

## ***Interactive comment on “Shelf sea tidal currents and mixing fronts determined from ocean glider observations” by Peter M. F. Sheehan et al.***

### **Anonymous Referee #2**

Received and published: 6 December 2017

General comments: This is a largely methodological paper that uses Seaglider derived depth averaged currents to calculate tidal velocities and amplitudes in a shelf sea environment. These tidal currents are compared to modelled tides and output from current meters before being used to define tidal mixing fronts. A combination of a simple model and hydrographic observations has been used to explain the positions of the fronts.

I think there is value in the methods presented within this work and that it has been done well. I do however have some concerns about how well some of the later analysis supports the conclusions and find that the general story gets lost because of this.

Specific comments: Introduction: Is the mixing front visible in satellite data? If so it would be interesting to add SST or a front map to figure 1 to highlight the co-location.

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Method 2.1: I would be interested to see if the glider altimeter depths compare well to the GEBCO bathymetry. Given that the depth is so important to your analysis then glider depth might be more accurate.

How have you combined the M2 and S2 tides? You often use M2-S2 as a concatenation and this suggests that you subtracted S2 from M2. You also need to be consistent in your notation for this combination throughout the text.

You have interpolated the velocities to give “along-track” glider velocities and then reference Figure 4 which show “meridional” and “zonal” velocities. Have you assumed that the along track direction is zonal? This needs to be made clear as the glider tracks are rarely completely zonal.

How were estimates extracted from the TPXO model? I assume the TPXO model has some interpolation or smoothing and as such the points within it aren’t entirely independent. In contrast the glider DACs are independent from each other. Have you accounted for this difference between models and observations?

Method 2.2: You explain the statistics and process of binning the data after you have introduced the binned data. However I think you do need to maintain the discussion of the accuracy at the end of this section and so some restructuring is required.

Frontal location: The structure of this section is very abrupt, with little initial introduction. Paragraph 2 is difficult to follow and again would benefit from restructuring. The information is all there but the story gets lost.

Why have you focussed a large part of this section on work by Simpson and Sharples, which you say is not appropriate for this region? It would be nice to see more discussion of Hughes which appears to be more suitable to this work. In the final paragraph you say that there “does not appear to be adjustment” and then explain the effects of the adjustment, is there adjustment?

Comparison with model output: Again the story gets a little lost due to the structure

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here. I think a short section linking the observation of the front to this analysis of it. Say upfront what it is you're trying to get out of the comparisons.

Why was this model chosen?

Why has the 1st of November been selected as a representative date?

Comparison with observations When you discuss the salinity gradient I think it would be interesting to show this, for example by a plot of the salinity gradient along a representative isobath, or something similar.

This section is very interesting and a good argument for why the model doesn't hold up in October but I'm not sure it is sufficient to support your conclusion of a hybrid front. This is a qualitative assessment of the glider, which I would expect to be more thorough in order to be a full discussion item and to have such an influence on your discussion.

Do you have data to show that October (your early glider transects) is representative of summer as this section implies?

Figures Figure 2 a and 3 should be the same geographical area, the one highlighted in Figure 1.

Why has the shaded area/zoomed in Figure 4 been selected? It appears to be when the fit is best, maybe a central point or even a period when the fit is worst would be more appropriate

Technical corrections: You have used a mixture of Fig. and Figure throughout, be consistent

2.2 line 10 "Ellipses from both" you have 3 data sources here not 2

3 line 19 "critical contour" should it be "critical value"?

3 line 32 When was the final occupation of the section?

3.1 line 38 glider has been spelt glided

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