

## ***Interactive comment on “Synergy between in situ and altimetry data to observe and study the Northern Current variations (NW Mediterranean Sea)” by Alice Carret et al.***

### **Anonymous Referee #1**

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The work presented by Carret et al compares SARAL and Jason 2 altimetry data with HF radar, vessel-mounted ADCP and glider data in the North Western Mediterranean Sea. Dataset are well presented, and a complete Section describes similitudes and differences between the dataset. Yet some important physical differences between the dataset are missing in that section. Most of the results presented are not new: it is well known that seasonal and mean average of the altimetry currents are trustable. Also, little is learnt in terms of description of the currents. On the other hand, it is presented a very interesting description of six cases where a detailed comparison between the datasets is made. I encourage the authors to push forward the analysis of the higher frequency and to clearly show when satellite altimetry works well and when does not.

I hope that the below specific comments will help in that sense.

Specific comments:

P3, L 13, add a comma after “swaths”

P3, L29-30, the list of articles is non-exhaustive. Please add “eg” at the beginning of the list.

P4, L 14: “associated to important mesoscale and sub-mesoscale variability at all time scales”. Meso and sub-mesoscale have time scales associated as well. Please rephrase.

P6, L3-5: could you comment why the optimal spatial filtering scale that you obtained is so different for tracks that are relatively close to each other?

P6, L7: Please justify the values used (for SARAL in the precedent paragraph you obtained values that ranged between 34km and 49km). Why you selected a fixed value?

P6, L13: please add a short discussion (with references) to justify that the selection of the MDT. An inaccurate MDT can largely bias your results.

P6, eq 1: it should be noted that this is the across-track component of the geostrophic velocities

P6, L29-30: how much is “too far away” and “too short” ?

P6, L31-P7L1: please improve sentences (for instance obs have the potential. . .).

P7, L6, a word is missing (end of the line)

P7, L8-9: Here and all over the document: Try to avoid parenthesis as much as possible

P7, L13, “of the second order” - > “of second order”

P7, L15, add “data” after “salinity”

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P7: 15-18: please clarify that these geostrophic velocities do not represent the same physical quantity that the ones obtained from satellite altimetry

P8: HF-radar: please add a sentence explaining the error associated to this dataset (ie explaining where velocity components are better solved in the spatial domain covered by the antennas)

P8, L24: altimetry currents are not “located at the surface”. They are computed from the SSH, but the SSH topography is the result of several process, including the density changes in the whole water column. Comparison of currents from different instruments elsewhere show that satellite altimetry represents better sub-surface than surface currents. Depth of best matching depends on time and space.

P9, L33-34: gliders provide density sections from where you can extract only the baroclinic component of the velocities. Altimeters provide SLA. When adding MDT, altimetry provides barotropic and baroclinic components. Depending on the accuracy of the geophysical corrections, altimetry data might be more or less biased by ageostrophic components. Please state more clearly the differences between gliders and altimetry data.

P10, L1-4: exactly what I expressed above for comment in P8, L24.

Figure 2: representation of mean velocities for the HF radar could be improved. There, you can solve two directions. The large blue spot is not very meaningful.

P10, L31-32: this information should be included in the legend of the Figure.

Figure 4: please add monthly ticks in the x axis. Please describe how HF radar data were treated. You averaged them along the coast? If so, please discuss how much variability is lost, as the distance along the coast is not so short.

Figure 4f: some interannual variability is also observed. And during 2014 some noisy(?) data close to the coast are also observed. Why it is observed only during that period of time?

Track 302 of SARAL is particularly suited to compare with the HF Radar dataset. Did you try different re-tracking procedures (ALES for example) to analyze how close to the coast the altimetry data can be improved?

P13, L35 & P14, L1-2: please provide a clearer explanation on the criterium adopted.

P14, L2-4: which velocity is seasonally averaged? Legend of Figure 5 says “maximum current amplitude” but from the text I understand that all velocities have been averaged

P14, L4-6, please improve sentences.

P14, L18: South of Toulon only SARAL data can be compared to HF radar data. Please add Toulon position in Figure 1.

P16, L11-13. Please justify the window time scales selected. I suggest to repeat the calculation as a function of the time window. In the coastal region time scales are shorter than 22 days.

P16, L19-22. Figure 6a. I wonder how the distance to the coast is measured. Figure 1 clearly shows that there are no measures of the altimeter inside the 1000m isobath, while gliders and ADCP do show measures up to the 200m isobath. Thus, I am suggesting that in Figure 6 Saral and J2 lines are not correctly placed. Orientation of J2\_0009 track is quite different from Saral\_887 (with respect to main direction of the isobaths).

P16, L34 to P17, L4: data are “very close in time” but then you argue that differences may be due to “one-week difference”. Please say precisely what is the difference in time for each case.

Figure 7 looks strange: double colorbars? Double x-axis?

P20, L2-4 “but a quantification of the high frequency component of the coastal ocean dynamics that altimetry is able to capture would require data that are colocalized in both space and time.” Completely agree. But with the dataset that you already have,

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you do have the possibility to quantify this quite precisely: how much is the bias that is introduced in the comparison because of non-colocalized data? Just compare, more precisely than what you have done so far, the “very close” space & time datasets with the “not very close”.

Discussion can be shortened and concentrate/highlight more on what the results of the work show.

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