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Interactive comment on "Depth-averaged instantaneous currents in a tidally dominated shelf sea from glider observations" *by* L. Merckelbach

Anonymous Referee #4

Received and published: 14 November 2016

The manuscript, "Depth-averaged instantaneous currents in a tidally dominated shelf sea from glider observations" proposes a novel and useful method to address the challenge of estimating the local currents being experienced by a glider. This is important not only to glider safety (i.e. the example of posting warnings to mariners given in the manuscript), but also more generally to glider navigation and improves a key scientific observation from gliders, as currents are important to the characterization of marine systems. The method is rigorous and, although I do not know the literature thoroughly, appears to appropriately reference related work. In general, the presentation is good, though in the comments that follow I suggest a number of changes that would improve the clarity and in one case the scope and therefore potential readership of the manuscript. I suggest that it be published after the minor corrections listed below are addressed.

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I have two general comments:

1. Given the drawback of the 10 hour phase lag in the near real-time current estimates, as I was reading I kept asking myself why you wouldn't have chosen a filter with less delay. You do discuss/show three different Butterworth filters and discuss their relative merits, but the discussion seems too narrow (no discussion of non-Butterworth filters) and too abstract (no sensitivity analysis of the consequences of using a filter that has a less sharp division between pass and not-pass but less delay). I would suggest including a fuller discussion of the relative benefits/disadvantages of using a less accurate but lower delay filter in the near realtime application – also considering the possibility of 1)using different filters for realtime and post-processing, or 2) if the delay is known, shifting the data appropriately.

2. I think this manuscript stands to increase its significance and gain much wider readership if it included a fuller discussion of how to generalize and apply this method in regions with different current regimes (e.g. mixed tidal components or non-tidal coastal currents). Although the focus on COSYNA may be appropriate to the special issue and is certainly an excellent test case, the method could be useful to the wider glider user community, but readers are more likely to pick it up if the manuscript provides help in understanding how it might apply to their region of operations.

Specific Comments:

Page 3, Lines 26-27: Why mention, and then leave out, the short non-tidal timescales? Are they not important to the predictions needed for the GVTCC? Or, is it simply too difficult? Please address this or remove the mention.

Page 4, Lines 2-4: Please rephrase this. It's strangely worded and unclear as to whether this refers to all filters or your choice of filter.

Page 4, Lines 13-14: Please give a concrete example to support the sentence "In practise this would mean that the algorithm would account for a transient feature, but

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with a given time delay yielding poor results throughout the time span of the delay."

Page 5, Eqns 2-6: These equations need to be better explained. There are undefined terms and it is unclear how they are applied.

Page 6, Eqns 7-8: How are these estimated?

Page 8, Lines 11-18: Paragraph is awkward and as written does little to help the reader understand what you did (for example I didn't understand that the first test was based on purely synthetic data until I read on). Please reword for clarity.

Page 8, Lines 28-29: What argument is this expectation based on? Can you add a scaling argument to convince the reader?

Page 9, Lines 6-7: Please provide the motivation for the choice of noise being "Gaussian with zero mean and a standard deviation of 1 cm Âůs -1"

Page 10, Fig 3: It looks like more than just the phase changes between the forward-only and forward-backward filters. Tidal frequencies are still present in the forward-only. Please discuss this.

Page 11, Line 4: How large a problem is the error margin of 9-9.7 cm/s? Please provide some context.

Page 11, Lines 13-14: Please explain to logic behind this statement "The sources of these errors are the decomposition of the currents into residual and tidal currents by low pass filtering on the one hand, and the oversimplified tidal currents model on the other"

Page 16, Lines 1-3: Confusing as written. Please explain your reasoning. Why leap from currents to mixing? Why do you need currents to assess mixing? Are not currently intrinsically interesting or necessary to other applications? (e.g. dispersal of pollutants, larvae, etc).

Technical comments:

Page 5, Line 3: Meaning of “odd-padded”?

Page 6, Line 10: Change “casted into” to “cast as”

Page 8, Line 25: Change “tracks are” to “track is”

Page 9, Line 2: Change “In order to evaluate the performance of the filter, first the ADCP measurements were used.” to “As a first step, the ADCP measurements were used to evaluate the performance of the filter.”

Page 14, Line 18: Unclear. What is meant by “and responses” in this sentence?

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