

Interactive comment on “De Long Trough: A newly discovered glacial trough on the East Siberian Continental Margin” by Matt O’Regan et al.

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The paper ‘De Long Trough: A newly discovered glacial trough on the East Siberian Continental Margin’ presents new geophysical and geological data from the East Siberian outer shelf and slope. Very little is presently known about the glacial history and past ice-sheet dynamics of this region, making this study particularly relevant to ideas about a Siberian Ice Sheet and an Arctic ice shelf. I have a few comments about the structure of the paper and the interpretations that are presented.

“In general we have revised the structure of the manuscript in accordance with the reviewers comments. How this was done is outlined below following each comment”

C1

Major comments - There could be further separation of description and interpretation in the manuscript. At present, the interpretations occur in the Discussion section and it is not clear what each of the six acoustic units have been interpreted as. Perhaps include separate description and interpretation headers within each of the results sub-chapters.

“We added a separate subsection at the end of the results section that provides an interpretation of the acoustic stratigraphy. This interpretation is based on the combined subbottom, bathymetry and coring data – and because of this we feel it fits better after each of these data-sets are described.”

- Some of the architectural features and landforms that are described in the Discussion should be introduced earlier in the manuscript. For example, the first paragraph of section 4.1 is background information that would better fit in an introduction. The introduction could include a short paragraph on the landforms that are typically associated with ice streams, e.g. GZWs, TMFs and mega-scale glacial lineations. This section would also benefit from additional references about GZWs, TMFs and moraines.

“We have moved the first paragraph of the Discussion into the introduction, and included a short paragraph on CSTs, MSGLs, GZWs, and TMFs. It includes more detailed referencing, but admittedly makes use of some of the most recent and extensive review papers of high latitude cross-shelf troughs and grounding zone wedges.”

- There is some discussion of the atypical characteristics of the De Long trough, i.e. it is quite shallow compared with other cross-shelf troughs. There could be further discussion of the ways in which the De Long trough differs from other cross-shelf troughs/ the limitations of the available data, e.g. the trough doesn’t appear to cross the entire shelf, e.g. the seafloor becomes deeper towards the shelf break, whereas most Arctic cross-shelf troughs have a reverse gradient.

“Many of the smaller high Arctic cross-shelf troughs do not display a reverse gradient, which tends to be a feature of some of the larger Antarctic troughs and those found

C2

around Southern Greenland. We have added this to the discussion section. We also highlight (Figure 3) that the landward extent of the trough is uncertain. Our interpretation of its extent is anchored in the data we have collected. Without more detailed bathymetric data, it is difficult to establish its exact origin.”

Minor comments - Are any iceberg ploughmarks detected on the sub-bottom profiles or bathymetry? “Yes, iceberg ploughmarks are very common above water depths of 280-320 mbsl. This has been added to the description of the Bathymetry data.”

- Start of second sentence of 4.1. Replace ‘they’ with ‘ice streams’, otherwise it could read as though cross-shelf troughs terminate in calving fronts. “This has been corrected.”

- Although some GZWs are found at the shelf break, they are more often outer-shelf to mid-shelf features, and are commonly associated with shallower and/or narrower regions of a trough. “A more detailed, but concise description of GZW location has been included in the introduction.”

- Section 4.1.1. The fact that the landforms occur close to the shelf break isn’t evidence that they are GZW, as shelf-break moraines are common in the geological record. Why does M2 more closely resemble a series of terminal moraines? Is this due to geometry/ amplitude/ length to height ratios?

“Our initial interpretation was based on their geometry, namely that M2 shows pronounced lateral variations in thickness. In the revised manuscript we have included estimates of their length to height ratios (165:1 to 600:1), which are clearly more similar to those reported for GZWs compared to terminal moraines (<10:1). We have elaborated on these observations in subsection ‘4.1.2 Grounding line deposits’. However, we still believe that the existing mapping data is too limited to unequivocally define these glacial landforms.”

- In Section 4.1.1: ‘As both types of features are found at the terminus of marine based

C3

ice streams. . .’. The presence of moraines doesn’t indicate a fast-flowing ice stream; in fact, moraines are more commonly associated with inter-ice stream regions. Both features do indicate the presence of grounded ice at the shelf break. “This is true, and we have corrected the text accordingly. We cannot unequivocally determine if the features are terminal moraines or GZWs, and recognize that the different interpretations are critical for interpreting the ice dynamics. We have made this clearer in the text.”

- Fig. 6. Labels could be added to this figure, e.g. acoustically transparent intervals. “The figure has been annotated to better illustrate the different units.”

- Fig. 7. The numbers in panels a and b should be rotated so they can be read. Where is the shelf break in panel a? This could be marked on, e.g. with a dashed white line. Panel a could be rotated so that the shelf is at the top of the image and the slope at the bottom, as in the other figures. Label the GZW in the profile in c. “These changes have been made.”

Interactive comment on Clim. Past Discuss., <https://doi.org/10.5194/cp-2017-56>, 2017.

C4

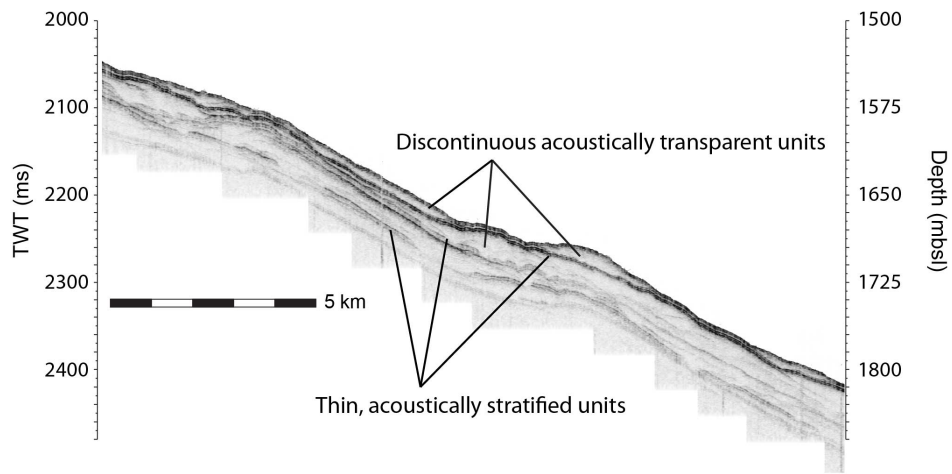


Fig. 1. Figure 6 edited after review

C5

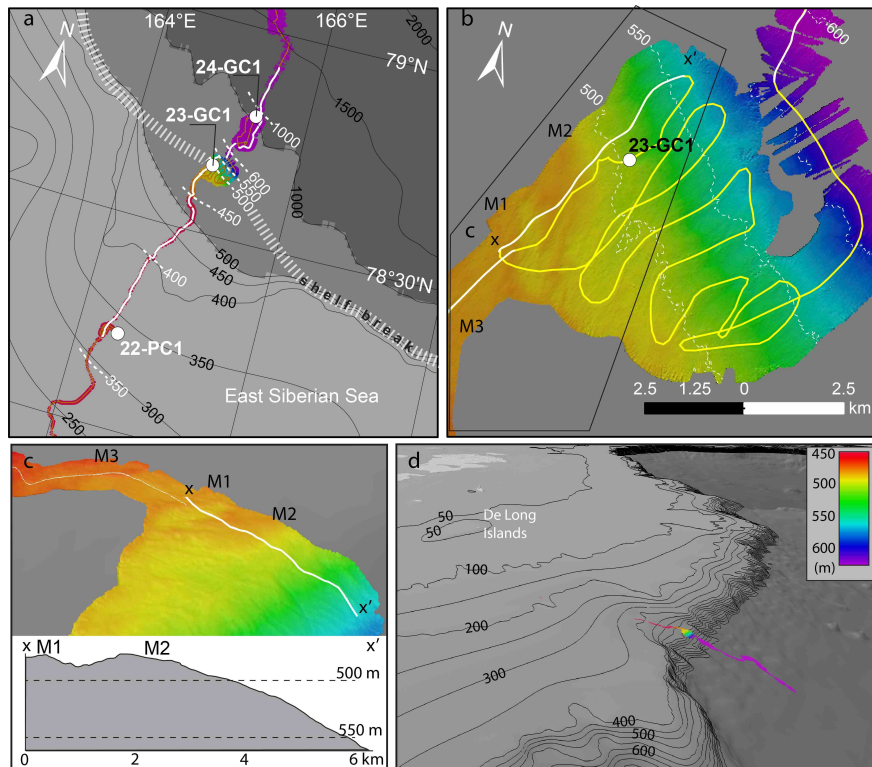


Fig. 2. Figure 7 edited after review

C6