

Geochronology Discuss., author comment AC2  
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## Reply on RC2

Klaus M. Wilcken et al.

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Author comment on "Technical note: Accelerator mass spectrometry of  $^{10}\text{Be}$  and  $^{26}\text{Al}$  at low nuclide concentrations" by Klaus M. Wilcken et al., Geochronology Discuss., <https://doi.org/10.5194/gchron-2021-30-AC2>, 2022

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Dear reviewer,

Thank you for your review. Whilst the overall assessment seems critical we generally agree with the detailed points raised and look forward to clarifying these in the revised manuscript. Perhaps what has led to your negative feeling/impression on the manuscript was choices we made in terms of target audience, content and how to present the work. Our aim with the manuscript was to discuss details of low isotope concentration AMS measurements to cosmogenic user community and/or highlight what is relevant to cosmogenic isotope user to more technical AMS specific reader without being overly technical. This is a balancing act and perhaps we didn't get the balance quite right in all sections. Addressing the detailed points, you raised, hopefully will bring us closer to the right balance.

Responses to few key points raised:

"I do not believe that references are required for this line because AMS is an established technique by now. "

We felt some references were required for completeness, but we do agree that there are many others that could be included. Perhaps a note that these two are examples and/or addition of other reviews will avoid the possible interpretation that these are the only two available.

"Lines 51 – 54: the wording here is less precise than I think it should be. "

Thank you pointing this out. We reword the sentences carefully.

"Section 2.1: Measurement of  $^{10}\text{Be}$ " needs major editing. "

We agree that there are many details regarding charge state distributions that we didn't present in the manuscript. Our starting point here was to demonstrate to the reader that there are different combinations in terms of accelerator terminal voltage and optimal charge state for a given accelerator including possible ion optical losses, and how these all are critical to optimise  $^{10}\text{Be}$  measurement efficiency. Our approach then was to present ion transmission rather than charge state yield as the critical factor for optimising the measurement and how we chose our setup at ANSTO as an example.

However, we do take your points, and even if this might not be the right manuscript to discuss Coulomb explosion or equilibrium charge state we might have kept the description of the method too light and lost some of the important physics. We'll work on this and rewrite this section carefully with more details.

"Lines 135 – 142: The phenomenon of current fall-off has been observed by others, but it is not fully understood and if these data are presented then clarification is needed. ..."

We agree that ion sources are idiosyncratic and indeed that was the main point to include this graph. We are aware of earlier work, e.g. Middleton who showed increasing current with increasing sputter voltage, but wanted to highlight here that alternative methods might not reduce output or efficiency that much but indeed can result in increased longevity of the source. However, we agree that this is qualitative evidence as we can't control all the parameters, e.g. the amount of Cs in the source, but important given the ion source is the site of largest measurement losses by far and any gain has a big difference to the achievable measurement precision. Point of this graph was not to say 4.5kV is always better than 6.5kV but we have found advantage using the lower sputter voltage contrary to some earlier work and encourage others to explore. We'll clarify the manuscript on this regard.

"Lines 148 – 155: Lines 151-2 were a little unclear: Were all the targets mixed with Ag and pressed into cathodes at ANSTO or at the labs where the Al<sub>2</sub>O<sub>3</sub> was prepared? "

We'll elaborate discussion around this point.

"Equation 1, line 220: I disagree with this equation. First, the denominator does not include <sup>9</sup>Be from the sample material itself. ... "

We'll clarify the equations and descriptions regarding to this point.

"Lines 350 – 355: I have also been thinking about this issue for some time. If we "sum the total counts and charge before calculating the final ratio" and we assume instrumental drift is cyclical over a period of time comparable to the full measurement time of a target then we are actually better off just burning through each target in sequence rather than separating the analyses into shorter intervals. "

Selecting the most suitable measurement time is about finding the right balance. Make it too short and time is wasted in sample changes and make it too long and QA samples become too infrequent. Being aware of the potential pitfalls is the key in finding the right balance for each system.

In summary, we believe we can address the raised points following the reasoning discussed above. This undoubtedly will improve the quality of the manuscript. Thank you for the constructive feedback.

On behalf of all the authors,

Klaus Wilcken