

# ***Interactive comment on “Evaluation of Sub-Monthly Oceanographic Signal in GRACE “Daily” Swath Series Using Altimetry” by Jennifer A. Bonin and Himanshu Save***

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The presented manuscript discusses bottom pressure variations at periods between 2 and 30 days picked up by satellite altimetry and gravimetry mission in comparison to corresponding predictions from numerical ocean models. The paper demonstrates that time-series of large-scale gravity models provide information on sub-monthly variability not introduced into the processing from a priori de-aliasing models. Moreover, the authors identify and characterize a potential artifact in the AOD1B RL06 background model data. The study generally fits into the scope of the journal, is well designed, and leads to convincing results. I nevertheless see a number of points that might be

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improved before publication.

It is stated at numerous places in the paper that the ITSG series are governed by external geophysical models whereas the swath solutions are free of a priori model information. I believe that both claims are not entirely correct and should be relaxed in the sense that both solutions utilize some external "information" (in certainly distinctly different ways). Note that such information might also include the assumptions that variability over oceans and land is uncorrelated, and that ocean bottom pressure variability in the tropics is very small. The inverse problem with just a 24-hour subset of GRACE data is ill-posed and needs to be stabilized in some way to obtain a reliable solution.

It is nice to see that swath solutions show less noise in the tropics than ITSG, but it should be acknowledged at some point in the paper that reducing noise in regions where geophysical signals are expected to be non-existent can be very easily achieved by regularizing the solution towards zero. In case of an unexpected event at some later date (say, an earthquake), regularized solutions tend to underestimate or even miss that signal. Maybe the authors could elaborate a little further about the utilization of regularization (or related techniques) in the swath solutions when discussing the tropical oceans for the pleasure of their geodetic audience?

The Low-degree Stokes coefficients not accessible from GRACE alone can be assumed to vary rather slowly in time so that linear interpolation from monthly to daily sampling might be feasible. Have you tried this in some way? Would you expect any consequences for your conclusions? Which regions might be affected most?

The impact of change in the MSS model might be explored a little further. What is the difference between the 16y and 20y MSS? Is that effect perfectly linear, or do you see larger biases in regions where the MSS models differ most?

The discussion of the signal in the Zapiola Gyre is interesting and deserves more attention. There has been previous work about the dynamics seen from both altimetry

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and gravimetry (see 10.1029/2018JC014189 and references therein), and it would fit well into the scope of the journal if some further discussion is added based on the swath data.

The assessment of the anomaly present in AOD1B RL06 in the South Pacific appears to be sound and forms valuable feedback for the development of general ocean circulation models. Our present-day understanding is that an overly simplified Ross Sea bathymetry in the MPIOM model run (i.e., all ocean areas covered by shelf-ice are treated as land) distorts the dominant eigenmodes in the larger region at periods around 3 to 8 days. I expect to see this problem reduced to a large extent in the next release of AOD1B.

A number of minor points might be also considered during the revision:

Section 4: In terms of the language, I suggest to clearly separate between observations, which might "see" or "observe" signals; and on the other hand numerical models, which rather "predict" variations. I suggest to modify this throughout the whole manuscript, but in particular adapt the wording in Section 4.

- I. 135: The products used here have higher resolution in time but not in space, right?
- I. 137: The desire of labelling the CSR swath data as the "main" GRACE product is understandable, but not fully justified. Maybe just call it "your" GRACE product?
- I. 159: ... results shown here represent the full non-tidal mass signal.
- I. 174: Who, in fact, is Norbert?

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