

Interactive comment on “A new phase in the production of quality-controlled sea level data” by Graham D. Quartly et al.

Anonymous Referee #1

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This manuscript describes the second version of sea level dataset produced by the European Space Agency’s Climate Change Initiative (CCI). The paper summarizes the changes to the dataset from version 1.1. It is suitable for publication in Earth System Science Data as a regular article in the data section. However, as an incremental improvement to an existing dataset, it does not include significant novel concepts or data sources. The length of the dataset has been extended and two new altimeters have been included (SARAL/AltiKa and CryoSat-2). The orbits and all of the instrument and geophysical corrections have been re-evaluated in an effort to create a single gridded dataset of sea level that can be used as a consistent and stable long-term record for use at spatial scales ranging from mesoscale to global. In some cases (e.g. wet troposphere), a new type of correction has been included in this version.

In general, the manuscript provides only a qualitative summary of the evaluations used

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for this version of SL_cci (e.g. "significantly reduced the crossover variance"; "shows that the variance for Envisat data is reduced") and much of the improvements are demonstrated in the figures rather than in detail in the text. Without a numerical context, it is not clear from this paper if some of the selections were significant choices or not. For example, on page 5 lines to 8, the evaluation criteria for orbits are described. The next sentence lists the best performing orbits based on these criteria with no quantitative results. I don't understand why this paper does not offer more detailed results, or at a minimum, it could cite specific CCI documentation that provides these details.

Minor comments

Page 4, lines 7 to 9: Add the phrase "when available" or otherwise clarify that some orbit determination instruments are/were not available on all missions.

Page 4, line 3: Insert "to the ocean surface" at the end of the sentence.

Page 4, line 19-20: Some of this sentence is awkward and should be rewritten. "This concept" does not refer directly to anything from the previous sentence. Furthermore, "referred to as" can be dropped, because time-varying gravity was introduced in the previous sentence. The verb "accepts" is not appropriate. I would suggest this rewording:

Detailed analysis of the observations of satellites in low Earth orbit, in particular, from the missions designed to observe Earth's gravity field, such as CHAMP (2000-2010), GRACE (2002-present), and GOCE (2009-2013), has significantly improved knowledge about Earth's static and time-variable gravity. Time variations of the gravity field include the mass redistribution in Earth's atmosphere, hydrosphere, ocean, and cryosphere seasonally and with epoch.

Page 4, line 25: Drop the phrase "to take into account"

Page 4, line 28: Please provide a citation for the GSFC orbits.

Page 6, line 2: Please clarify that the "artefacts" result from the degradation of the

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point-target-response of TOPEX-A until 1999 and provide a citation.

Page 7, lines 15 to 16: On my first reading, I didn't understand if the "greater mesoscale signal" was in the dry troposphere correction or in the resulting sea level anomalies, which was not clear. In Section 5.1, page 9 lines 23 to 31 better explain how the atmospheric models were evaluated for the atmospheric pressure correction. Can more of this level of detail be included here?

Page 7, lines 22 to 23. I don't understand why this sentence includes the detail that 10-day missions were adjusted "before" 35-day missions. Aren't these adjustments independent? Does it matter that one set of satellites was adjusted first? Please better explain this adjustment procedure, or drop this sentence.

Page 9 lines 3 to 8: Can the authors clarify which of these sea state bias models were applied in Version 1.1 and which are new to Version 2?

Page 9, line 13. "Thus short-term effects have to be removed." It would be helpful if this section were expanded. Perhaps the authors could briefly explain that short scale temporal variability results in an aliasing problem.

Page 10, line 8: This part of the text identifies GOT4.10 as the latest and best iteration of the GOT tide model. However, Figure 6 uses GOT4.8 in comparison with the FES 2014 without any discussion of GOT4.8.

Page 10, lines 21 to 23: Please either provide a published citation for this result or drop this sentence.

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