Reply to interactive comment on "Interannual evolutions of (sub)mesoscale dynamics in the Bay of Biscay" by Guillaume Charria et al.

L. Brannigan (Referee)
Submitted: 26 June 2017

L 17 "Earth's rotation

The manuscript has been modified following referee suggestion.

p3 L17 "where h is the depth"?

The text has been corrected.

L24 "width is 20 km"

The manuscript has been corrected.

L25 "The tide with 14..."

The sentence has been modified.

L33 "A spin-up of two years is required taking into account

The sentence has been improved following suggestion.

P4 L11 - this equation (and others on this page) need to be on their own line

Equations of p.4 have been written on their own lines.

P5 L4 "better resolve"

The text has been corrected.

L10-15 - this could all be deleted, readers can look up the database construction themselves if interested.

Following referee suggestion, this part has been simplified.

L39 "The Figure 6" should be "Figure 6" with no article (and elsewhere)

The text has been modified.

P6 L38 "there is also a velocity..."

The manuscript has been rephrased following suggestion.

P7 L15 "at different contrasted"

The text is following referee suggestion.

P8 L9 "vertical mixing" - I think you really mean vertical transport here as the discussion focuses on resolved vertical motions rather than parameterised vertical mixing.

Indeed, we agree with the referee and the text has been modified. "vertical mixing" => "these vertical motions"

L26 - missing a "x" here in the number perhaps?

As it depends the journal conventions, we followed the referee suggestion and add the 'x'.

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The sentence has been replaced to improve the reader understanding of this result:

" The maxima are in phase with the coldest period in temperature and associated with the larger anomalies compared with the averaged annual cycle (Figure 14c) before the spring warming and the beginning of seasonal stratification."

has been replaced by

"The maxima are in phase with the coldest period in temperature and most extreme values in vertical velocity and relative vorticity are corresponding to the most extreme cold values in temperature compared with the annual cycle (Figure 14c) before the spring warming and the beginning of seasonal stratification."

The manuscript has been corrected.

The manuscript has been corrected.

The sentence has been modified.

Indeed, the use of this term is not the most suitable. We modified the text using "steep" and "shallowest" terms. The manuscript text is then:

"The Figure 15 shows the shallowest slopes (larger than $k^{-0.4}$) occurring in autumn/winter (from November to March). At the opposite, slopes values are steeper (between $k^{-1.2}$ and $k^{-1.4}$) in spring with a minimum in May or June. The interannual variability of this minimum (corresponding to steepest slopes) is limited and values are very similar following the year. Concerning the winter shallowest slopes, the value is decreasing with time but the limited number of simulated years does not allow concluding to the significance of this trend. The monthly seasonal cycle is very stable every year. However, we can notice that in 2004, shallowest slopes are reached earlier (in November) than during the other years (December, January or February)."

To clarify the text, we replaced "... in winter (from November - year-1 to March year) ..." by "... in autumn/winter (from November to March) ...".

The text has been corrected.

The text has been corrected.

The text has been corrected.

The manuscript has been modified.

L15 "associated with" (and elsewhere)

All occurrences of "associated to" have been replaced by "associated with".

L16 "also reach deep mixed layer depth maxima"

The manuscript has been modified.

L20 "On the contrary,... had shallower mixed layer depth maxima ... reduced" L21 ". These shallower mixed layers are related ..."

The text has been adapted to take the suggestion into account.
Improved manuscript text is:
" On the contrary, 2007 and 2008 had shallower mixed layer depth maxima (Figure 16a) associated with a reduced maximum of vertical buoyancy flux at (sub)mesoscale (Figure 16b). These shallower mixed layers are related to warm winters causing warming of the surface ocean and a decrease in winter mixing."

L23 "recorded"

The text has been corrected.

L34 "autumn 2004"

The text has been corrected.

P11 L14 "warm winters"

The text has been corrected.

P12 L21 - delete comma

The text has been corrected.

Appendix A - I'm not suggesting you need to do anything for this paper,
but I'd recommend preparing papers in some variation of Latex to avoid the slightly strange appearance of the equations that happens with Word.

We thank the referee for these future recommendations.