Geochronology Discuss., author comment AC3
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Reply on EC1

Stephanie Harmonie Arcusa et al.

Author comment on "A Bayesian approach to integrating radiometric dating and varve measurements in intermittently indistinct sediment" by Stephanie Harmonie Arcusa et al., Geochronology Discuss., https://doi.org/10.5194/gchron-2021-15-AC3, 2021

Dear Dr. Dietze,

Thank you for giving us the opportunity to respond to the referees and to improve our manuscript. We are thankful to the referees for their comments and suggestions.

As Referee 2 makes clear, asserting that sediments are annually laminated should not be done lightly. We agree entirely and therefore we made every effort to replicate the samples and use three different dating techniques. Our data convinced us that Columbine Lake sediments were indeed varved, albeit with large uncertainty.

Where we disagree with Referee 2 is the implication that only near-perfect varve sequences should be investigated. It is more common to have imperfect sequences, but we argue that most imperfect sequences can still provide information. The traditional varve chronology methods do not allow the extraction of this information, our manuscript is attempting to fill this gap. Referee 1 helpfully pointed out that this problem is also pertinent to non-lacustrine records such as geological outcrops.

Originally, we thought the extra geochemical data would help the reader assess the quality of the varves. However, the length and complexity of the text did not bring our main points across. We agree with both referees to reduce the amount and discussion of the geochemical data so as to focus the text and improve clarity.

With revisions, our manuscript will show that an imperfect varve sequence can yield a better chronology than one based on radiocarbon dating alone. In addition, our revised manuscript will provide a pathway for realistic estimates of uncertainty in any varve chronology, whether lacustrine or not.

Thank you for your consideration,

Respectfully,

Stephanie Arcusa, on behalf of the co-authors.