

## ***Interactive comment on “Chemical de-staining and the delta correction for blue intensity measurements of stained lake subfossil trees” by Feng Wang et al.***

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General comments:

The manuscript addresses a highly topical issue related to the dendroclimatic utilization of reflected light (blue intensity) from lake subfossil wood material, specifically a discoloration bias related to staining, which is primarily attributed to Fe oxidation. The study investigates the application of a range of chemical treatment techniques in order to improve light reflectance data by reducing staining bias and also provides additional validation for the applicability of the delta BI correction procedure in the context of using samples affected by staining.

C1

Overall, it is a nice, relevant and focused paper building on previous work on this topic. The study is designed and performed in a methodical manner and the manuscript is generally well organized and logically structured. Although I do not have any major comments on the methods used or analysis performed, the (mostly minor) comments detailed below will hopefully help to further refine this work. I would also recommend checking the manuscript to make minor language improvements (for example in order to clarify the meaning of certain statements) and I include specific suggestions (under minor comments) to indicate parts of the text where I believe most improvements could be made.

Specific comments:

L83: what is meant by 'new lake'? as in 'newly sampled lake' (i.e. data from samples from this lake were not analyzed / published before)? – please clarify

L106: Why were the treatment times different for MixC? Please explain briefly.

L117-118: Please add relevant reference(s) here.

L135-138: Please include information about the measurement resolution of the photo sensor used (i.e. the step size along the density measurement profile) – e.g. 10 $\mu$ m or variable?

L147-148: In what way were they affected – structurally, their color? If this is true for the unstained samples, could this play a role in affecting the properties of stained samples to some degree as well? Undoubtedly, the treatments lead to improvement, but it would also be worth discussing if there are (or could be) some undesirable effects as well that may perhaps limit the observed improvement?

L150: Was there any apparent difference in the sapwood / heartwood of the subfossil samples and if so, could that then potentially also have some effect on the results?

L152-153: Just to clarify - 'regional chronologies' here represents different parameters / treatment methods and not the two sites (since those were pooled together)? A slight

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re-wording might help to ensure that this is clear.

L263: Slight reformulation is required here since the higher replication is needed to obtain a robust and representative (DBI) chronology rather than a chronology with an equivalent (or similarly strong) climatic signal to MXD (although it is true that these two things usually go hand in hand).

L264: At the same time, DBI appears to calibrate more weakly compared to LWB over the instrumental period. Could you suggest a possible explanation for this? Could you also add some moving window EPS statistics somewhere (e.g. in Figure 6) for the final chronologies used for the reconstruction in order to get a better idea which parts of the chronologies might be stronger / weaker.

L278-279: I think this sentence could be reformulated somewhat and expressed more clearly.

Table 2: It would be helpful to clarify a few things. To avoid any possible misinterpretation, it would help to specify in the caption that RGB refers to separate (R, G, and B) color channels rather than for example a full color RGB light values. Also, some more details should be included in relation to no. 3 and 5 to clarify the difference between these two terms – presumably delta RGB refers to all of the color channels whereas DBI only refers to the blue channel? Or is there some difference when it comes to how delta B (in RGB) was calculated compared to DBI? Unless I am mistaken, the settings for calculating DBI (i.e. how LBI and EBI are determined) in CooRecorder are adjustable – the main settings for this calculation should probably also be stated here.

Figure 1 caption: 'The gray shades in (a) correspond to ...' / 'The gray shading in (a) corresponds to ...'. Also, maybe simply use the term 'replication' instead of 'distribution range' here?

Figure 2: Certainly in the main text and maybe also here (e.g. in the figure caption) define MP-AES. For text in right-middle box consider: 'Residual iron content per gram

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of wood ...'. Also, it may be more suitable to use past tense in the text boxes: e.g. 'lath1 digested using ...'; 'lath 2 rinsed in de-ionized water for 2 hrs, then air dried and sanded', etc.

Figure 3 caption: The description for (a) should make it clear that these are multiple laths from one LST - for example: '(a) shows examples of differently treated laths from one LST and one living tree sample (last row)'. When referring to panels (b) and (c), it would be clearer to write it using the following format: (b) description, and (c) description – (instead of (b), and (c) description)

Figure 6: Consider also adding some statistics in the panels such as the full period calibration. In the caption, maybe also specify the type of filter used.

Minor comments:

L36: Consider changing to e.g. '... high cost of X-ray densitometric equipment' ... unless this is meant to refer to the relatively high costs associated with processing samples at a 'facility' that is equipped to perform X-ray densitometry. In any case, a small edit is needed.

L37: It may be more accurate to state that the production of BI is 'relatively cheap' rather than 'cheap'.

L39: 'coherence' instead of 'coherences'

L43: Perhaps be a bit more specific here by changing 'color issues' for example to something like 'color inconsistencies' or 'inconsistent color properties'?

L44/45: As this is a property of the wood, 'leading to' is not really appropriate here – instead perhaps '... exhibiting darker heartwood than sapwood'

L47: 'occurs' instead of 'happens'

L48: 'LSTs are ...'?

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L49: just 'replication'

L53: The second part of this sentence could be improved for example along the lines of '... to realize the potential of the promising BI technique ...'

L58: 'consists of' instead of 'consists in'; the word 'delta' can be removed from this part of the sentence

L59: Consider changing 'DBI is suitable to recover ...' for example to 'DBI suitably represents ...' or 'DBI corrects for ...'

L64: The last part of the sentence should be re-phrased e.g. '... without utilizing low frequency information of the more temperature-sensitive BI data' / '... without benefiting from / exploiting any potential improvements in the low frequency domain from the more temperature-sensitive BI data'

L69/70: Consider changing the last part of the sentence to something along the lines of '... to a standard comparable to MXD-based reconstructions'

L80/81: minor change needed here, e.g. '... LSTs after falling into the water and eventually becoming buried in lake sediments'

L88: 'fungal' rather than 'fungi'? Also, is there a better word that could replace 'invasion' here? Perhaps simply 'fungal discoloration'?

L89: 'before the year'

L94: Should this be 'radius' instead of 'radii' if laths are cut along a single radius, otherwise specify the number of radii

L96: This should probably be 'weighed' instead of 'weighted'

L102: I would recommend presenting the figures in the order that they are first mentioned in the text (Fig. S1 is first mentioned here while Fig. S2 is first mentioned in L131).

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L108: This could probably be improved slightly – e.g. 'one lath from each pair of laths'?

L111: Please mention first that MP-AES stands for "microwave plasma-atomic emission spectrometer"

L112: '... weight of the corresponding ...'

L113: The meaning of this sentence was not immediately clear to me. Consider the following minor revision for the sake of clarity: '... represent the combined total ... cannot be separately distinguished by MP-AES'

L115: 'grit' rather than 'grits'

L118: 'interference' instead of 'inferences'

L122: I think this could be explained a bit better – in a more specific way. Also, 'consistent with' rather than 'consistent to'

L141: perhaps '(i.e. each lath pair)'?

L143: 'An age-dependent spline ...'

L148/L150: Also in relation to Fig. S8 / S7, see earlier comment about sequential order of figures mentioned above.

L151: maybe 'poor (tree) health' would be better than 'unhealthy tree growth'

L154: 'averaged into'? Also, maybe consider showing the individual MXD chronologies in the SI.

L161: This could use a bit of re-wording.

L165: maybe slightly re-word – e.g. '... in order to assess the role of Fe in the staining issue'

L167: Perhaps just briefly specify the advantage of applying this specific filter in the context of high-pass / low-pass filtering.

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L168: 'Performance of the reconstructions was assessed ...'  
L170: '... while the 1961-2015 period ...'  
L178-179: Just as a general point, I wonder what the reason for this might be? Could it be related to the 'color properties' of the staining caused by Fe?  
L182: 'intensities'  
L186-187: '... of treated earlywood and latewood'?  
L189: Please be more specific here and elaborate on what the difference is.  
L191: Consider something along the lines of '... four treatments examined in more detail ...'  
L192: 'prior to 1900 CE' or 'prior to the year 1900 CE'  
L193: 'coherence' rather than 'coherences'  
L196: 'few differences' instead of 'little differences'  
L203: 'Briefly' is probably not needed here  
L208: I would recommend re-wording 'combine to wood' – 'combine with wood' or maybe 'bind to wood'?  
L225: just 'etc.' instead of 'and etc.'  
L228: maybe 'in our samples' rather than 'from our samples'?  
L229-230: Minor edit needed here: e.g. 'is not sensitive to sulfur and phosphorous' / 'is not designed to detect sulfur and phosphorous' or 'is not sufficiently sensitive to detect ...'?  
L234: '... very little residual Fe ...'  
L236: probably replace 'such' with 'the'

C7

L240: maybe something like '... when staining is present in subfossil wood' would be better  
L242: 'a' should be removed  
L247: something is missing here – e.g. '... for example as with the most efficient MixC protocol' or something similar  
L250-251: 'This evidence suggests that DBI is not only an excellent solution to resolving ...'  
L251: 'but also efficiently resolves ...'  
L256-257: The last part of this sentence could be re-worded and expanded a bit to clarify what is meant by this.  
L258: replace 'declined' with 'declining'  
L259: 'decline' instead of 'declines'? Also, the reference Björklund et al., 2019 (Reviews of Geophysics) may also be relevant to this point.  
L261: 'need to be' rather than 'need be'?  
L268-269: '... further attention / investigation is needed ...'  
L281: should probably be '... used as part of Fe extraction protocols ...'  
L282: 'which also face / are also susceptible to / also suffer from'?

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Interactive comment on Biogeosciences Discuss., <https://doi.org/10.5194/bg-2020-102>, 2020.

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