

## ***Interactive comment on “Characterization of Ocean Mixing and Dynamics during the 2017 Maud Rise Polynya Event” by Jhon F. Mojica et al.***

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Dear referee #1, Thank you for reviewing our manuscript. We found the comments and suggestions useful, and we respond to them as indicated in our point-by-point answers below. The aim of this work is to describe and create a temporal mixing map in the area that allows us to illustrate the ocean characteristics prior to and during the formation of the Maud Rise Polynya. Therefore, we would like to change the manuscript title to “Characterization of Ocean Mixing during the 2017 Maud Rise Polynya event”, eliminating the word dynamics. We present our hypothesis in lines 94-98. In the next version of our manuscript, we will highlight thermobaric convection, and clarify any confusion regarding polynya dynamics.

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Major issues: 1) We are rewriting the confusing parts of the manuscript that you mentioned, and are clarifying our hypothesis to present more clearly the role of thermobaric convection in driving energy exchange at the thermal barrier. This process is just one component of the ocean preconditioning that forms part of the polynya formation puzzle. As we discuss in lines 499 – 510, wind and atmospheric effects are needed to open the polynya. Moreover, Francis et al., 2019, have confirmed that atmospheric events trigger the opening of the polynya. Therefore, we focus here on the ocean part, using rare measurements to describe the ocean preconditioning that occurs in this region.

2) Yes, it was a mistake to choose ‘dynamics’ for the title. We will change the title by deleting the word ‘dynamics’. By doing this, we are not narrowing down our scope, just clarifying our focus subject: an assessment of the ocean conditions that make Maud Rise susceptible to a Polynya opening, based on a new and rare dataset.

3) We will check the full manuscript to make sure that the present tense is used consistently and to clarify our ideas as best we can. But we take your suggestions into account in our revision.

4) Thanks for the comments. In our introduction, we emphasize the role of the pycnocline in relation to the thermal barrier, which is why we focus on the thermocline rather than the halocline. We will rewrite this part to mention the important role of the halocline, but will give more emphasis to the thermohaline.

Minor issues:

Lines 16, 160, 163, 187, etc. You switch between present and past tense, but maybe you should stick to using present tense consistently throughout the text.

OK, we will check all tenses throughout the manuscript to check for consistency and will stick to the present tense.

Line 95 and others. You vaguely talk about “physical properties” when you can be

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specific that you mean density.

OK, we will check over the full manuscript and we will be more specific when we talk about physical properties.

Line 64, Line 368 and other instances – you talk about “production of sensible heat” when you mean “transport” and “release”

OK, we will change it.

Line 100 “providing” → “facilitating”

OK, we will change it.

Line 114 “within” → “during”

OK, we will change it.

Line 119 You do not have to keep the reader waiting. Briefly state what we should expect.

OK, we will add a sentence to conclude that thermobaric convection is an important driver of stability and exchange of fluxes in the thermal barrier.

Line 55 “by associated Ekman transport” – awkward phrasing

OK, we will change it.

176 “near to the surface” → “near the surface”

OK, we will change it.

Line 200. Diapycnal “diffusivity” is not “a process.” Diffusion is a process, while diffusivity is an inherent characteristic of the system.

OK, we will change it.

Section 3 title. Why do you refer to the following as “methodology?” It seems that you

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are doing an overview of theory.

This is the theory and steps we follow to quantify the variables in this work.

Lines 113, 137-140, 193-194, 202-206, 286, 289, 297, 325-326, 349-353, 394, 444, 450 – awkward or confusing phrasing

OK, we will rewrite this part.

Line 226 “quantified as” → “defined as”

OK, we will change it.

Line 271 expand the abbreviation ASW to explain what it stands for

OK, we will expand it.

Line 301 drop “a”

OK, we will change it.

Line 335 – if the isopycnals are steep, then there is both a lateral and a vertical component to isopycnal mixing. So I would not label diapycnal and isopycnal mixing as vertical and lateral.

The isopycnals are not steep. The isopycnals squeeze because of the steep slope of the Maud Rise in an area approx. ~100 km, to keep talking about isopycnal and diapycnal mixing.

Please also note the supplement to this comment:

<https://www.ocean-sci-discuss.net/os-2019-41/os-2019-41-AC1-supplement.pdf>

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Interactive comment on Ocean Sci. Discuss., <https://doi.org/10.5194/os-2019-41>, 2019.

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