

Interactive comment on “Bathymetry and oceanic flow structure at two deep passages crossing the Lomonosov Ridge” by Göran Björk et al.

Anonymous Referee #2

Received and published: 3 July 2017

General comments: This paper presents new oceanographic and multibeam bathymetric data over a little known part of the Lomonosov Ridge and discusses the exchange of water masses across two channels in the ridge. The data presented and conclusions reached seem to be sound with good comparisons with historical oceanographic data from the area. Overall, I find the discussion a little lacking as it mostly reviews existing data rather than placing the data presented in this study in context and discussing it more fully. What are the broader implications of the new study? For example, on seabed temperatures and the GHSZ, as raised in the Introduction. Or on heat exchange with the Arctic Ocean? Can the authors comment on any unresolved or new questions raised by the study? I found the paper to have a clear structure and the figures are sufficient to provide evidence for the results and discussion sections.

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However, some parts of the text need revising to improve the written English/clarity of the sentences and likewise the figures can be made more consistent and clearer with some small edits (see specific/technical comments). If the authors can address the below comments, in particular developing the Discussion and relevance of the study, and revising the figures and written text appropriately then I can recommend publication in OS.

Specific comments: P6, Line 11: Could you colour stations 137 and 138 differently so that this statement is clearer on Fig 4? I can just about see what you mean, lower salinities c 500 m, but all profiles being blue it is hard to distinguish from the other profiles for the remaining depths

P7, line 14 & figures: Please make all multi-panel figures in the paper a,b,c etc. You have done this for some figs but not all. Make consistent across the figures, and also how you label them and the fonts used (some bold with a bracket, some not bold no bracket. . .). You can then refer more easily to the salinity/potential temperature plots in the text.

P7, line 27: Any comment on this westernmost station? Marakov water just not reached here or Amundsen signal overwhelming, barrier to W transport/mixing?

P9 line 9: Interleaving motions = or could it be a gyre/circulation within the intra basin? Perhaps explain the origin of "interleaving motions" if this is the correct oceanographic term (not my speciality)

P10, line 25: Label disturbed bottom sediments and transparent lenses on Fig 9

P12 line 4-5: I would prefer to see a comment on what kind of data could be used to elucidate the flow exchange rather than a negative comment on the data presented in this study! Otherwise why are we publishing it?

P12 line 20-27: The discussion lacks discussion on larger implications of this work plus any comments on unresolved/new questions raised by the study. What is the

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implication, if any, on seabed temp, for example.

Technical corrections: P5, Line 15: degrees symbol missing on lat/long. Check the rest of the text for this as I also noted it elsewhere (e.g. p7).

P6, Line 15: sentence needs re-writing/punctuation as it is a little confusing, e.g. . . .lower concentrations in the northern deep part of the section. . .

P6, Lines 16-19: Which observations, up to now you are talking about the three northern stations. Check and clarify the last sentence. Change to "Therefore, in addition to flow from the Makarov Basin in the north, there is clear evidence for flow from the Amundsen to the Makarov Basin in the depth interval 400-1300m"?

P7, line 6: Remove "is"; doesn't quite make sense, re-word slightly: ...indicates that it contributes to cross-ridge flows giving rise to sloping isopycnals

P7, line13: Is Atlantic Water always with a capital W? Check here and throughout the text, I thought the standard was for a small w in the literature. . .

P8, line 5-6: Written English not great here, suggest changing it to: ". . .excluded the possibility of strategically placing hydrographic stations along section lines based on the detailed multibeam map. . ." I'd actually replace detailed bathymetry map, rather than multibeam map, although the data was collected by a MBES what you are actually mapping is the bathymetry. . .

P8, line 8: I think this should be 72-km long and 33-km wide; could check OS hyphenation policy

P8 line 10: Replace has been with was. Refer to Fig 2e

P8 line 12: Remove acronym SCUFN as not used anywhere else in the text

P8 line 17: Is "about 1704 m deep"?! 1704 m is pretty specific! I'd suggest removing about

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P9 line 19: Refer to Fig 8d after latitude

P9 line 25: Have you defined AW acronym? If so then please use throughout the text; check

P9 line 27: What is Makarov AW? I know it has been discussed but perhaps define it by its T/S properties in brackets if you are going to talk about this as a distinct water mass

P9 line 34: Passive voice not great in this sentence; consider replacing “It is indicated from the profiles that this” with “The TS profiles indicate that this”

P10 line 4: Replace for with in terms of

P10 line 6: “grow to large amplitudes” not great written English. Replace with “..grow in amplitude and form..”?

P10 line 8: Should be Oden Trough

P10 line 9: Replace in with into. I’d replace having with with

P10 line 10: Add punctuation: “Since the LR has a strong steering effect, with flow generally along the ridge, it reduces the water..”

P10 line 16: Replace at each with on either; remove close

P10 line 17: and forming irregular intrusions. Replace can be with is

P10 line 18: Remove should; frontal speeds

P10 line 21: ...deepening, from the sill northward along the northern footwall of Oden Trough,...

P10 line 31: Comma after above

P11 line 15: Word missing here? Seabed temperature in the entire...? Commas after water and Basin

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P11 line 16-20: Long sentence! Consider splitting into two

P11 line 21: Remove will; comma after Also

P11 line 28: Replace bottom with “seabed upwards,”

P11 line 31: Should be directions

P12 line 10: water mass?

P12 line 12: bathymetrical structure...yikes! Overly complicated I think, suggest change to bathymetry or seafloor morphology. Structure implies tectonic influence to me, or internal Earth processes – bathymetry or morphology seems appropriate in this case

P12 line 25: I thought NADW was a widely used acronym, capitalise North Atlantic Deep Water

P12 line 25-27: Weak last sentence which needs rewriting but see my more general comments on developing the Discussion of this paper so I hope that this sentence will be revised

Figures, general: Please make sure fonts and labels for each panel are the same in each figure, and of an appropriate size to be read. Label panels in Figs 3, 4, 7, 8 as a, b, c etc and then refer to specific panels in the text.

Figure 6: The lines on c-h are too thick to distinguish in many places. At least at the scale that the figures are reproduced in the PDF. Check that these can be clearly seen, Figure 7 is much better so please make consistent.

Figures 4, 6, 7, 8: Cannot have negative depths..! And you do not have this in your other figures, please remove negative signs in front of depths

Figures 6, 8: Maps are very small, at least in the PDF version, and labels are too small and not clear. Revise.

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