

The Cryosphere Discuss., referee comment RC1
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Comment on Dyonisius et al, in situ 14C

Anonymous Referee #1

Referee comment on "Using ice core measurements from Taylor Glacier, Antarctica, to calibrate in situ cosmogenic ^{14}C production rates by muons" by Michael Dyonisius et al., The Cryosphere Discuss., <https://doi.org/10.5194/tc-2021-375-RC1>, 2022

Review of Dyonisius et al.: Using ice core measurements from Taylor Glacier to calibrate in situ cosmogenic 14C production rates by muons

Dyonisius et al. present measurements of $^{14}\text{CO}_2$, ^{14}CO , and $^{14}\text{CH}_4$ from the Taylor Glacier blue ice area. The measurements build on the work of Petrenko et al., 2016. The unique glaciological setting of Taylor Glacier allows old ice to be relatively near the surface. This permits large volume sampling of ancient air which makes these measurements possible. The authors also use a new sublimation technique for $^{14}\text{CO}_2$ which does not require large volume samples. Dyonisius focus on the deeper and older ice to constrain the production rate of ^{14}C within the ice and thus allows a clearer picture of the atmospheric ^{14}C production. They find that commonly used values for muogenic production are too high by a factor of ~ 5 . They further suggest that muogenic production is overestimated in quartz as well.

Dyonisius et al. have written a clear and detailed manuscript. They provide a number of technical advances in addition to the primary conclusion that muogenic production of ^{14}C is currently overestimated. These include that the previous natural sublimation estimates from Scharffenbergbotnen were accurate and that dry extraction does not bias ^{14}C measurements. I am primarily a glaciologist, so I have a limited ability to review the majority of the manuscript as my understanding of ^{14}C production is limited – which is to say that I learned a lot reading this paper. The scope of my review is therefore limited.

This is one of the best written manuscripts I have reviewed recently. The research is well motivated, with a comprehensive introduction. It flows logically and is succinct. With the exception of a few minor typos and a few figures with low image quality (both things I fully expect the authors to clean up before final publication), I have no substantive comments. This may be in part due to my lack of expertise in much of the subject matter; however, the description of the ice parcel trajectories was clear and at sufficient detail for the manuscript.

