Ocean Science Discussions

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Comment on os-2022-8

Anonymous Referee #2

Referee comment on "Assessing the capability of three different altimetry satellite missions to observe the Northern Current by using a high-resolution model" by Alice Carret et al., Ocean Sci. Discuss., https://doi.org/10.5194/os-2022-8-RC2, 2022

Assessment of the observability of coastal currents in LRM and SAR altimetry observations: a north-western Mediterranean Sea case study

General comments:

The paper deals with an original method to evaluate the ability of altimetry to catch the main features of a coastal slope current having a space scale in the range of few ten kilometres. A validated numerical modelling is used to fill the gap in terms of space and time co-localisation between in situ measurement and altimetric tracks. The method is innovative and worthy.

Page 3, observability is defined as the condition that the observed processes have a sea level signature and spatial-temporal scales larger than the altimeter resolution. For the north-western Mediterranean Sea, the objective is therefore to check whether altimetry is capable of capturing the observed behaviour of the North Current (mean characteristics, trend, seasonal variability, higher frequency variability of the order of 2 to 15 days, etc.).

Unfortunately, the paper fails to reach this goal and suffer of weaknesses and is not suitable for pulication as is. It should be rejected or strongly revised before any publication.

1) The paper only considers the mean characteristics of the North Current (NC), and the variability is discussed only in terms of standard deviation without distinguishing between measurement noise and physical variability. Of course, the mesoscale perturbations of the NC remain out of the scope as the revisiting period of satellite is too coarse, but one expected at least a discussion about the observability of the seasonal variability. The

figure 5.c suggest strongly a comparison with altimetric observations that is not achieved.

2) You use the MDT of Rio et al (2014) which reproduces the NC mean slope rather well. One would thus like to know the respective contribution of the SLA and of the MTD to the altimetry derived characteristics of the NC. That is, what is the benefit of adding an SLA to derive the mean characteristics over the concerned time period? Using the longest common available window between altimetric data and numerical modelling prevent any investigation in term of variability and lead only to global statistics.

3) I don't agree with your chapter 4.2 and associated figures 8,9,10 (maybe I don't understand correctly your methodology?). I guess (it is not written explicitly) you filtered -spatially- only the SLAs before adding the MDT and then derive the current trough geostrophy using your relation (1). Using a low-pass filter with a cut-off wavelength of 60, 50 or even 30 km will remove almost all traces of the Northern Current since it has a horizontal cross-sectional scale of about 20 km. Consequently, the figures 8,9,10 mainly show the distribution of the current derived from the MDT signal appearing when removing progressively the part of NC in the SLA signal. The MDT is more or less in aggreement with the numerical modelling.

The methodology used reduces the ambition of the study. The benefit of the different altimetric signal (Jason,Saral,Sentinel) is not fully demonstrated as we don't know the SLA's own contribution to the current mean and as the physical variability is mixed with the noise. May I suggest to do at least seasonal means in order to investigate if the SLA is able to catch the seasonal variation of the NC. It seems possible on longer series.

Detailed comments:

Lines 122-128: You refer to the variability of the NC without indicating a time scale or length. It might be useful for the reader to have this information in relation to the frequency of the model outputs and the satellite repetition. In the literatures, two periods

dominate 10-20 days and 2-6 days.

Line 210: You should explain why you are or are not applying filtering.

Line 250: *amplitude* is perhaps not the exact terms as it refers here to the mean value of the NC core velocity.

Figure 3: A suggestion, a white centred palette would be more appropriate to illustrate the velocity differences.

Line 280: "*They are associated with a misplaced current in the model rather than with incorrect current values*

". ? You mean probably "incorrect current intensity" or more precisely "incorrect current maximum"

Line 290: "*The irregular temporal sampling of the gliders also contributes to these larger model-data differences, compared to the HF radars results. Indeed, a deeper analysis shows that the same features may occur in the simulation and in the observations, but shifted by one or two days (not shown).*" I don't understand why time lags in signal induce more differences for irregular sampling than for regular one. Figure 3c exhibits also strong difference for radar comparison with the HF.

Figure 4: In my opinion, figure 4 is not really useful for your demonstration and the associated paragraph (line 286-314) is confusing.

Figure 5: To support the corresponding text, dx, |u|max, |u|max/2 must be quoted in figures 5a and b, otherwise these figures are not helpful.

Line 466: The increase in noise due to spatial filtering does not seem to be addressed in section 4.1

Typo:

Line 97: the3 -> the

The name of the journal is missing for several references.