

Dear reviewer,

First, thank you for your careful review of our manuscript and your remarks. They have been really helpful to improve the manuscript and we have addressed them into the text, as explained in the point by point responses further down. Thank you for your specific comments on the paper structure as well, since they helped to realize that the explanation of the approach that we used was not clear enough. We hope that thanks to your suggestions we have managed to improve the manuscript, and that it suits now the standards of Ocean Science. Best regards,

Ivan Manso

AR = Author's response

AC = Author's changes in the manuscript

All the changes' lines and pages correspond to the revised manuscript

After considering the comments of the two anonymous referees, major changes have been made in the manuscript. First, we have better defined the context of this work using, among others, the references proposed by referee#2 in order to get a more complete introduction with regard to studies for the expansion of HFR data to subsurface levels. We have also changed the Sect. 3.1 into Sect. 3 separating it from the main results (now in Sect. 4), thus leaving its own section to the description of the simulated 'true' ocean. We have also clarified the main aim, approach and conclusions of our work, with changes in several parts of the manuscript which are detailed in the following point by point responses.

Comments are enumerated

1- *Page 1, line 7: should technology be capitalized?*

AR: Done.

AC: in page 1 line 8

2- *Page 1, line 16: should it read *multiplatform* or *multisensory*. Change to "*aiming for the continuous*".*

AR: Both terms could be used, but "*multiplatform*" is the term that better fits to the main focus of this paper, based on a model-based scenario where different platforms and sensors are measuring the same parameters and where different platforms are combined.

AC: "*aiming for the continuous*" corrected in the manuscript in page 1 lines 16-17.

3- Page 1, line 17: change from "is today" to "are".

AR: We have maintained "is" because it refers to the percentage, thus "is today" was changed by "is".

AC: "is today" was changed by "is" in page 1 line 17.

4- Page 1, line 18: change to "resolution, but are limited to the".

AR: We have rephrased the entire sentence and we have removed that part.

AC: rephrased sentence in page 1 lines 17-18.

5- The authors should make it more clear that the the ADCP and HFR data they are discussing were derived from model output. On the first read of the manuscript, I thought that data was from sensors deployed in the ocean.

AR: The reviewer is right, and this was also the comment of referee #2. We have clarified this point with changes throughout the manuscript. In the new version, we explain that we use an assessment approach inspired by the techniques used in Observing System Simulation Experiments (OSSEs) where a numerical simulation is used as 'true ocean', which provides both, the observations and the 3D reference field that will be used to assess the results of the reconstruction (as shown in Fig. 2).

AC: There are changes in the abstract, introduction and Sec. 2.1 in order to better explain our main aim and the used approach. The title of the paper has also been changed to: "3D Reconstruction of Ocean Velocity from HFR and ADCP: a model-based assessment study", in order to make clearer this aspect of the methodology.

6- Page 2, line 27: change to "combining simulated information from".

AR: We have changed the full sentence to make it clearer. In fact, we have fully changed this part of the Introduction.

7- Page 2, line 30: change to "performance".

AR: Done.

AC: in page 3, line 6

8- Page 3, line 17: change to "with surface temperatures over".

AR: Done

AC: in page 3, line 20

9- Page 4, line 1: remove Moreover.

AR: Done.

AC: in page 4, line 19

10- Page 5, line 3: replace *Summarizing* with *In summary*,

AR: Done.

AC: in page 5, line 18

11- Page 5, line 11: change to “*surface current fields along the Mid Atlantic*”.

AR: Done.

AC: in page 5, line 26

12- Page 6, line 19: *can the authors be more specific on what is meant by the observations and the reference fields.*

AR: When dealing with methods for data 3D reconstruction, what we need to evaluate is the solution in the whole 3D domain, and namely in the areas that are not close to the observations. To this end, as explained in comment 5, we use an assessment approach inspired by the techniques used in Observing System Simulation Experiments (OSSEs), where the observations that are used as inputs for the methods are emulated by a numerical simulation, and then the outputs (the reconstructed fields) are compared to the reference field obtained also from the ‘true ocean’ that is provided by such simulation. This approach is now better explained in Sect. 2.1 and different modifications through all the manuscript have been addressed accordingly.

13- Page 7: *What data source was used for the correlation scale tests, IBI, GLORYS-HR or GLORYS-LR?*

AR: The analysis of Sect. 3.1 (now changed to Sect. 3) provides an overview of the characteristics of the currents simulated by the numerical simulation from where the ‘true’ ocean was extracted. The IBI dataset was used for this purpose since as explained in this section, it has proven to be a realistic numerical simulation.

This change of Sect. 3.1 to Sect. 3 was made in order to make the manuscript clearer. In addition, note that the first paragraph of Sect. 2.3, where the numerical simulations are described, also links that section to this one.

AC: the initial configuration of the sections has been changed as mentioned, in addition to some changes throughout Sect. 3.

14- Page 9: *Figs 10-11 are mentioned before Figs 6-9, can this be changed.*

AR: Thank you, you are right.

AC: We have moved this paragraph to the end of the section as a general conclusion. Page 10, lines 20-24.

15- Page 12, line 6: change to “*the combination of synthetic data that mimics sensors from a multiplatform observing system to reconstruct*”.

AR: We have changed the full paragraph to make clearer that we use emulated observations based on a realistic scenario as explained in the response to the comments before.

AC: in page 11