

## Response to editor's decision

Please find editor comments in blue and our responses in black.

Dear Dr. Jones and co-authors,

Thank you for submitting your revised version to Ocean Science. I would like to take the opportunity to thank both reviewers for their very thorough and constructive comments, as well as to thank the authors for their detailed and respectful responses. I find that most concerns were addressed by the authors and have some more minor issues that I noticed during my evaluation of the revised article.

The paper presents a comprehensive machine learning-based classification of oceanographic "provinces" from profiles from the Weddell Gyre region. Using unsupervised machine-learning may present a new analysis technique for many members of the WSDML community, especially in the context of an interdisciplinary special issue, which is why the level of detail used in this paper is appropriate.

We are glad that you found the paper to be comprehensive and within the scope for the special issue.

Nevertheless, the paper is overall quite long and as criticized by reviewer #2, the paper is divided into many subsections, which may create redundancy and decrease the text flow in certain sections. However, the authors state that the structure was chosen specifically to allow for easier browsing for the casual reader. While I can relate to the reviewer's concerns, I am generally happy to support the author's approach, as the structuring style is a matter of taste and preference.

Below are some minor comments and suggestions for figure improvements, which I encourage the authors to consider before acceptance of the paper.

Thank you for your helpful suggestions. Please see our response below.

### Minor comments on text

Line 39: do you mean to say "30°E, 70°E"?

We have changed this for simplicity.

Line 40: 60°S

Yes, thanks for catching this.

Line 112: suggest to include the reference for the data collection here

Done.

Line 119: paper

Fixed.

Lines 124-125 and 198-204: In my opinion, these are unnecessary introductions to subsections, as was also pointed out by one reviewer. Please re-consider whether preambles are really needed.

Removed.

Line 78 and 224: „in latitude and longitude“ seems unnecessary

Removed.

#Line 247: perhaps better say “thickness of the water column”

Apologies, but I wasn't sure which phrase you were referring to here, so I didn't change anything.

Line 331: parenthesis and period missing

Fixed.

Line 372: „becomes“ is used twice in this sentence

Yes, thanks. We removed one of them.

Line 446: an

Changed.

Section 3.5 in particular as well as other text passages: the word “relatively” is used somewhat inflationary

This is a great point – the word “relatively” really was overused in the original draft. I have removed or changed most of the instances of this word. Now it only shows up four times, which is relatively few (ha).

Suggestions for figure improvements:

Discrete colorbars: This may also be a matter of taste and hence suggestions rather than requests, but discrete increments generally provide more quantitative detail in the figures. While some of your figures employ discrete colorbars, this could be used to improve figs 2, 4-8 and 12 as well.

Thank you for this excellent and specific suggestion. We have replaced the colormaps with discrete ones.

[Fig 3: Why are different colors used for the profiles?](#)

Each class gets its own color. We use the same scheme for Figure 10 and Figure 15.

[Fig11: the tickmarks on the colorbar do not quite agree with the increments](#)

Updated. They now line up.

[Fig 12,13: "latitude", "longitude" labels are missing](#)

For consistency, because none of the other map plots have "latitude" or "longitude" labels, we left them off here as well.

[Fig 13: remove right-hand y-axis labels](#)

Done.

[Fig 14: The panels are missing grids and need more detailed captions](#)

Yes, good point. The caption was very minimal. This has been updated.

[FigA1: very small fonts, consider using only one ylabel "depth \(m\)" on the left hand side and remove all other labels, as the panels overall share identical y-axes. Perhaps include titles with larger fonts inside of the panels](#)

Updated.