Answer to Referee #3

We thank the Referee #3 for his/her comments and respond below:

Authors Outrequin et al. submitted a manuscript about recent experiments investigating the controls over the triple oxygen isotope composition of phytoliths and the feasibility of using phytoliths as a paleo-aridity proxy. The authors detail a well thought out plant growth chamber experiment where temperature, carbon dioxide concentration, and humidity are each controlled. The authors conclude that relative humidity has the largest influence on the triple oxygen isotope value of the phytolith. The authors provide a new dataset from West Africa and examine the range in triple oxygen isotope values.

They compare their new results to previously published plant growth experiments and data from West Africa grasslands. It would be interesting to see values from different regions. However, the authors note in the conclusions that doing so is beyond the scope of the study. The only major critique of the paper is that the data from West Africa are not really described in terms of how it can be used to reconstruct relative humidity. The manuscript only notes that it follows closer to the 2018 growth experiment calculation due to the differences in the δ18O value of the initial water. It would be interesting to use Eq. 12 to predict the relative humidity in the modern analog (knowing the initial δ18O value of the precipitation water). Overall, this manuscript details a very time intensive and difficulty study and does a good job of distinguishing the main driver of the oxygen isotope composition of phytoliths. This manuscript is fitting for the journal and suitable for publication, pending addressing the major (optional) comment above and the small (and optional) comments below.

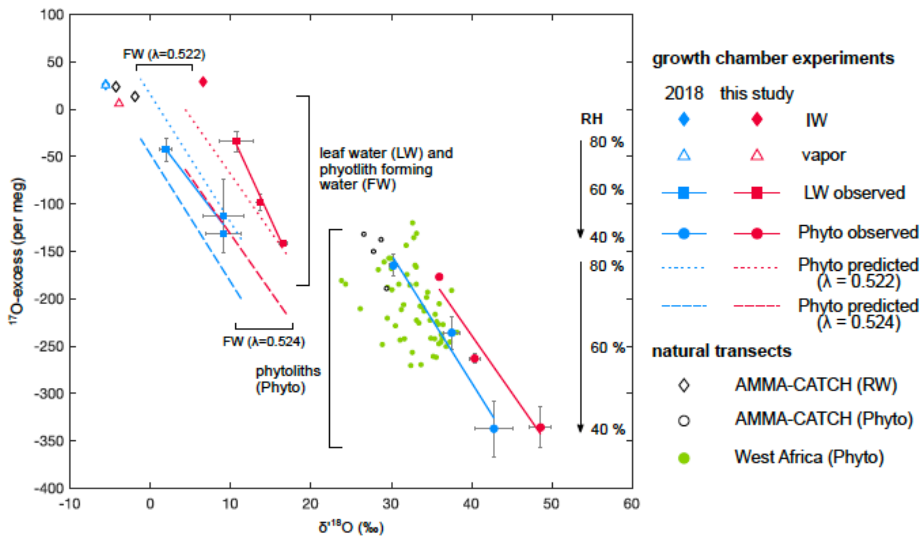
The new dataset obtained from ongoing monitoring at the AMMA-CATCH Natural Observatory in Benin (West Africa) is limited to isotope composition data of stem phytoliths and rainwater. This data set is only used to examine the fractionation values for the rainwater-stem phytolith couples. This will be clarified in section 3.4 to avoid any misunderstanding. A more complete dataset (including the isotope compositions of soil water, leaf water and leaf phytoliths) is currently being processed and will be submitted for publication in the near future.

Line 97: The denominator should be 18, not 17

This will be corrected

Figure 4: Are there any open red or blue circles? (Phyto predicted?) There are dotted lines but in the legend it says there are open red and open blue circles. May be worthwhile to add error bars on the phytolith measurements.

The legend of this figure will be corrected and error bars added to the phytolith measurements (cf below).



Revised Figure 5: *^{17}O-excess vs δ^{18}O of irrigation water (IW), final water vapor (V), bulk leaf water (LW), phytolith (phyto) and phytolith-forming water (FW) observed and predicted for the current and 2018 relative humidity (RH) treatment where RH varies from 40 to 60 and 80%. Phytolith-forming water values are predicted using equilibrium $^{18}\alpha_{Silica\text{-}water}$ estimated from Dodd and Sharp (2010) and $\lambda_{Silica\text{-}water}$ values of 0.524 (Sharp et al., 2016) and 0.522 (Sup. mat. 1.3). For comparison, values from the 2018 natural transect dataset (Alexandre et al., 2018) and from the AMMA-CATCH grass stem phytoliths and rainwater (RW) data (Table 3) are plotted.*

Why not add Eq. 12 and predict relative humidity of the natural phytolith samples?

In agreement with this comment, the prediction will be added in section 5.3. When applying (eq. 11) to calculate RH from ^{17}O-excess$_{Phyto}$ values obtained for the 2018 natural transect, the mean difference is 0.0 ± 6.1 % (n=55). It is 2.7 ± 6.6 % per meg (n=55) when using (eq. 12).