

## ***Interactive comment on “Observability of fine-scale ocean dynamics in the Northwest Mediterranean Sea” by Rosemary Morrow et al.***

### **Anonymous Referee #1**

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This paper investigates the noise levels for recent altimeter missions (Jason-2, CryoSat-2 and AltiKA), as emerging from the computation of along-track spectra. This technique has been already applied to global altimeter data sets, for Jason-1 (Xu and Fu 2012) and for Jason-2, AltiKA and CryoSat-2 (Dufau et al. (2016). The authors replicate the analysis in the NW Mediterranean Sea that is an excellent laboratory to assess finer-scale ocean processes with along-track altimeter data.

The authors use 1 Hz data that have a flat noise floor – the higher frequency (20 Hz or 40 Hz data) showing a spectral bump at wavelengths less than 70 km which does not allow us to estimate a stable noise floor. The authors show how much of the ocean dynamical signal is observable above the noise. The smallest scales observable vary from one altimeter mission to another and seasonally. In the study area, the results show that we cannot observe structures less than 35-45 km wavelength with

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AltiKA, 50-60 km wavelength with the higher noise of Jason-2 and CryoSat-2 blocks the observation of scales less than 50-55 km.

As the point is that energetic features can be observable above statistical noise, the authors present and discuss specific case-studies where ground-truth is available at time of altimeter passages. One case-study is a series of collocated along-track altimeter-glider sections where geostrophic velocities derived from the two independent data sets are compared. The second case-study utilizes co-located HF radar to compare the oceanic surface currents.

This paper contributes to better understanding the potential of along-track altimeter data in observing the ocean variability at small scale, considering that improved capabilities of new satellite altimetry missions and refined processing are expected to provide more and better data than past. The paper shows evidence that along-track filtering usually applied to reduce the instrument and geophysical noise should not be applied in a similar way to all altimeter missions but also adapted to the regional conditions. The results also show the interpretation difficulties encountered in comparing with in-situ data at short scale, especially when there is a rapidly evolving ocean dynamics and along-track altimetry data are not exactly and collocated in time and space with in situ observations.

Overall, the paper is well organized and easy to read with very good English. I recommend publication after minor revision. I only strongly suggest authors to include and consider an analysis at cross-over points, as CryoSat-2 due to its non-geodetic orbit provides lot of crosses, some probably near coincident in time with the other satellites over the 13-month common data period from 1 April 2013 to 30 April 2014.

Additional minor comments:

Pg 3, Row 10, “seasons,,” – typo to be corrected Pg 3, Row 25, “..The Mediterranean Sea, dominated by small dynamical structures, may have different spectral energy and spectral slopes than in other open ocean regions..” – this statement is not proved; it

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seems just a speculation Pg 6, row 21, “SSH PSD” – somewhere you state SLA and now SSH. is PSD computed using SSH or SSHA (anomalies) ? Pg 13, row 29 and row 34, “HFradar” – separate HF from radar Pg 14, row 1, “HFradar” – separate HF from radar

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