

We thank Dr. Schimmelpfennig for her constructive input and have done our best to address her comments, questions, and suggestions in red below.

RC1

This technical note presents the new automated in situ cosmogenic carbon-14 extraction system at PRIME lab. Improvements and advantages of the new installations compared to the previous system are described. Tests with different sample boat materials and various Lithium Metaborate flux batches show the impact of these materials on the procedural blank levels. Experiments with different preheating and extraction temperatures demonstrate the importance of these temperatures for the ^{14}C recovery from the largely used inter-comparison material CRONUS-A and are therefore very useful for other in situ ^{14}C labs.

The manuscript reads very well and the data is very well presented and described. Below I only list a few technical suggestions that could be considered.

The title is a bit bulky and could be clarified in my opinion. In particular I find a few terms confusing: First, it only becomes clear in the text that you use the term « combustion » to refer to the preheating step that removes atmospheric/organic C. Isn't heating to 1000-1100°C during the in situ extraction also combustion? Secondly, people who are familiar with in situ ^{14}C extraction procedures would associate “high-temperature extraction” with systems that do not use the LiBO_2 flux (heating at much higher temperatures instead). Maybe rather change the title to “Studying Li-metaborate fluxes and preheating and extraction temperatures with a new, fully automated *in situ* cosmogenic ^{14}C processing system at PRIME Lab”?

We agree and have simplified the title to “Technical note: Studying Li-metaborate fluxes and extraction protocols with a new, fully automated *in situ* cosmogenic ^{14}C processing system at PRIME Lab”

Lines 140-141: Please specify whether or not you also add He on Day 2 when you insert the sample.

Good point. We have clarified that section – added any time that we open the tube.

Lines 241-251: Concerning the high ^{14}C and C blanks from the various LiBO_2 batches: Isn't the heating on Day 1 supposed to degas all the CO_2 in the LiBO_2 ? Was a longer degassing duration tested to reduce the blanks? BTW, the heating temperature on Day 1 is not specified. Is it always the same the extraction temperature on Day 2?

The short answer to the first question is yes. We don't understand the mechanism for the observed higher blanks in the various batches, but clearly there is a systematic increase. We have clarified this in the text.

In terms of the longer degassing duration – the aggressiveness of the LiBO_2 in etching the quartz sleeve limits how long we can heat the flux in total at the extraction temperatures investigated. From much previous experience, if we heat the LiBO_2 for a longer time or to a higher temperature on the first day, while keeping the extraction temperature/time the same, we risk destroying the sleeve and potentially damaging the mullite furnace tube, so we are very cautious on that front. We prefer not to speculate as to whether or not such procedures might improve the blanks at this point, given that the source is clearly something associated with the Claisse products.

The degassing temperature is already specified in line 138.

Lines 290-296: It would have been interesting to test the 500°C preheating with the Al₂O₃ boats. Can you exclude that the 10% difference in 14C is due to absorption by the Al₂O₃?

In Lifton's experience, he's never seen any demonstrable absorption of CO₂ by the alumina boats. The previous iteration of the Purdue extraction systems in Lifton et al. (2015) yielded results with a 500 °C preheating step consistent with the consensus CRONUS-A value. We now show the Lifton et al. (2015) mean value as well on Figure 6 and cite that in the text.

Lines 303-315: For the CRONUS-A extractions in the Pt/Rh boat, there seems to be slight trend though of 14C concentrations increasing with extraction temperature: 4 of the 5 extractions at 1100°C are systematically higher than those at 1050° (3h) and 1000° (4.5h). It would be interesting to test further if there is systematic impact or not. Especially because the mean of CRONUS-A concentrations at ETH being the highest of all published values (ref your Fig. 6), was derived with a higher extraction temperature than elsewhere.

We agree with the reviewer that this could possibly be the case but are cautious in drawing too strong a conclusion from small numbers of results under variable conditions (particularly at the lower temperatures). We thus prefer to leave the text as-is on this point. We intend to continue measuring CRONUS-A and CoQtz-N with our newly established procedures going forward so hopefully more robust relationships and statistics can be derived with the additional data, as suggested by the reviewer.

Fig. 6: It would be helpful if the 1sigma band of the PCEGS mean was shown, and also to clarify on the figure if PCEGS-47 and -50 included in that mean value.

Added shading to the figure as suggested. Also added to the caption – the mean on the figure only drops PCEGS-47. Also dropping PCEGS-50 does not change the mean significantly, so we prefer the former number: $(7.08 \pm 0.17) \times 10^5$ at g⁻¹ (47 only dropped) vs $(7.12 \pm 0.13) \times 10^5$ at g⁻¹ (47 and 50 dropped).

Table 4: Shouldn't the first three samples get a footnote saying that they were combusted at 600°C?

Yes, the footnote is already listed below the table and the superscript is on the Al₂O₃ subheading. We have modified this to have the superscripts on the individual samples for clarity, per the suggestion.

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