Open Access

Earth System
Science
Data

Discussions

Interactive comment on "Altimetry, gravimetry, GPS and viscoelastic modelling data for the joint inversion for glacial isostatic adjustment in Antarctica (ESA STSE Project REGINA)" *by* Ingo Sasgen et al.

Anonymous Referee #2

Received and published: 16 October 2017

This paper gives a detailed description of a group of linked geodetic datasets for Antarctica: ice surface height change from altimetry, gravity change from GRACE, and uplift rates from GPS. In addition, a set of viscoelastic response functions are provided, which can be used for joint inversion or other modeling of these data. The paper is comprehensive and thorough, and with a few minor points of confusion, gives a complete description of these datasets. The datasets themselves are useful, and although some version of each has been published before, there is good reason for people to use these latest and more complete versions. The authors do an excellent job in de-

scription and complete citation, and are to be commended for including the DOIs for the GPS sites that they use.

The paper seems to indicate that the code (in some cases) is also provided (and function names and so on are provided). But I do not see the code in the repository. I encourage the authors to include the code with the data. There was also mention in the paper of some other products such as the geodesic grid, which at present are not included in the repository. I see the value in including this, so the authors need to carefully check the repository for completeness. There also are some intermediate (calibration) data products that might be worth considering to add to the repository, in particular the time series for the firn correction and the SMB (as de-trended for this study).

I marked a number of minor corrections on an annotated manuscript. Only the pages with corrections are included. More substantial comments are given below.

Introduction: Explain why the 2003-2009 time span was chosen for GRACE. It matches the altimetry, but a longer time span was used for GNSS. Also, emphasize more strongly the key assumption of a constant rate of change of all variables over the time period chosen, especially where datasets do not exactly coincide in time.

Line 158. Units mismatch: "rate" and "cm". cm/year?

Section 2.3. Why not use a weighted average of the two datasets? I can guess that maybe when one of the datasets has a large uncertainty then it can be really bad? Could you either present the values or statistics of (data_type_chosen − data_type_not_chosen)/(sqrt(sum of sigmas^2)? The reader wonders how well the two altimetry sources agree.

Section 2.4 Explain how the 27 km grid of firn corrections is re-sampled to the 10x10 km grid used for the altimetry. Standard bilinear interpolation, or something else? Also, line 213 refers to a 20 km grid. What is the relationship between this grid and the 10x10

grid? Are the 10x10 grid values decimated to 20 km? Block mean, block median? Or is the reference to 20 km an error in the text?

Section 3. Why not just use JPL's orbits and clocks? A short explanation is enough. I presume that the reason relates to ensuring consistency.

Line 281. Give the median values for white noise sigma scaling and the flicker noise amplitude.

In all the tables in Section 3, please clarify if the Argus et al. (2014) result are as originally presented, or if you attempted to correct for the small frame difference.

Lines 617-618. This sentence says that the loading rate is held constant until dynamic equilibrium is reached, which as written suggests that the loading rate is changed after that time. How is it changed? Or is this simply an error in English? Based on other parts of the text, it seems that the loading rate was actually held constant for 2000 years (West Antarctica) or 15,000 years (East Antarctica), and that after this an extra time step is done with no loading change to give the purely viscoelastic response. In fact, the 2000 years and 15,000 years are argued to be longer times than needed to reach dynamic equilibrium, if I understood the authors properly.

Line 658. Clarify whether you mean "to a value of $1/e$" (as written), or "by a factor of $1/e$ relative to the initial value".

Fore figure 7-11, it would be useful to complement the versions shown with a figure that shows the uplift rate as a function of time at the center of the load. If there is any change in the loading rate during the calculation (see the comment on the ambiguity introduced by lines 617-618), then the loading rate should also be shown.

SMB correction. Because the SMB correction for the GRACE has been detrended over the GRACE time period, it does not contribute to the rate. However, the SMB variations might contribute to the GPS uplift rates given that the time spans of these data vary. I wonder if this effect has been considered and whether it might be

important? Sites with strongly non-linear time series were identified and excluded or handled separately, but there may be some subtle biases that remain. I think it would be useful to evaluate this impact, or at least to provide the de-trended SMB grid time series so that it could be assessed.

Please also note the supplement to this comment:
https://www.earth-syst-sci-data-discuss.net/essd-2017-46/essd-2017-46-RC2-supplement.pdf

Interactive comment on Earth Syst. Sci. Data Discuss., https://doi.org/10.5194/essd-2017-46, 2017.