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Interactive comment on "French summer droughts since 1326 AD: a reconstruction based on tree ring cellulose δ^{18}O" *by* I. Labuhn et al.

Anonymous Referee #2

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General comments

The authors have used previously published and new d18O data of Oak latewood tree-ring cellulose to reconstruct summer drought for 2 sites in France over six centuries. The sites are about 300 km apart and share much similarity in climate variability during the 20th century, but chronologies differ somewhat during earlier periods. Relatively wet and dry periods were identified and compared with grape harvest data. The analysis, correction, combination of data and calibration are all carefully done. The outcome of the study is a valuable contribution to understand better past hydroclimate variability. There are some limitations to the study which are partly inherent to reconstruction work, particularly when using historic material, but that should still be better addressed:

- d18O in tree-rings is statistically related to drought, as shown in the analysis, but

nevertheless there are clearly more factors that are important. Source water d18O is dependent on large-scale hydrological processes and atmospheric circulation. Temperature is recognized as a major driver of this variation. As many studies have shown that the source water isotope signal is strongly reflected in the tree-rings, it seems a simplification to assume drought as the only factor. Because several climate factors act on d18O in combination, I would not expect that the d18O-drought relationship is stable over time, which makes it challenging to use the calibration function from the 20th in earlier centuries. Such questions need to be addressed in the manuscript.

- Due to isotope offsets, different cohorts of material needed to be corrected to be combined into a chronology. While I agree that this might be necessary, I find that the consequences of such adjustment has not been sufficiently analysed and discussed. What information is lost during offset correction? What does it mean for the drought reconstruction that low frequency is underestimated? How much is the correlation between the two chronologies changing (improving) when going from raw data to corrected data? This information could be useful as a general outcome because the combination of different records is still challenging and no established protocol available.

- Two explanations are given to explain the divergent signal of the two sites in earlier phase. I think that methodological issue might be more important than indicated in the text. Maybe the authors overestimate the reliability of the reconstructions. Could the site conditions of historic material be different from recent ones? The offset correction affects this earlier phase and may interfere because it is different for the two sites. Would the combination of the records actually result in a more stable regional drought reconstruction?

Specific comments

5115, l. 4 “algal booms” should be algal blooms

5115, l. 8 “In response to increased greenhouse gas concentrations, climate projections anticipate a marked increase in heat waves and droughts . . .” Not everywhere,

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needs to be more specific, otherwise the statement is wrong.

5115, l. 19 no information on droughts “prior to 1950”. Meteo data go much further back, so there is information on droughts before that year

5117, l. 5-12 References are missing. Discuss approaches in Gagen et al. and Hangartner et al.

5119, l. 16 “The building wood likely originates from the neighboring forest”. This seems important so please expand a bit on this. How likely is it that site conditions are similar to recent site considering the surrounding area?

l. 28 Same question for the Angouleme site. (“but a local origin of the wood can be assumed”)

5123, l. 3 “The confidence interval around the reconstruction was determined based on the differences between the measured and the reconstructed SPEI values” Is this really constant over time?

5124, 3.3 Is the strong mismatch around 1700 related mainly to one cohort only (PE1 in Fig. 4). Any issue with this cohort?

5124, 3.4 In climate analysis, SPEI is not sticking out as dominant climate factor, but T and P are also important. Did you try combing the records and correlate to averaged climate? This might result in a stronger and more stable relationship.

In Fig. 7b, the low-frequency trends in the 2 records appear to be rather similar. It could be interesting to look at splines using higher cutoff than 10 years. A good match in the low-frequency would enhance the credibility of the reconstructions.

5126, first section: Are the cited papers really on drought reconstructions? I think not many studies really reconstructed drought from d18O. From the complexity of the d18O-source water signal, no simple relationship is expected, and that’s actually why not many studies have used it for that purpose.

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5126, 4.1. This section is a bit vague and not very quantitative. How does the applied correction method affect the results?

5127, 4.2 Possible errors in the reconstruction should be given more discussion

5129, 4.3 Comparison to the grape harvest index is interesting, but it would be useful to consider other published drought reconstructions for comparison

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Interactive comment on Clim. Past Discuss., 11, 5113, 2015.