

Interactive comment on “Increased West Antarctic ice discharge and East Antarctic stability over the last seven years” by Alex S. Gardner et al.

Anonymous Referee #2

Received and published: 19 September 2017

This study is a useful benchmark contribution to Antarctic mass balance research in particular because it uses very large data archives to achieve high-resolution, near-comprehensive coverage and improved uncertainty reduction in ice flow measurements. In this way (and with updated SMB products and a new approach to flux gate comparisons), it compliments and improves upon earlier pioneering continent-scale flux studies, and allows recent flux changes to be calculated. As such, it marks a maturation in mass-balance auditing and points the way towards the regular, operational big-data measurement of Antarctic mass change.

Specific comments: Most of my queries have been covered in the authors' responses to the other review.

In title and throughout: I suggest avoiding using the term stability (or stable, re-

stabilization) to mean unchanging flux because stability has other particular connotations for ice sheet mass balance.

Abstract: I suggest rewording the final sentences, e.g. “The modest increase in ice discharge over the past 7 years but ongoing high rates of ice sheet mass loss and distinct patterns of elevation lowering suggest that the recent pattern of mass loss in Antarctica is part of a longer-term phase of enhanced glacier flow initiated in the decades leading up to the first continent-wide radar mapping of ice flow.”

For the uncertainty associated with the assumption of surface velocity being equal to depth-averaged velocity ($\sigma_F \bar{v}$), the authors convincingly explain that this term is small, however it is a bias term of a particular sign which suggests that it should be corrected for or otherwise added to one side of the uncertainty range rather than being combined in quadrature.

Section 3.1.2: line 405, replace ‘certainty’ with ‘confidence’. Can the authors please be more specific in this section – do they consider the 56 Gt to be incorrect and the real imbalance to be close to zero?

Figure 4 caption: Please clarify the y-axis units.

There are two Figure 6s. The second one (now Figure 7) needs a legend and also more discussion of the range of values yielded by the various tracking methods for some basins, e.g. 13 (as mentioned in the response to the other review).

Conclusions: I suggest adding a statement on how best to improve and continue ice sheet mass balance monitoring in this way, e.g., by adding to the time series of high-resolution Peninsula velocity fields, improving the flux-gate RES coverage, improving the SMB fields, continuing Landsat-like and Cryosat/ICESat-like datasets etc. – where do the biggest potential improvements lie? Emphasise the value of this study as the potential starting point for routine ongoing assessments, and the potential importance of this in diagnosing unstable behaviour.

[Printer-friendly version](#)[Discussion paper](#)

Detailed comments: Line 182: 'mean mean' Line 272: 'See appendix A for the ...' Line 383 and onwards: Figure 7 instead of 6 etc. Line 431: 'Groundling' Line 440: '...Totten Glacier increased in ...' Line 445: '79% of the increase comes from glaciers...and another 11% comes from...' Line 509: 'that that' References: Fretwell et al repeated. Figure 5 caption: '...along-flux-gate...' Figure 9 caption: '...all 2015 image-pair displacements...' Line 819: '...assumed to be indicative of...'

Interactive comment on The Cryosphere Discuss., <https://doi.org/10.5194/tc-2017-75>, 2017.

[Printer-friendly version](#)[Discussion paper](#)