

Interactive comment on “Deep drivers of mesoscale circulation in the central Rockall Trough” by T. J. Sherwin et al.

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Anonymous Referee #2

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General Comments

This paper provides a thorough description and analysis of the mesoscale circulation in the central Rockall Trough and only misses out on delivering on the full promise in its title through not expanding fully on what drives the whole system. By combination of glider, ship based and remotely-sensed observations the paper demonstrates the potential to continue to improve our understanding of even the most fundamental parts (hydrography and circulation) of a well studied system. The only weakness in the pa-

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per is that the discussion and conclusion on drivers is not put across strongly with a particularly interesting finding of long-term increase in EKE not followed up. A convincing link to the wider region would make this paper even better. The paper is very well written which aids the reader and helps the scientific argument to flow. In terms of readability the only difficulty is in the parts where overuse of three letter acronyms ADS, MDT, ADT is present. I have a few queries and questions but the paper should be finalised and published as soon as possible.

Thank you for the positive feedback. We have taken your comments on board and where we agree have made the necessary changes. On the rare occasion that we don't agree with you we have explained why.

Specific Comments

Abstract

A clear and well written abstract covering the main points of the paper well.

1. Introduction

This short section gives the broader motivation for the study in the paper. It only includes one citation but makes some broad statements about the level of attention received by parts of the SPG and probably undersells the previous work on the 'warmer and saltier water in the east' which the author then calls upon in the Background section. The citation to Tett et al, 2014 is given as an eg. suggesting that this evidence from reanalyses comes from more than just this paper. For such a significant statement (lines 6-9) more support should be cited. The connection between this introductory overarching motivation and the rest of the paper is also weak.

The Introduction has been enhanced in response to these comments, to emphasise that all regions of the SPG are interlinked and hence that the Rockall Trough is of more than local importance. The Tett et al paper now makes clear that the statement about uncorrelated transports is based on analysis of ocean reanalyses, without going into

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further detail. The reference to OSNAP demonstrates the topicality of this subject.
2.Background

Well written and with the right level of detail to give the reader a good idea of the state of understanding in this system. p2609 line 25-26 replace '...the gyre...' with '... the SPG...' Done

p2610 line 5 - can you add an uncertainty to the 0.6Sv ?

No To add a justified uncertainty to this value would increase the length of the manuscript, which after all is not about transport through the Rockall Trough, since none of the references make unambiguous statements about this flow. However, we've changed the value to 0.7 Sv to match that quoted by Holliday et al and cited below it.

p2610 line 9 - how does this 3Sv of ENAW +0.6Sv of NAW , suggested in figure 1 to reach the Wyville Thomson Ridge, compare with the latest understanding of transports of Atlantic water just northeast of the ridge? cf Berx et al (2013) and Rossby and Flagg(2012)

Not addressed This is not the subject of this paper. It's an interesting question though and one we think deserves a paper in its own right. But we repeat this paper is not about net transports.

3.Methods Clear and concise description of the methods applied but also describing the observational datasets used. p2612 l20-21 Give the cruise report a citation and add to reference list and then remove final sentence p2613 l7-8. 'The cruise report can be ...' Done p2614 l6 - should acronym RHIB be expanded? Reference to RHIB has been removed as it is unnecessary

p2614 l1-14 - the paragraph should include information on Transit 3 and possibly transit 6 both of which were broken for other mission objectives. This break and any impact in the analysis is not mentioned here or in section 6.1. How did you deal with this - can Transit 3 be justifiably considered a transit?- and particularly how did you then adjust

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for the comparison with AVISO in Table 1?

The text has changed in §3.1 and §3.4 to point out the existence of these breaks and their implication for data analysis. They are now also shown in Fig. 6. p2514 l20 - 'Up to dive 476...' add date just to help the reader. Done

p2615 l1-3 - Are you saying that there were spikes in the collected data, or that there could have been but were not. Then are you using Fig 3 to back up either of those contentions?

The point has been clarified 4.Background observations

This section briefly describes the main features observed in each of the datasets but could be expanded a little in a couple of places. p2617 l4-7 - This section is unclear. Is this interleaving west of ADS very different from that on the eastern side? Comparing the October profiles of salinity Fig3cd and θ S Fig 3ef both have interesting structure and 'dynamic changes' over the period of the observations. The sentence describing the increase in both θ and S below 200m is worded ambiguously (I looked initially for an increase with depth rather than the obvious shift to warmer and saltier water in the full profile), and should be reworded to describe this change and if possible panels in Figure 3 redrawn to make the depth variations easier to compare with the θ S plot. Partly agree The confusing sentence has been reworded and hopefully the statement is clearer. It's a big ask to add depth contours to θ -S profiles, which is why the depth profiles are included in the same figure

p2618 l4-19 Here a really interesting trend is found in EKE alongside with some analysis of its seasonal cycle. But the interannual variability looks large compared to both the trend and the seasonal cycle yet is only discussed in terms of the EKE anomaly in 2009-2010. Then the brief discussion of possible correlations with NAO or T & S seems to be limited only to trends in these parameters. This is an interesting finding that needs to be looked at in a little more depth.

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Not done We agree that this apparent correlation with $\bar{A}S$ and S is interesting, which is why we've said what we have about the NAO and SPG retreat. But the trend in EKE is not the subject of this paper and is only included to place the magnitude of EKE in the winter of 2009-10 in context. Nevertheless we have gone a little further and quantified the correlations between $\bar{A}S$ and NAO.

5. Sub-surface glider observations winter 2009/10

A good concise set of sub-sections that describe the basic findings from the glider mission. Could the break in Transit 3 and any implications be discussed here?

We have assumed that this is a rhetorical question. Anyway as is now described in §3.4 we do not believe that the gap has any impact on the overall results. 6. Direct comparison of the glider and altimeter current measurements

p2623 l1-3 the LADCP measured currents are brought into the discussion and the subsequent sentence discussing correlation between velocity components then becomes unclear - clarify whether these correlations are AVISO -Glider only.

Sentence about LADCP observations is now in brackets. Word 'glider' added to next sentence. 7. Discussion

A good and well written discussion but I think should expand more on the promise of identification of key drivers, connecting to the wider region and considering the long-term change in EKE result.

p2625 l6-l10 Add a little more justification for this suggestion of origin, spelling out your reasoning for why this should be - this argument generates Conclusion 1 on p2627, and needs just a little bit more justification. In para 1 we've made it clearer that we believe that we're looking at the same deep eddies as those observed by Ullgren and White (2012) in the south of the Trough, but we've included the possibility of northern origins and made use of specific dive $\bar{A}S$ plots to strengthen the discussion. p2625 l14-15 The citation to Holliday et al has the brackets in the wrong place and the sentence is

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not clearly linked to either the preceding or subsequent sentence. This point has now been addressed with an additional phrase at the end of the sentence. p2626 l4-10 Here the ADS is referred to as Anton Dohrn, which helps the reader I think. The final sentence is ambiguous what are you trying to say?

8. Conclusions Clear and relevant conclusions that the readers will be able to use. If possible then a conclusion on the long term increase in EKE would be a useful addition. Also the first conclusion needs to be supported better by the discussion (as above). Hopefully we have covered both these reservations with the changes above that we have made to the text.

Interactive comment on Ocean Sci. Discuss., 11, 2607, 2014.

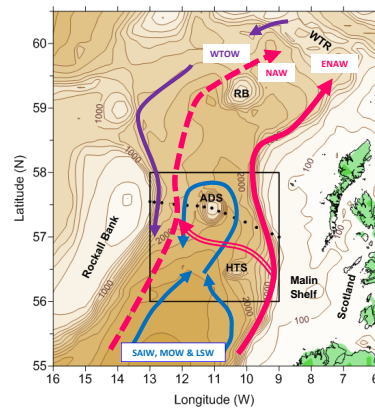


Figure 1

Fig. 1.

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