

Interactive comment on “Ice stream or not? Radio-echo sounding of Carlson Inlet, West Antarctica” by E. C. King

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1. General comments

This manuscript describes an observational study of the ice-flow history of Carlson Inlet, which is an interesting feature adjacent to Rutford Ice Stream that, based on previous studies, may be a relict ice stream. The author makes a convincing if somewhat qualitative case that much of the Carlson Inlet does not possess the patterns of internal radar stratigraphy that are characteristic of ice-stream flow. The duration of its present ice-flow pattern is roughly constrained using 1-D modeling, and possible explanations for its subaerial and basal similarity to Rutford Ice Stream are also presented. This study is presented as an intermediate step towards a complete understanding of the ice-flow history of Carlson Inlet and the ice dynamics that produced this feature. The

motivating hypothesis is clear, and the manuscript is overall well written and illustrated. My minor comments are mostly centered upon requests for improvements to the clarity of the arguments concerning the observed folding.

2. Specific comments

a. 1222/25. Is Talutis Inlet a minor outlet glacier or ice stream? These terms are often used interchangeably, but dynamically there are some distinctions that can be made (mostly rock margins vs. ice margins, bed-supported vs. margin-supported). Perhaps there is insufficient data to constrain the answer, but the ambiguity in this statement is awkward for a manuscript focused on determining whether or not another feature is an ice stream.

b. Given the presumably non-uniform surface topography (higher at the margins?) and its relevance to the discussion of ice flow from the margins towards the center, topographic correction of the radargrams would be valuable.

c. The line numbers are unnecessarily complicated (e.g., J300/J2925), and their presumed relevance to the original survey design is not germane to this study. Renumbering them A–A'/B–B'/C–C' or something similar for this manuscript would aid the reader.

d. The along-flow width changes within Talutis Ice Stream should be quantified and compared to the amplitude of internal folding within these zones. Is there indeed a correlation between these quantities, as is suggested?

e. For the estimation of the period over which streaming ice has not been present in Carlson Inlet from surface velocity and flowline length, the grounding line does not appear to be the correct downstream reference to use. Instead, the distance between the Rutford–Carlson flow margin and the most downstream across-flow radar transect (Figure 3b) should be used. This update assumes that there no corroborating data near the grounding line, but if such data do exist, they would have to be presented here

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to support the use of the grounding line as the reference point to where no evidence of streaming flow is observed.

f. Numerical modeling could also address specific hypotheses concerning the origin of the morphology of internal layers, e.g., Catania et al. [2006] (JGR), and should be mentioned as another possibility for future work.

2. Figures

a. Figure 1. Add a north arrow. Add units to axes, and switch to kilometers rather than meters (easier for reader to determine distances and consistent with later figures). The origin of the grounding-line determination is unclear. For Rutford Ice Stream, it does not appear to be the MOA grounding line because it has presumably been determined more accurately in an earlier study. However, because this study does not critically rely on the character of the grounding line, it would be simpler to use the MOA grounding line, which would then permit a continuous grounding line to be used in Figure 1a. Figure 1b does not appear to show the same region as Figure 1a; rather than adding a box to Figure 1a, it would be simpler to show the same area. Also, is this basal topography from BEDMAP or the improved product from Vaughan et al. [2008]? For the MODIS imagery, the proper name (MODIS Mosaic of Antarctica) should be given for first and abbreviated later (MOA). A logarithmic color scale for surface velocities would make the zones of lateral shearing discussed in the paper easier to see.

b. Figures 2 and 3. It would be easier to compare the magnitude of folding between different radargrams if these figures were merged into a single figure, and if their horizontal scaling was consistent (i.e., 25 km for Figure 2a was the same width as 25 km for Figure 2b). For Figure 2b, the edges of the radargram should be labeled with geographic features as for Figure 2a and Figure 3. Ice-flow direction could be labeled below the bed reflector rather than explained in the caption. Axis labels could be bigger. Label zones A–E in Figure 3a.

c. Figure 4. Is there vertical exaggeration in Figure 4a? Unclear because there is no

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vertical scale. Label ice-flow direction in figure rather than describe in caption. Fletcher Promontory is labeled Fletcher Ice Rise in Figure 4b and not elsewhere. Axis labels should definitely be bigger. Label the C flowband at the downstream end, perhaps with an arrow.

3. Grammar (page number/line number)

- a. 1221/14. “as revealed by ice-penetrating radar” instead of “on radargrams”.
- b. 1222/20. “Treating the approximate length of an ice stream as the along-flow distance between the onset of fast ice flow (> 100 m a⁻¹) and the grounding line. . .”.
- c. 1223/9. “King et al. (2008))”: remove second closing parenthesis.
- d. 1223/15. “The system can be towed” probably should be “. . .was towed”.
- e. 1223/19. “and finite-difference migration.”
- f. 1225/19. “Flow-lines” drop hyphen.
- g. 1226/26. “(Vaughan et al. 2008)” should be “Vaughan et al. (2008)”.
- h. 1227/19. “temperature by. . .” should be “surface temperature by. . .”.
- i. 1229/1. Drop “very”.
- j. 1228/9. Move reference to end of sentence.
- k. 1229/18. “heavily-crevassed ice fall” should be “heavily crevassed icefall”.
- l. 1230/19. “common history” should probably be “common recent (3500–6800 yr) history”.
- m. 1231/6,9,12,14 and 1232/29. Unnecessary to add “-Earth” to “J. Geophys. Res.”.

Interactive comment on The Cryosphere Discuss., 5, 1219, 2011.

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