

The Cryosphere Discuss., referee comment RC1
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Comment on tc-2022-82

Anonymous Referee #1

Referee comment on "New ^{10}Be exposure ages improve Holocene ice sheet thinning history near the grounding line of Pope Glacier, Antarctica" by Jonathan R. Adams et al., The Cryosphere Discuss., <https://doi.org/10.5194/tc-2022-82-RC1>, 2022

ice sheet history of Pope Glacier in Amundsen Sea embayment (ASE). Based on newly obtained Be-10 surface exposure ages and evaluation of the existing data set from Johnson et al. (2020), the authors refined the ice thinning rate and timing of deglaciation at the lowest site currently exposed. Because constraining the past ice behavior will provide insight into the drivers and mechanisms of the rapid ice mass loss and for model validation and refinement, this research is of international scientific interest.

Although this paper makes an excellent addition to our knowledge about the Holocene ice thinning history in West Antarctic Ice Sheet, I found some points need to be clear before publication.

The issues authors should better address are summarized as follows.

- Effect of the geometry of the ice sheet. The authors use the same value (80 masl) as the modern ice surface elevation. However, the curvature of the ice surface around the scoria cone looks not simple and may affect the timing of the exposure of samples. Topographic profiles of the scoria cone (including outcrop A to B) and ice surface nearby should be presented. The relative height of each sample site from the contemporary ice sheet surface may be better for the thinning rate calculation. Another point to note is the measurement of sample altitudes. I do not see any description of how the authors obtained the altitudes of the samples. If these are based on GPS measurements, the altitude data should be corrected to Geoid highest. The difference will not be large, but it is thought to be crucial for the interpretation with this high resolution.
- Origin of the faster ice thinning. I think the refined ice sheet history probably requires some revisions for the interpretation done by Johnson et al. (2020). Could you address this by adding a discussion about the paleoclimatic context for Holocene thinning in ASE?

Minor issues

- The geological background of the scoria cone should be mentioned. What are their age and origin? And also, "bedrock surface at a scoria cone" (in the caption of Fig.3) sounds a little bit awkward for me.
- Discription about the arcuate ridge landform is preferable. What is the origin of this? It looks like a moraine ridge might be formed by readvance. Could you discuss the origin of this?
- Line 315: Delete pace between "7." and "5"
- Figure 6: Please make clear the origin of samples (which ones are from the Scoria cone?)
- Table 1: uniform the number of digits for the site coordinates. I think the number of digits exceeds the precision of the measurement (Needs more info about this).