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Climate of the Past Discussions

Interactive comment on "Blue Intensity based experiments for reconstructing North Pacific temperatures along the Gulf of Alaska" *by* Rob Wilson et al.

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General comments:

The manuscript experiments with the less expensive surrogate to Xray-density MXD, namely the flatbed-scanner BI method, latewood BI parameter, for a previously unexplored species and part of the world. The authors are particularly interested in the lower frequency fidelity of LWB and the DB parameter to temperature. They explore different proxy and standardization configurations to identify the most suitable approach. They find that results are inconsistent depending on the options tested, but nevertheless can make acceptable reconstructions of past temperature variability. The work is relevant because it tries to increase our knowledge about temperature history by exploiting

proxies that could give us the opportunity to greatly upscale studies phylogenetically, geographically and in terms of replication, in site chronologies.

The major problem with this manuscript is the combination of a great number of models tested and the great variability among the different models tested. Because of this combination it could be argued that the successful models have been achieved spuriously. To attempt to avoid this, I recommend to limit the number of models tested, by performing also climate calibrations with high-pass filtered data (see suggestions below) and to combine this with a discussion of which monthly temperatures can have a causal effect on tree growth. Conducting this additional analysis would narrow down the options that can be tested, but also function as a baseline for the discussion of low-frequency skill in the data. If the high-frequency part of the data is agreeing well with temperature, it is likely safe to assume that a breakdown of agreement when low-frequencies are added is due to low-frequency biases, such as HW-SW-, standardization, etc.. problems. When this is established then tests of how to minimize the loss of signal at lower frequencies can be conducted (different standardizations alternatives). If however, the high-frequency part of the data does not agree very well with temperatures in the first place, it is very unlikely to expect that adding the low-frequency part will contribute with useful information even if correlations are boosted. Therefore, the high-frequency analysis must come first and inform subsequent choices of configurations and options.

A secondary issue is that the authors use reflected BI. This type of data is negatively correlated with what the authors claim to measure in the wood: cell wall, lignin content, but also with the discolorations. If the authors would opt to use the absorbed BI it would let them completely avoid many confused elaborations (see detailed comments below) with regard to standardization and comparisons with MXD etc.

In conclusion, I find the manuscript well written and prepared but I strongly suggest adding a high-frequency analysis, and using absorbed BI. After these revisions and the implementation of the comments below, the manuscript should be suitable for publication.

Detailed comments: L45 Remove “However” L49 replace “for” with “covering” L54-59 This section only discuss the non-climatological variance distorting RW signal, and does not acknowledging that RW and LWB actually may contain different climatic fingerprints. I suggest adding something along this line. L70 Björklund et al worked with absorbed Maximum BI L71-72 Here and in many other places it would be much simpler to start talking about absorbed BI values because these values will be positively correlated with the properties that you mention as potential measurement targets. Why measure the inverted value of what you are interested in? In this way just confuse readers about what you had to do before standardization to make them work properly and why BI is inversely correlated with density etc. L80-81 This is true if we disregard the principle of diminishing records back in time. L92-93 Björklund et al 2014 subtracted average absorption Earlywood BI from maximum absorption BI. L96-98 This sounds like a hypothesis you are going to test later in this paper, but it is not really tested. I would phrase it more like a discussion point: If EWB and LWB contain similar climatic responses and similar standard deviations. . . L100-101 Not really “another concern”. I suggest changes to something like this (I let you worry bout the grammar and English): Finally, although BI based variables hold great promise as an alternative proxy to MXD at inter-annual time-scales, the potential ability of BI to capture decadal to centennial time-scales related to long term-climate changes is still under question. L102 Please clarify if you mean HW-SW color difference L131-134 If you decide to use absorbed BI values this entire section can be removed. If you decide to keep it as is, I strongly recommend to go in to a discussion about why the detrending alternatives are sensitive to this. For example, deterministic detrending such as Neg. exp. or hugershof assume a decline in data values with age. If data values instead have an assumed increase, these methods will be useless. The reason for wanting this added discussion is that some researchers have missed this point and use these methods also for reflected BI. L136-138 I recommend expanding this to also include a more aggressive detrending, perhaps a 25- 35-year spline. This will give more robust climate correlation result. If there are lingering trends in the tree-ring data, and there will be some using

200-year-splines, the risk of spurious trend correlations is relatively high. Adding a high frequency alternative can help to better identify important months for tree-growth. I suspect that some months enter your models just because they have similar trends as the tree-ring data. Also, before performing the aggressive alternative, the climate data should also be detrended similarly. Furthermore, I recommend to restructure the presented results; The high frequency monthly data analysis should be in the main manuscript and the seasonal climate correlations in the supplement together with the low-frequency counterparts. The HW-SW problem will still be present in the analysis using a 200-year spline, if you want to remove this for the analysis you need a softer spline. Rbar, PCA, climate response, between variable correlations should all be done with data with less autocorrelation: softer spline. The low-frequency alternative can be presented on the background of this analysis, but not stand alone. The models’ monthly targets for reconstruction should be informed in the first place with high-frequency results. A discussion can be conducted referring to the low-frequency results but not as a major informant of the models. L167 Please specify which function was used to model the regional curve. L171-172 LINres has been shown to create quite some bias in resulting chronologies, see works of Melvin and Briffa, especially if used to model the RC. I instead recommend time-varying response smoother Melvin et al., 2007. L177-181 I suspect the results could be somewhat different with the high-frequency data analysis, see recommendations above. If they are, this is going to be vital information for your main question in the introduction: b) whether meaningful low frequency information can be gleaned from these data? Furthermore, if they are very different, the continuation of the question: “exploiting the long monthly instrumental temperature records that go back into the mid-19 validate secular trends in the TR data” becomes heavily diluted. L198 Again, must be done also with high-frequency data. Should likely cut off some month, and give a better causal reflection of which months are important for radial tree growth. High and persistent correlations with consecutive months makes me suspect trend-correlations. L217-219 Awkward sentence, please rephrase. L227 in both or just in the new one? L265-271 Use absorption BI to avoid confusing comparisons with

MXD.

L272-273 The original DB was introduced in Björklund et al., (2014), but it was further developed in Björklund et al., (2015) were they used a contrast adjustment. More discolored samples had a systematically lower contrast between earlywood and latewood than less discolored samples. If there is a systematic difference in discoloration then this will affect also the traditional DB data. You can easily test if there is a contrast problem in your data with scatterplots of DB vs EWBI, as done in Björklund et al., (2015). If there is a relationship you might at least want to discuss this. If there is not a relationship you will have cleared a question mark.

L276-281 According to my experience the age-trend of MXD would be more similar to DB than LWB. Perhaps different detrending options are needed, but if age-dependent splines are used, as suggested before, these would adapt to the small differences in the data. Neg. exp. or linear functions, for instance, may be directly inappropriate when having juvenile phases of increase and then followed by a decline.

L278 Again use absorption BI.

L283-288 Use absorption BI to avoid having to clarify what you mean.

L288-292 It seems as a contradiction to write that LWB (as temperature proxy) should not have a negative trend w.r.t glacier advancements? The glacier advancement was stable up until 1800 CE and glacier advancement peaked around the turn of the 20th century. Would fit very well with the LWB record that has no trend from 1600-1800 CE and then a negative trend from 1800-1900 CE. The problem would be that there is no pronounced positive trend in the 20th century to melt away the glaciers that expanded prior to this.

L343 Conclusions sections is very long and more like a summary of the discussion

L349-353 I would recommend to test high frequency results before making these bold statements. That is, to first to rule out any trend correlations with winter months for ring

width. After all it is very unusual for ring width to have a broader temperature response than BI or density se e.g. Briffa et al., (2002).

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