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# *Interactive comment on* "Younger Dryas ice-margin retreat in Greenland, new evidence from Southwest Greenland" *by* Svend Funder et al.

**Svend Funder et al.**

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We are grateful for the interest shown in our results and below we will address the points raised by Nicolas Young.

We agree that sampling erratic boulders perched on bedrock or on a moraine would have been ideal to minimise the potential problems with nuclide inheritance (which can plague bedrock samples in some, but not all, locations), but this was not possible at our sample sites. Few boulders were found, and thus our dataset largely consists of bedrock samples. Although not ideal, this dataset still has value, mainly because the low-lying coastal archipelago in our study area is the product of intense erosion by warm-based ice, probably during several ice ages and for the better part of the last Ice



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Discussion paper

Age (Seidenkrantz et al., 2019). Therefore, the sample sites are at least not an obvious candidate for nuclide inheritance, much in the way that other parts of west Greenland in terrains of aerial scouring produce bedrock exposure ages with little-to-no evidence for inheritance (Young et al., 2013). However, it is clear from our data that some of the bedrock samples show signs of possible inheritance, recognized as variable ages with some well older than a cluster of others. We have addressed these indications of inheritance by using the youngest group of ages as the most likely deglaciation age of the area.

The two oldest of our sample sites (Buksefjord, average age of 12.3 ka and Fiskenæsset, average age of 13.3 ka) are especially suspicious to the reviewer because it would move the deglaciation of the inner shelf prior too or in early YD i.e. making a strong argument against the Fiskebanke moraines in this area as being not connected to the YD, as previously hypothesized in several publications. Perhaps also because these deglaciation ages are a little older than those from our other sites. On the other hand, the ages from these two sites are internally consistent (low scatter) with only one obvious outlier at Buksefjord. The reviewer raises the possibility that all samples might be affected by small amount of uniform nuclide inheritance from long exposure durations combined with light glacial erosion during brief glacial occupations (cf. Briner et al., 2016). The reviewer points out that the deglaciation of Buksefjord is significantly older (by 1.6 kyr) than 10Be ages of boulders and 14C ages of marine molluscs from nearby sites around Buksefjord, and suggest that uniform inheritance may be the cause of this. Although we cannot rule out that inheritance is a possibility, we find it, as noted above, not likely. We favor our current interpretation that the coastal areas between fjords and troughs became ice free earlier than in the troughs, which were perhaps occupied later by lingering ice streams. This may apply also to our oldest site at Fiskenæsset, which implies that the ice margin was close to the coast in late Allerød times (13.3 ka). Here, there are no controlling data from nearby land. However, in the adjacent area to the south, the ice margin had already retreated from the shelf by the late YD (Sparrenbom et al. 2013; Levy et al., 2020), and farther south, the ice margin retreated on land al-

ready before the YD (Bennike et al., 2002; Levy et al., 2020). So, a deglaciation age of the coastline in the northern parts of ours study area in Allerød-early YD times would at least not be in conflict with data from neighbouring areas.

To sum up: NY raises several important issues concerning our dataset, especially about nuclide inheritance in our ages. We will modify our manuscript to discuss alternative interpretations of our ages, and then provide support for our favored interpretation.

Response to specific points: 1) The Cronus calculator: Thank you for pointing this out. We used Cronus version 3 with a production rate of 4.04+-0.07 i.e. the ages are correct. We will change this in the revision.

2) YD ice on the shelf: We agree that the new evidence presented in Young et al. (2020) clearly demonstrates that the ice margin was out on the shelf during the YD – just as it was on the Disko shelf immediately to the north. The same is the case for SE Greenland with early Holocene dates along the coast (Dyke et al., 2018, Levy et al., 2020), and in NW Greenland (Søndergaard et al., 2020). However, in some areas around Greenland, ice DID retreat onto land prior to the YD (northernmost and southernmost Greenland, Scoresby Sund). So it is not inconsistent that there might be other coastal areas in SW Greenland where there is a quite narrow continental shelf that ice pulled back to land during the late Allerød or early YD. We have incorporated these new references and discussion into the revised version of the manuscript.

3) Correcting for isostatic rebound: We agree and we will incorporate this in the revised manuscript.

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