

Interactive comment on “Time-variable gravity fields and ocean mass change from 37 months of kinematic Swarm orbits” by Christina Lück et al.

Anonymous Referee #1

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GENERAL COMMENTS

The paper deals with the time-variable gravity field signal derived from GPS data of the three Swarm satellites. The main use of the obtained signal is the study of ocean mass changes, to validate the results also several other test areas are analysed (basins of large rivers). The motivation of the paper is that recently the GRACE mission has finished its operation and there are gaps in the time series of its standard monthly gravity fields, and there will be also a longer gap before GRACE-Follow-On is launched (early in 2018). The authors show that although the Swarm GPS-based gravity fields are noisier than those from GRACE, they can be successfully used to substitute the missing GRACE monthlies, especially for ocean mass. I think this is a useful paper coming at the right time.

The manuscript is written in a clear way and contains new results. I recommend the publication after considering my minor comments below.

SPECIFIC COMMENTS

Page-line:

2-4: Add a reference for the Swarm mission.

2-15: "orbit is at 515 km" please add an epoch, due to drag the altitude diminishes, so add something like "orbit is at 515 km at present"

2-16 of Swarm C => of Swarm B

2-32 integral equation approach/short arc: please consider adding the information of your specific inversion method to the abstract, it might useful for readers

5-1: delete "acceleration spikes due to thruster activations, and failures of automatically detecting and correcting errors". I think both these items are erroneously here. One of the reasons to include accelerometers aboard the gravity field dedicated spacecraft is to measure and record the action of the thrusters, so that it could be eliminated from further processing. I believe the CHAMP/GRACE/Swarm accelerometers should measure without any need of automatic error corrections.

5-15: The drag coefficient C_d depends on density => The drag coefficient C_d depends on composition

6-2: please add a reference or a website link for CERES

7-7, 7-8: from biases . . . from: please re-read these two lines and modify the usage of 'from'

7-7: "sampling problems with the thermosphere density model" What do you mean? One can get whatever sampling needed from the density models.

7-9: "accelerometer bias", 7-12 "accelerometer parameterization": Please add a short

explanation to readers, who are not familiar with accelerometer data processing, to describe why you like using such a terminology (even if you do not use the actual accelerometer data). Please check this whole paragraph.

9-3: IGG comes here as an abbreviation or acronym without any explanation

12-3: improved => combined

14-8, 14-9: The same comment applies here as up to 7-9, please explain the reader (or refer him up to your previous explanation), what do you mean by treatment of your non-gravitational models in a way of "accelerometer bias and scale factors".

15-2: "One possible explanation might be the different receiver settings". And what about simply a different noise realizations in individual months?

15-7: "the root mean square (RMS) of the GRACE time series" In statistics, the RMS value is equal to the mean value squared plus variance. I guess that what you mean here is only the variance. See, e.g. https://en.wikipedia.org/wiki/Root_mean_square#Relationship_to_other_statistics

19-10: "we would have been able, and thus will also be able in the future, to detect La Niña" Consider a slightly less strong statements, even if you demonstrated an example in Fig. 13, still this is only a guess. I mean, one may say "we should have been able ...".

21-6: "could have been easily identified with Swarm" the same comment as the previous one, in my opinion especially the word 'easily' is a bit exaggerated

TECHNICAL CORRECTIONS

Page-line:

1-5: gaps during => gaps occurred during

1-16: including non-dedicated satellites => including satellites non-dedicated to gravity

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Discussion paper



field study

3-table 1: van Den IJssel => van den IJssel (twice in the table)

8-6: to also => also to

21-1: by again comparing to => by comparing them to

Interactive comment on Solid Earth Discuss., <https://doi.org/10.5194/se-2017-127>, 2017.

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