

Interactive comment on “Is blue intensity ready to replace maximum latewood density as a strong temperature proxy? A tree-ring case study on Scots pine from northern Sweden” by J. A. Björklund et al.

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There is some really excellent science in this paper and I think it has the potential to be seen as a major advance in dendroclimatology and to become very widely cited. However, this manuscript is terribly over-complicated and lacks focus, to the extent that it is very difficult to read. The gems are hidden away in so much unhelpful analysis that few people are likely to have the patience to read it. I propose a major re-write, focussing on the major advance and producing a shorter and much clearer paper. This will require some extra work, but I am sure it will be worth it.

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The big advance this paper makes is to incorporate information from the early-wood and use it to clarify and enhance the palaeoclimate signal from the late-wood, in both MXD and BI. This is an excellent idea and it works really well. For MXD the climate signal is stronger and more tightly constrained to the summer and for BI it helps to deal with the problems of heartwood/sapwood colour differences and discolouration of old dead wood. This is a major advance and it should be the clear focus of this paper. Most people using either MXD or BI will try this new method and quote this paper.

In this manuscript the focus is actually on trying to ‘calibrate’ BI so that it can be translated into MXD. Like the first reviewer I find this completely and utterly pointless. No one is arguing that BI actually measures density. We already know that MXD and BI correlate quite well, but the important question is how well they each reproduce past climate. Trying to ‘calibrate’ BI into MXD makes no sense at all to me. If your lab has invested in a densitometer, why would you bother with BI? The potential advantage of BI is that it does not require such expensive equipment. If the Blue method is to be useful it has to work completely independently of MXD. It was never intended as a proxy for MXD, it is a proxy for climate.

By focussing so much on trying to change BI into MXD this paper really goes astray. What we really need to know is how well the new delta proxies actually reconstruct past climate. That is not dealt with properly at all. The MXD data are treated using the state of the art method (RCS) but there is no attempt to treat the BI data to extract a useful climate signal. Comparing RCS treated MXD with untreated BI is not helpful at all. Rather than ‘calibrating’ BI to MXD, why not use the original BI and the delta BI to reconstruct climate using the most appropriate methods? There are many options of course, but for delta BI I would simply z-score each tree series over its full length and then de-trend using Arstan or something similar. Of course this means that some low-frequency climate information is potentially lost, but how much? Actually that is a very difficult question and cannot be answered simply by comparing BI and MXD results because some (or all) of the low frequency ‘signal’ in MXD may actually be

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low-frequency noise. In the Millennium northern composite paper (McCarroll 2012) the RCS series from different sites in the same region did not agree at low frequency and when they were averaged the resulting mean chronology was remarkably similar to chronologies produced without RCS. The difference between an 'absolute' measure of density and a 'relative' measure may not be as large as is often assumed.

In summary my advice is to forget about trying to change BI into density units and focus on the major advance, which is the new delta-versions of both MXD and BI. If you want to compare these proxies then they need to each be treated independently and in the most appropriate way. When they are used for climate reconstruction it must not be assumed that the MXD signal is perfect. If you really want to present the work on 'calibrating' BI into MXD do it in another paper.

I know this means a bit more work, but you have the potential to produce a paper that is very well cited.

I will not make detailed comments on the text, since I am suggesting such a major re-write, but would be happy to comment in detail on a revised manuscript.

Sincere apologies for taking too long to submit this review. Good luck Danny McCarroll

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