

Clim. Past Discuss., author comment AC3  
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## Authors' Response to EC1

Paul D. Zander et al.

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Author comment on "Seasonal climate signals preserved in biochemical varves: insights from novel high-resolution sediment scanning techniques" by Paul D. Zander et al., Clim. Past Discuss., <https://doi.org/10.5194/cp-2021-56-AC3>, 2021

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### *Authors' Response to EC1*

*Thank you for your comments, we will implement these suggestions in the revised manuscript. Our responses are provided in italics.*

### **Dear Authors,**

**I have read the reviewers comments, and both seems quite positive about your manuscript. I also read your preprint, and I also found it well written, structured and presenting a very promising new way to analyze varved sediments.**

**You will find below a few minor comments or suggestions to improve your manuscript.**

**Lines 69-71: this sentence belongs to a conclusion not to an introduction.**

*We will remove this sentence from the introduction*

**Lines 99-100: can you provide more information about the dry bulk density sampling technique for each varve? Your thick varves are 6 mm thick, but this is still quite thin for discrete sampling.**

*We will add information here. Material was sampled carefully from within a single varve, packed into a 3 cm<sup>3</sup> syringe and weighed. The material was then dried and weighed once again to determine dry bulk density.*

**Lines 128-129: Can you provide this information in Supplement?**

*Yes, we can include a table of corrected and uncorrected data in the supplement.*

**Line 134: this link to data is currently not working, but I was able to access them using this link: <https://boris.unibe.ch/156383/>. Please make sure to provide a working link in the revised version.**

*The DOI link is working for us as of this writing. Please contact me if it is still not working for you.*

**Lines 92-93: Can you better explain what you mean by the onset of varve precipitation, and indicate that point in a Ca profile (for instance in Figure S1).**

*We will add a sentence here to clarify. Varve boundaries were assigned using the Ca data images (maps) where the varve boundary marked the onset of Ca-rich lamina. This was done with support from thin section images and other XRF data to ensure the correct placement of the boundary. We will add a supplementary figure showing the varve boundaries on the Ca data.*

**Line 139 and following: I understand that you can have the entire liberty to choose your own abbreviation for Varve Types (VT). However, VT is often used for Varve Thickness, and this may lead to some confusion. Maybe could you change VT for VTy or something else, but this is really a suggestion and you may decide to keep VT.**

*This is a good point because VT is widely used as varve thickness. We will modify to Vty.*

**Line 143: You write here that "Data were detrended, log-transformed and normalized prior to classification". Were data detrended, log-transformed and normalized prior to the perform the alignment of the two sets of data ( $\mu$ XRF and HSI) or did you use raw data for that alignment? I think some clarification is required here. By the way, this is very interesting.**

*Detrending, log-transformation, and normalization were only done for the varve type classification analysis. The data were normalized before the alignment step, simply for the purpose of being able to plot the data on the same scale. Correlations and GAMs were done using raw data. We will clarify this in the methods text.*

**Lines 157-159: maybe a reference that covers the GAMs?**

*Yes, this should be added here.*

**Line 174: You write, "The  $^{137}\text{Cs}$  activities in these two varves are indistinguishable within the measurement uncertainty". Maybe you should write, "The  $^{137}\text{Cs}$  activities in these two varves are indistinguishable from each other within the measurement uncertainty.**

*We agree with the modification.*

**Line 283: Why do you add this argument, why mentioning carbon burial? You mean carbon trapped by carbonate or organic carbon?**

*Here, we had in mind mainly organic carbon, because previous studies have shown it is better preserved under stronger thermal stratification. We included this argument as it could be a secondary mechanism driving the positive correlations seen between temperature and TC.*

**Figure 3: on the legend of the horizontal axis,  $\mu$ XRF (counts per second), add  $\mu$ . Also, there are values less than 1 in the  $\mu$ XRF data, meaning that these counts were normalized somehow. Can you be more explicit about that?**

*Yes, we will add  $\mu$ . The reason for fractional count data is that for some elements there was less than 1 count per second per pixel (or measurement spot). The only normalization applied was division by counting time. Each data point plotted represents the average counts per second of each pixel within a  $60 \times 2000 \mu\text{m}$  area. Summing the counts across pixels before normalizing by measurement time might result in more intuitive numeric*

*values, but would not change the results.*

**Figure S2. What are the dots pointing to? Please specify in the caption.**

*We will add to the caption that dots mark varve boundaries.*

**So the next step for you is to reply to the comments of the reviewers and mine using the Copernicus system, maybe not in detail, but enough to allow me to get to the step of the process, i.e., authorizing you to submit a revised version.**

**I'm looking forward to your replies.**

**Best regards,**

**Pierre Francus**