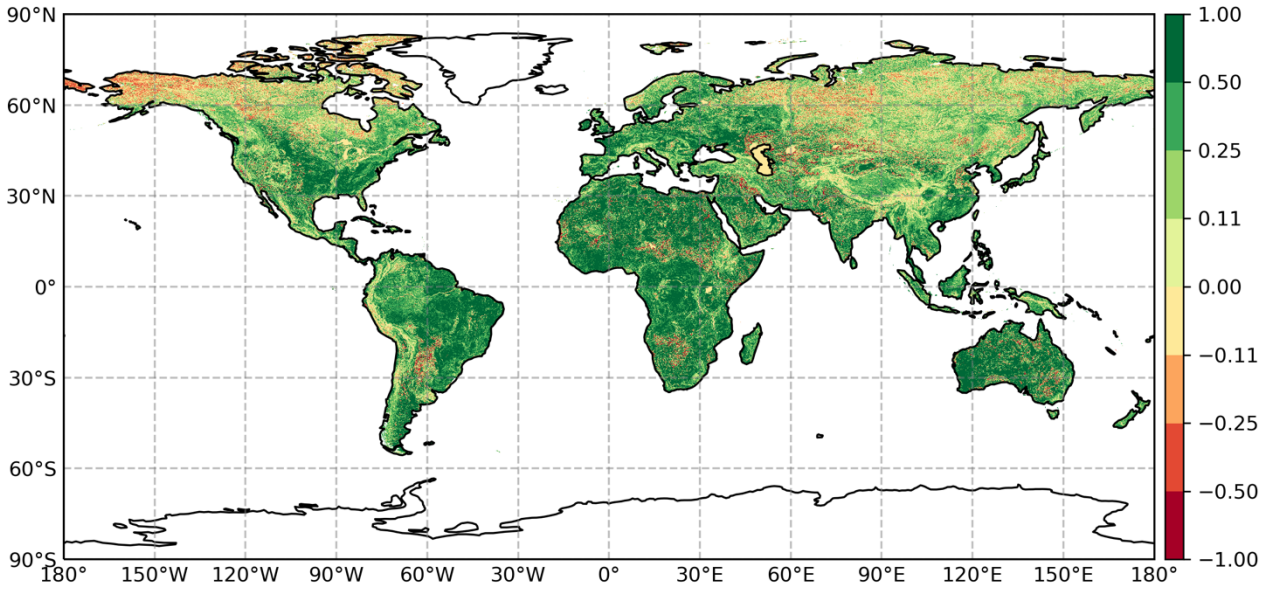

Figure 2: Correlation between WTD and T.

Minor points:

- *"Is the scope to analyse hydrological control of trees or of forests? From the title I expected only forests, but basically all results are based on any pixels having a canopy height>3m independent of any definition of a forest, eg tree density."*

We are interested in all natural vegetation but applied a filter of 3 meters to exclude most farmland as the signal of the natural controls will be heavily distorted. This threshold to classify trees seemed reasonable and is often used in literature. A pixel containing vegetation with an average height of 3 meters is consequently called forest. For clarity we will explain the use of 'forest' better in the methodology.

- *"Consistency of the long-term averages of the data sets: As shown in table 1 of the main text, the length and the periods that they represent differ by 10 years and more between individual data sets. How might this affect the consistency of the long-term averages that are the basis of the analysis?"*

In this study we are using data with high resolution, obtained from long term observations. The period mismatch will presumably lower the correlation values somewhat, but significance might still be tested. As the windowed correlation approach looks at local scale patterns, the mismatch will presumably only change the absolute values (of P and WTD), but the gradient within each correlation window will likely remain equal, as the landscape forms are still the same. This will not always work, in such cases as local water extractions being implemented, but on average on the whole world these changes will be relatively minor. We believe this mismatch will not substantially influence the conclusions.

- *"the data availability of at least the fPAR dataset will vary seasonally due to snow or cloud effects. Has this issue been considered and taken into account in some way in order to prevent the longterm averages to be seasonally biased?"*

The following fPAR data source has been used: https://developers.google.com/earth-engine/datasets/catalog/MODIS_006_MCD15A3H. It uses the best value for each pixel in four consecutive days. The long term averaging has been performed on this data directly to mostly avoid phenomena such as cloud effects.

The biases in the averaging and the seasonal cycle are addressed by the regional scale on which the correlations are calculated. Within each 15x15 grid cell window these biases are assumed homogeneous. The absolute values will shift, but the gradients would remain equal, yielding similar correlation values.

- *"The assumption that the 'translation from fAPAR values to photosynthetic activity are homogeneous' (l. 91) in each moving window appears strong when only the threshold of 3m is used as a filter criterion and in reality several vegetation types might be mixed in the pixel."*

This is indeed a good point. We assume not only vegetation type, but also vegetation age to be homogeneously distributed over each window (which would then make it justifiable to also assume a similar conversion function between fPAR and actual photosynthesis). Locally this assumption will not always hold but we believe this assumption is reasonable for a global synthesis and that the errors the assumption induces not to substantially alter the final observations and conclusions.

- *"Are only those correlations displayed and evaluated that were tested as significant? Have you tried whether the results strongly change of you apply other criteria in addition, such as a (higher) correlation threshold? A threshold of 0.11 for a significant correlation for fully available spatial windows (l.101) is quite low as to have a strong meaning for the interpretation."*

Currently we are using a alpha threshold value of 5%, which yields a significant correlation value (for n=225) of 0.11. We believe this is the most straightforward way of interpreting the data, as we are not interested in the explanatory power of WTD and P but merely in its significance in driving vegetation growth.ß