Interactive comment on "Major improvement of altimetry sea level estimations using pressure derived corrections based on ERA-interim atmospheric reanalysis" by L. Carrere et al.

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Dear Remko Scharroo,

Thank you for your review and comments. My answers and suggestions for changes are noted in blue in the text below.

Best regards

Loren Carrere

I am very pleased to have read this paper, as it makes very clear the progress made in

determining the DAC for altimetry using the ERA-Interim sea level pressure and wind

speed fields.

Nonetheless, I have numerous suggestions to improve the paper. Some are merely

textual, some conceptual, but none ought to be too hard to apply in a minor revision.

Comments below are indicated by a pair of (page/line number).

(2/8) "deeply improved" -> "greatly improved"

LC: OK text has been changed

(2/11) "IB correction" was not previously introduced/explained.

LC: OK. Replaced by : "a static inverse barometer correction (IB)".

(4/5) "If compared" -> "When compared"

LC: OK text has been changed.

(4/7) "improved compared" -> "better than"

LC: OK text has bee changed.

(4/8) "Six-hour ERA-interim analysis" -> "Six-hourly ERA-interim analysis grids"

LC: OK text has been changed.

(4/24) "each studied" -> "each of the studied"

LC: OK text has been changed

(4/26) "10 days". Why not 5 days, as this is the maximum time difference between ascending

and descending tracks. With 10-day time differences you will create duplicate

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statistics, using the same measurements more than once.

LC: Indeed this 10-day time difference is to be used with all missions (TPJ, ERS-EN …) and it aims at minimizing the impact of the oceanic variability on the crossovers differences, while keeping enough points for statistical analysis. This threshold of 10 days is used for each cycle separately thus avoiding using same measurement more than once even for TPJ..

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(4/30) "HF part". "HF" was not previously introduced or explained.

LC: OK text has been clarified..

(4/32) "computed ;" -> "computed;"

10   LC: OK text has been changed.

(6/1-6/8) Why would different filtering be used for TOPEX/Jason on the one hand (20 days) and ERS/Envisat on the other (70 days)? DAC is a physical phenomenon independent on the sampling frequency (just as tides). Of course, there are different

15   aliasing characteristics just like tides, but the DAC per se is the physical phenomenon of the sea level variation due to pressure and wind ("weather") just like tides are due to sun and moon. Also, the Nyquist frequency is not 20 days, but 10 days in crossovers. So why the insistence on using a 20-day filter. Please explain.

LC: I agree that DAC contains a physical phenomenon (response of the ocean to wind and pressure forcing) as described in

20   p5/l 22-28, but for altimetry the main purpose of this correction is to remove the HF ocean variability (due to wind and pressure forcing) which is aliased in the lower frequency band due to bad temporal sampling of altimeters. Thus talking of aliasing we could envision using different filtering wavelengths for the different missions, but the choice was to keep the same filtering for all the missions with a wavelength based on the reference mission aliasing.

I also agree that the Nyquist frequency of crossovers is shorter compared to along-track, but the DAC is applied on along-

25   track products and it is thus optimized for these along-track products and aliasing problems. Moreover 10 days crossovers are mainly used for validation as described in section 2.3. But if you would like to use crossovers time series, thus benefitting form the higher temporal sampling of crossovers, you could also use a DAC with a 10-day filter. For the moment only one DAC is provided in altimeter products, but it can be envisioned to provide a non filtered DAC for users who would like to optimize the filtering wavelength with their specific analysis/purposes…

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(6/17) "radiationnal" -> "radiational"

LC: OK text has been changed.

(6/24) "Ocean ... Earth." -> "oceans ... land."

LC: OK text has been changed.

(7/4) "EN" -> "Envisat" (as in most other cases)

LC: OK text has been changed.

(8/1) "altimeter" -> "altimetry"

LC: OK text has been changed.

5 (8/7-8/10) Would it not be better to "remove-replace", i.e. remove the S1-S2 atmospheric

tides from the model grids, then replace it along-track.

LC: indeed a remove-replace process is done along-track: S1 and S2 aliased atmospheric tides are removed using gridded

S1S2 pressure climatologies (Ponte and Ray 2002), and they are then replaced by correct S1 and S2 atmospheric tides using

a specific atmospheric tide model (Ray and Ponte 2003). => Text has been changed to be clearer.

10 (9/9) "cm" -> "cm^2"

LC: OK. cm² already noted in the text but there is likely an edition problem with ² => text has been changed

(9/10) "2-3 cm" -> "1-2 cm". I doubt this range. First: the difference DAC_ERA-DAC_

ECMWF is no more than 1.8 cm std.dev. globally, so how can the SSH error

reduce 2-3 cm std.dev. globally? Second: the crossover variance reduction is quoted

15 as 5-12 cm^2, which leads to SSH variance reduction (on a single track) of 2.5-6 cm^2,

which suggests an error reduction of 1.6-2.4 cm maximum. Therefore 1-2 cm is a better

indication.

LC: You are right, I missed a 2 factor between crossovers and SSH. "2-3 cm" is replaced by "1-2.4 cm" in the text.

(9/13) "+/- 1 cm" -> "+/- 1 cm^2"

20 LC: OK. cm² already noted in the text but there is likely an edition problem with ² => text has been changed

(9/15 and a number of other places) "DAC-ECMWF" -> "DAC_ECMWF"

LC: OK name has been homogenized

(10/26) "ERA-1" -> "ERS-1"

LC: OK text has been changed.

25 (10/27) "10 cm" -> "10 cm^2"

LC: OK. cm² already noted in the text but there is likely an edition problem with ² => text has been changed

(11/30) "nearly the global" -> "nearly everywhere across the global"

LC: OK text has been changed.

(12/29) "2-3 cm" -> "1-2 cm" (see comment on (9/10))

30 LC: OK "2-3 cm" is replaced by "1-2.4 cm" in the text.

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