Ocean Science
Discussions

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Interactive comment on "Contribution of future wide swath altimetry missions to ocean analysis and forecasting" *by* Antonio Bonaduce et al.

Anonymous Referee #1

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1   General comments

There are currently 3 nadir altimeters in orbit, which provide along track measurements of Sea-Surface Height (SSH). However, due to their narrow band nature, and the repeat times, the gaps between tracks are large compared to the ocean mesoscale – thus only limited spatial and temporal coverage is available. Wide swath altimeters are being developed to which would provide much greater SSH data.

This paper looks at the implication of such data being available to constrain model solutions for the IBI region. They note that similar studies are needed for the global scale, and for other regions.

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Discussion paper

They run a series of Observations Synthetic Simulation Experiments to assess the impact of assimilating the current constellation of altimeters, and future wide band altimeters. I found the experimental design satisfying, and analysis convincing.

2 Specific comments

I found the paper well thought out, clear and useful, and would recommend it for publication with corrections.

I think it had scientific significance, scientific quality. The presentation quality is also quite good, although I think it needs to be proof read by another native-English speaker, as there are sections that are incorrect or unclear. I think they need to reproduce the graphics with a better colour-map – jet/rainbow is very misleading.

I thought there should be a bit more description of the altimeters and of the ocean forecasting/analysis/reanalysis system.

I think there could be a little more discussion of what the statistics mean physically, in terms of location, mechanism etc.

I have outlined these specific comments here.

Page 4: End of introduction. Later in the paper when you start talking about forecast errors, I realised that it was not a reanalysis study – I wonder if this should be further clarified in the introduction. . . perhaps a sentence of two describing the forecast/analysis system, something like: . . . data is assimilated in 2 day analysis part of the run, which then is run freely as a 5 day forecast, with the end of the analysis used as initial conditions for the next forecast cycle. We use the analysis period to assess the impact of ssh, and then compare the errors in the 1st, 3rd and 5th day of the forecast period). . .

Page 7: section 2.3.2. Need to give more information on the current Nadir altimeters: how often do they pass over a particular place? How wide is the footprint? How wide is it between passes (compare to the newer ones)? What does 1Hz mean in terms of km's? You say the wide swath altimeters have 20.9 day repeats, and 7km – does this imply that the same is true for the nadir satellites? Perhaps a table giving these details might be useful.

Page 7: section 3. Did you consider an OSSE assimilating TS and SST, but not SSH? Assuming correcting the ocean temperature structure won't affect the SSH through expansion, but it may constrain eddies, which would affect the SSH?

Page 8: Line 26. Clarify exactly what variance you mean. I assume you mean a spatial map of temporal variance. Maybe add an equation along the lines of:

$$\frac{\sum_{t=0}^{t=T}(ssh_{OSSEk}(x,y,t)-ssh_{NR}(x,y,t))^2}{n_t} - \left(\frac{\sum_{t=0}^{t=T}(ssh_{OSSEk}(x,y,t)-ssh_{NR}(x,y,t))}{n_t}\right)^2$$

$$Var(NR) = \frac{\sum_{t=0}^{t=T} ssh_{NR}(x,y,t)^2}{n_t} - \left(\frac{\sum_{t=0}^{t=T} ssh_{NR}(x,y,t)}{n_t}\right)^2$$

Page 9: Line 31-32. It is good to see you talk about what the improved statistics mean physically (in terms of ocean features). You should do more of this in the paper.

Page 20: Figure 1. I suggest you use a perceptually uniform colour map, and don't use the jet/rainbow style colour map. This applied to all the map figures.

3 Technical corrections

Page 2: Line 6. "these" and "source" need to agree – perhaps "these unique sources".

Page 2: Line 28. Change "could not be suitable" to "may not be suitable"?

Page 3: Line 14. Remove the space before the semi colon "NEMO ; Madec" vs "NEMO;

Madec".

Page 3: Line 15. Perhaps change "'nature" run' to "'natural" run'?

Page 4: Line 4. Remove "a" from "In this study a particular attention.."

Page 4: line 25. You say the "last version". Do you really mean Last, latest or previous?

Page 4: line 26. Remove extra space, change "used , the" with "used, the"

Page 6, Line 7. Remove extra space after reference.

Page 6: line 29. Should it be daily average sst? I guess it depends on the assimilation system?

Page 8: line 4-5. Incorrect phrasing, please rephrase "As already mentioned, SWOT-like data have a temporal resolution which could not allow to resolve correctly the evolution of mesoscale structures"

Page 8: line 8.Is order of magnitude the correct term?

Page 8: Line 13-16. Justify the values of the improved radar interferometer error values in OSSE4. Is this a possible improvement?

Page 8: line 15. Change 'an halved' to 'a halved'

Page 8: line 19. Do you mean NR? If so, change for consistency.

Page 8: line 20. Perhaps helpful to say steep bathymetric slope or deep sea-bed slope – might otherwise confuse some readers.

Page 8: line 21. Change word order to 'was also captured'

Page 8: Line 25. Perhaps call var* relative variance?

Page 9: Line 8. Change 'an higher' to 'a higher'

Page 9: Line 17. Is 20-30

Page 9: Line 26. Is the 6

Page 10: Line 3. Add a reference to Table 4.

Page 10: Line 10. Is this the correct table?

Page 10: Line 15. Is 19W too close to your lateral open boundary?

Page 10: Line 21-23. The wording is confusing in this sentence, feels like it's the wrong way around.

Page 10: Line 21. Change word order 'to evaluate also' to 'to also evaluate'.

Page 10: Line 24. Looks like you can see the impact to 50km, although to a much smaller level. Perhaps add a qualifier here, or weaken.

Page 10: Line 27. Also add a reference to table 7 – something like "(Figure 7, left panel; Table 7)".

Page 10: Line 30-32. What about the difference between OSSE2 and OSSE3? I assume you mean it's interesting to notice that the difference is small, but maybe no... clarify.

Page 11: Line 17. Change word order "increased significantly" to "significantly increased".

Page 12: Line 2. We've just been talking about Table 5, do you need this last sentence?

Page 13: Line 5. Do you mean OSSE4 when you say "accurate" if so, clarify. Also applied to Line 27

Page 13: Line 22. Change word order from "observed also" to "also observed".

4 Figures

Page 21: Line 3. Use left, centre, right to describe the upper panels. It is unclear using semi-colons.

Page 22: Figure 4. Given the whitespace in the upper left, perhaps add OSSE1 in blue... OSSE4 in green text. This applies to figure 5 and 7. It's good you've used the same colour ordering for these panels. Check the colour for colour blindness. Perhaps removed the 100's of x ticks.

Page 22: Line 3 (caption for Figure 4). Change "(blue lines)" to "(blue line)".

Page 23: Line 2. Type – Frebruary – change to February

Page 25: Figure 7. Break Y axis on the left hand panel, (i.e. y values of 0-4 and then 4-10) to capture the top of the grey line.

Page 25: Line 2-3. Confusing text... perhaps say something like "... February-December 2009. The results for experiments OSSE0... OSSE4 (green lines) are shown at the spectral window between 400km and 12km."

5 Tables

Page 29. Table 5. Add km to the last 3 columns (280km, 155km, 125km...)

Page 29: Table 6. Add columns for current magnitude.