

## Reply to Reviewer 1 – Greg Balco

### *Please find point-by-point changes in red*

In my opinion the revised manuscript is basically OK for publication. I just have a couple of technical corrections:

Line 153-154 -- "Due to the irregular...a single...was recovered." I don't understand what this means -- does this mean that only core BH01 was sampled, or does this mean that some kind of a subsample was taken from the top of BH01 to be further sliced for luminescence measurements? Needs clarification.

This text has been clarified to read: “Due to the irregular core-top morphology of BH01, only a single luminescence-sample core could be drilled in the luminescence laboratory (i.e. a sub-sample of the larger core collected by the Winkie Drill). This subsample was sliced...”

Lines 256-7 - "The values...are indistinguishable from the global blank value". This is confusing -- one would tend to assume here that the 'global blank value' is the average of these 15 blanks. If it's not, what is the global blank value exactly? I guess maybe it is an average of blanks over a longer time period? Easily fixed with a sentence defining 'global blank value,' e.g., 'the global blank value is the average and standard deviation of 945 blank measurements made over a period of 21 years,' or whatever.

We have added the clarification: “ which represents the average and standard deviation of all process blanks measured at ANSTO over the last 6 years.”

Line 307-8 - 'however, we note that in both cores the lowermost sample has a slightly higher concentration'. I see that this was inserted in response to the anonymous reviewer's pointing this out, but in point of fact it is not true: the pairs of measurements are indistinguishable at quoted uncertainties. As noted above in this paragraph, the cosmogenic C-14 concentrations are physically required to decrease with depth. If they did not decrease with depth, it would indicate a measurement error (or, I guess, some previously unknown production mechanism). This isn't the case here, because when measurement uncertainties are considered, the data are consistent with the physically required decrease in concentration with depth. Thus, this clause is neither necessary or helpful, and I would remove it.

We have removed this sentence.

Also, I have one more comment to clarify a point in the anonymous review: this review pointed out the discrepancy between measurements of the CRONUS-A standard at this lab and others. While I agree that this is interesting and important from the broader perspective of C-14 measurement generally and should be sorted out, it's only very weakly relevant to this paper: the CRONUS-A discrepancies are a 15% effect, and the conclusion in this paper that the duration of the period of thinner ice was in the range 300-3800 years is not materially affected by a 15% uncertainty in production rate estimates. Thus, it's fine that this issue is now discussed in the supplement, but it's not necessary and it doesn't affect the overall conclusions.

And some small errors that will most likely be caught by the copy-editors without my help:

Lines 81-3 - misspellings of 'Hills' and 'Winkie' - **fixed**

231-232 - missing verb? – added **“we calculate”**

246-7 - I feel like a comma or two are somehow missing here? – **Have broken sentence up to make it flow better. “Our measured signal it is not a quartz signal or a K-feldspar signal stimulated by infra-red wavelengths typically used for dating. The unsuitable luminescence properties could thus manifest...”**

Figure 10 - is it possible to have the desired aspect ratio for the figures without squishing the text? This looks weird. – **Changed aspect ratio to make text appear unsquished.**