Editor comments

I would like to thank the authors for addressing all comments on the previous version of the manuscript.

Many of the technical queries have now been resolved, but I list a number of minor points at the end of this document that require clarification. Page/line numbers refer to the most recently-uploaded 'track-change' version of the manuscript.

The grammar and punctuation of the manuscript are generally good, but the syntax of the text is occasionally awkward and I recommend detailed proof-reading by a native English speaker. In a few places your edits have resulted in ambiguities, or inconsistencies with the original text. One example is included in the list at the end of this document. Please check the logic of the text wherever you have made edits.

Two points require more detailed clarification:

1) Application of the elastic correction to altimetry observations: On page 4, line 8, you state that the elastic bed elevation change (BEC) term 'is reduced' – please explain what you mean by this (do you mean subtracted?) and clarify the reason for subtracting the elastic term from $\dot{\tilde{h}}_{alt}$. Related to this, please define which of $\dot{\tilde{h}}_{alt}$ and $\dot{h}_{alt}$ is the observed quantity, and provide a physical interpretation for the other term. Finally, on page 9, line 14, you state that $\dot{\tilde{h}}_{alt}$ is scaled by 1.015 – does this scaling provide a revised value for $\dot{\tilde{h}}_{alt}$ or a value for $\dot{h}_{alt}$?

2) Application of the LPZ corrections: The steps taken to apply the 'LPZ-based GRACE bias correction' are unclear. From the manuscript (page 6, lines 4-5):

   "Prior to determining the mass-balance, a bias correction is applied to the total-mass change derived from time-variable gravity fields."

   However, from the 'author response' document:

   "GRACE-derived area density changes are not calibrated to the LPZ prior the actual combination (Eq. 9). GRACE-derived area density changes and the GIA solution from the combination are calibrated over the LPZ to determine the mass balance. In other words: The combined result derived from GRACE, altimetry and firn process models, namely the GIA-induced BEC, is calibrated over the LPZ".

   I suspect these statements are compatible, but a lot of the terminology used it not clearly defined, making it difficult to work out when or how the second bias correction is carried out, and which data sets are involved. In general, the whole of section 2.2 is difficult to follow - please review this section, and if necessary expand the text to clarify the details and motivation for the steps carried out.

Once these points and the issues below are addressed, I would be happy to review a revised version of the manuscript.

Kind regards,
Pippa Whitehouse

Minor technical points

- Page 1, line 17: "various time periods" – can you be more specific?
- Page 2, line 1: the edited sentence is unclear – you talk about mass balance being the difference between three things (an example of where an edit has led to confusion)
- Page 2, line 8: check the typical timescale of glacial cycle loading/unloading
- Page 2, line 35: You clarify on page 3 that you are using the term 'firn' to describe both SMB change and volume changes in the firn layer. However, before the reader reaches this statement, they are presented with the phrase "…**firn** processes, namely SMB and the volume change of the firn layer". I suggest editing this to "…**surface** processes, namely SMB and the volume change of the firn layer" to prevent any confusion at this point. Your definition of firn appears on the next line, after which it is fine to use your terminology.
- Page 5, line 9: you mention that the Kamb Ice Stream is treated separately, but you do not say how it is treated separately. Text on lines 14-15 hints at a mask being used for "regions of ice-dynamic thickening", but the regions are not specified. Please clarify.
- Page 5, line 11: "If the difference is not significant… it is not considered" – please clarify what is not being considered. Please also explicitly define what you mean by cases I, II and III, perhaps by using this terminology within equation 10.
- Page 21, lines 31-32: you refer to the assumption that GIA-induce BEC must be linear, but earlier (page 7, line 24) you acknowledge that this assumption may be violated under some conditions. Please consider whether the text on page 21 should be revised to reflect the information on page 7.