The Cryosphere Discuss.,
https://doi.org/10.5194/tc-2019-271-AC1, 2020

The Cryosphere Discussions

Interactive comment on "Past ice sheet-seabed interactions in the northeastern Weddell Sea Embayment, Antarctica" *by* Jan Erik Arndt et al.

Jan Erik Arndt et al.

jan.erik.arndt@awi.de

Received and published: 30 March 2020

Response to the review of Frank Nitsche

In the following we mark reviewer comments with (1), our responses with (2), and our changes to a revised manuscript with (3).

(1) General comments: The manuscript presents a new compilation and interpretation of new and older multibeam bathymetry data from the continental shelf near the Brunt Ice Shelf in the Weddell Sea. It provides the first detailed past ice sheet reconstruction for this area and discusses processes forming some specific, unusual morphological features. The detailed paleo-ice sheet history for large parts of the Weddell Sea is still uncertain and therefore, this is an important contribution to this discussion. In addition,

the observations and discussion of features formed outside fast ice streams. The paper is well written and structured, and I have only some minor comments:

(2) We thank Frank Nitsche for this positive review.

(1) Specific comments: The observed ramps (type H) and related ridges (type E) are discussed in detail and are a centerpiece of the paper. It would be good to also compare these features to the ones described by Jakobssen et al. 2011 (https://doi.org/10.1130/G32153.1). They describe the movement of melange of broken-up ice shelf in Pine Island Bay including smaller iceberg plow ridges.

(2) We agree that a comparison to this proposed process should be added. We referred to the iceberg plow ridges observed by Jakobsson et al. (2011) in the section on Class H formation as terminal berms (line 325), but so far did not mention that these were hypothesized to have formed by the mélange of a broken up ice-shelf. This process indeed has some similarities to the process we propose for offshore the Brunt Ice Shelf, but occurred at different scale and in a different geographical setting. In addition, we used the iceberg ploughmarks size values of a statistical investigation of swath bathymetry from the eastern Amundsen Sea (Wise et al. 2017) for testing, whether Class H ramps could represent such iceberg berms (line 327). This investigation analysed the data presented by Jakobsson et al. (2011).

(3) We added information on the proposed formation process in the Amundsen Sea, including its differences to our Class H landforms, to the revised version.

(1) Line 268: Could the ramps 5 and 7 actually be some kind of GZW? It seems possible that the GZW in the top right of figure 4 extended along H5 and H7. The absence of MSGL in this part likely indicates lower ice movement, as stated in the text, so these GZW would receive less sediment and be smaller. It seems that the events forming the ramp6 is overprinting any older features.

(2) Ramps 5 and 7 are the most ambiguous landforms of Class H ramps with the

highest similarities to GZWs. Our main reasoning for classifying them as Class H ramps and not as GZWs was the close proximity to other Class H features (line 272), the lack of MSGLs (line 277) and their setting outside of a palaeo-ice stream trough (line 278). Nevertheless, we cannot rule out the possibility that ramps 5 and 7 represent GZWs in a situation as described by the reviewer.

(3) We clarify in the revised version of the manuscript that we do not rule out a GZW origin for ramps 5 and 7.

(1) Technical comments: Line 111/112: The text states that x-radiographs were taken every 2 cm. Aren't Xradiographs usually combined into a continues image? Are the 2cm a resolution or a stepping interval? Line132: It might be worth mentioning that the ice slap is not moving fast, so 14/17 year intervals are fine. Line 226: add space between "landward" and "shelf" Line 288: add space between "such" and "topographic" Line 291: Maybe use a different phrase instead of "supposed" here. Maybe something like "These studies suggest that hill-hole pairs occur : : :" Line 413: add space between "stresses" and "that" Line 471: Is the reference to figure 8a is correct here? It seems Fig 9b would be more appropriate here.

(2) We thank the reviewer for these valid technical comments.

(3) We changed the manuscript accordingly.

Interactive comment on The Cryosphere Discuss., https://doi.org/10.5194/tc-2019-271, 2019.