1 Overview

Xu et al. use a constrained inversion to produce GRACE-based mass trend estimates for regions of the Greenland ice sheet. The GRACE estimate is compared with estimates from independent techniques. In addition, methods for deriving fluxes for the input-output method are investigated.

2 Broad comments

- The coastal versus interior derivation is explained in a much more clear manner than the previous version.
- What is the impact of the fact that the D_0 presented is actually not equal to SMB_0 (413 Gt/yr versus 403 Gt/yr)? The use of reference periods seems to result in less agreement between methods, which likely means deficiencies in the reference period calculations.
- Being able to resolve some of these mascons (particularly 4a, 4b, 5a, and 5b) and separate between the interior and exterior is very unlikely with current GRACE errors and resolution. In order to get estimates that even seem reasonable, one would likely have to constrain GRACE to the point of it being inseparable from the input model. Another problem is that the difference in the approximation can be due to more than just truncation and smoothing. The misfit results found in this analysis could be due to ringing, or not properly sampling the averaging area. For example, mascon 1a covers a vast area with the GRACE trend showing a non-uniform spatial pattern over the same region. Fitting a uniform layer to this mass pattern will result in leakage.
- There's still a few issues with grammar and sentence structure throughout the paper.

3 Line-by-line comments

- Page 2, Line 17: ICESat instead of ICEsat.
- Page 3, Line 5: runoff instead of run-off
- Page 3, Lines 9–11: There are some major dynamical changes happening in Southeast Greenland (e.g. Enderlin et al. (2014)). I couldn't find a comment about the mass loss being dominated by SMB in Noël et al. (2015). Is this to reference the RACMO2.3 model or work within the paper?
- Page 3, Lines 14–15: You can mention that you use altimetry for validation purposes.
- Pages 3–4, Lines 21–22+Line 1: I'm not sure the use of the 1961–1990 reference period is to reduce the uncertainties, but to help provide interpretation of the current mass loss. As you mentioned in the next line, the reference period introduces uncertainties of its own. Also as you mention near the end of the manuscript, the use of the reference periods reduces the agreement between IOM and GRACE (Page 23 line 23–Page 24 line 1).
- Page 4, Lines 4–6: should be a comma instead of a period in front of which.
- Page 4, Line 13: I wouldn't use the word "tackle".
- Page 5, Line 7: sub-regions instead of sub-region.
- Page 5, Lines 11–13: Wouters et al. (2008) is cited twice in this sentence, and you use the word "also" twice. I would rewrite the sentence

  Regional GrIS mass changes estimated with GRACE are influenced by mass changes from areas outside the ice sheet, such as from Ellesmere Island, Baffin Island, Iceland and Svalbard (EBIS) Wouters et al. (2008).

- Page 6, Line 10: "In the end, we"
- Page 7, Line 5: I would remove "Note that" from this sentence.
- Page 7, Line 6: I would remove "Note that" here as well.
- Page 7, Lines 9–11. I would split this sentence to have one sentence about ice thickness ending after "radar data", and the next sentence talking about surface velocities.
- Page 9, Lines 5–9: Still seems a bit strange to have a GRACE introduction within the IOM methods. Might also want to cite Wahr et al. (1998) after the thin layer assumption sentence.
- Pages 10–11, Lines 18–20 and Lines 1–2: these results suggest that the ice sheet (interior at least) is not in balance during this time period. Also Andersen et al. (2015) and Colgan et al. (2015) are based on different interior delineations.
- Page 11, Lines 4 and 6: should be δ components (i.e. δSMB and δD)?
- Page 17, Lines 15–16: using the indice i for a different meaning than on Line 12 is very confusing.
- Page 18, Line 21–22: "applying the relationship to" (to what?)
- Page 21, lines 13–19: it is hard to meaningfully compare Greenland estimates over different time periods. The regressed trend and acceleration terms are highly dependent on the observation period.
- Page 21, lines 20–22: Despite the lack of acceleration, the mass loss in SE Greenland has been pretty variable due to both variations in SMB and ice dynamics. Note the time series in Velicogna et al. (2014) (despite the large difference in averaging areas compared to these results).
- Page 22, Lines 12–13: How did you extend the ICESat results to 2013? With an IceBridge solution?
- Page 22–23, Lines 21–22 and 1–5: The leakage of mass could be more discrete than a positive in one mascon and a negative in another. Also note that ice discharge changes of the Canadian Archipelago marine terminating glaciers is largely unknown.
- Page 23, Lines 7–9: Kjeldsen et al. (2013) is a combined ICESat+Operation IceBridge estimate.
- Page 24, Line 9: ICESat instead of ICEsat.
- Page 24, Line 12: ICESat instead of ICESAT.
- Page 26, Line 2: Is this supposed to be pre-1996 discharge estimations?
- Page 28, Line 6: 3 GIA models with 2 having a range of rheological parameters. Not 11 independent models.
- Figure 4: There should be common X and Y axes for each subplot to help discern the actual correlation. Where are the plots for the interior?
- Figure 5: Listing the GRACE estimates before the approximation correction is applied would be helpful.
- Table 1: Besides the Colgan and Sasgen results, none of these estimates are for the same time period. As Greenland loss is accelerating, it is difficult to discern how your results compare with the others using this table (i.e. the listed altimetry estimates are for at most 6 years, while your estimate is a 10 year study).

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