

## ***Interactive comment on “Improved sea level record over the satellite altimetry era (1993–2010) from the Climate Change Initiative Project” by M. Ablain et al.***

**Anonymous Referee #1**

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Review on the manuscript (#OS-2014-46) "Improved sea level record over the satellite altimetry era (1993-2010) from the Climate Change Initiative Project" by M. Ablain et al.

This manuscript give an overview of an updated satellite sea level product out of the Climate Change Initiative (CCI) sea level project, including its validation protocol, updated algorithms and corrections, validation with other products. This is going to be a very welcome contribution to the sea level community, or broadly to the climate science community.

The manuscript is written quite well, however there are several important issues which

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need to be clarified. Thus I recommend the authors to address them before the manuscript is accepted for final publication. Detailed comments are as follows.

### General Comments

1. As discussed in Section 2, the impact of a new altimetry correction can be objectively judged based on its influences on GMSL trend or regional sea level trends, however, whether one new correction is an improvement or degradation may be determined somehow qualitatively, or even subjectively. In particular, new corrections do not always lead to improvement, thus the differences between SL\_cci and AVISO products should not be directly labelled as “improvement” or “reduction of errors”. For example, in the end of Section 6, the authors directly use differences between SL\_cci and AVISO products in Fig. 6 as an evidence of error reduction in SL\_cci product.

2. Two ocean data assimilation (DA) products (GECCO2 and ORAS4) are used to evaluate the SL\_cci product. It's concluded that SL\_cci product is closer to both DA products than the AVISO product, though both of them assimilate AVISO. I think it's a not very meticulous practice and could be misleading without giving some key details about how data assimilation is done in both DA products (e.g., heavily or loosely constrained by sea level or any other observational fields), what's the sea level formula in the model (e.g., including freshwater input from land ice melting, Boussinesq vs non-Boussinesq). Ideally you want to compare both AVISO and SL\_cci sea level products with a DA product which assimilates other variables excluding sea level, thus better agreement between one sea level product with above DA product can be regarded as a robust evidence for supporting better quality of this product.

### Minor Comments

3. Page 2035, Lines 4, 10 & 16, Table 1 should be Fig. 1?
4. P 2036, L 20 & 25, Table 2 should be Fig. 2?
5. P 2043, L 18, Wind forcing is one important driver for regional sea level distribution,

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but it's not the only one. For example, buoyance forcing (heat and freshwater fluxes) may also play significant role in some regions. There are quite a few publications on this aspect.

6. P 2043, L 25, remove "and" after "by comparing"
7. P 2043, L 7-12, not all processes contributing to sea level variations are included in those general circulation models, which may cause what altimeters observe and what models simulate can be different.
8. P 2044, L 13-14, what percent of total ocean area is in red colour (with improvement), what's the average improvement ratio? How is blue colour? It's easier to interpret with some numbers.
9. P 2047 L 12-13, Similarity between sea level trend map and steric sea level trend map has been presented in many conferences & publications, and it does not critically depends on which altimeter product is used to generate the sea level trend map. So such comparison should not be counted to support the improvement of SL\_cci product over previous products.
10. P2049 L27 – P 2050 L1, "Substantial improvements" seem to be an overstatement to me. Yes, there are improvements, but some of them are not substantial or even marginal. Despite improvements over previous sea level products, this new sea level product still cannot address some climate study related questions raised in the Abstract, therefore we still need either longer altimeter sea level products or other in-situ fields (such as subsurface temperature and salinity) to address those questions.

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Interactive comment on Ocean Sci. Discuss., 11, 2029, 2014.

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