

Reply to TC-2018-40-AC1 on 'Greenland Ice Mapping Project: Ice Flow Velocity Variation at sub-monthly to decadal time scales' by Joughin, Smith & Howat.

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We thank the authors for their thorough response to our Short Comment dated 6 April 2018. We concur with their summary that ‘both datasets have issues with sampling’ and that ‘we may be operating near the margin of what’s achievable’. Broadly, we consider much of their final paragraph summary to be a welcome and nuanced discussion of their position, which we suggest could make an appropriate replacement to ‘the trends Tedstone et al (2015) observe may be statistical artefacts resulting from some combination noise [sic] and a shorter-duration (after 2000) record’.

We do however wish to remark further on just one important caveat, which we suspect became lost in the length of our original comment. In brief: the baselines in this study versus T2015 are never going to be reconcilable in terms of the glaciological processes/flow regimes that they each capture.

For instance, if the processes responsible for the slowdown observed in T2015 occur primarily in the transition period from summer to winter (i.e. loosely late August through early October) then T2015 will capture the impact of these processes (albeit with the uncertainty introduced by the 352-400 day baseline) whereas J2018 with a focus on velocities observed during October-April will not. An example of how much variability occurs in this period compared to the rest of winter is quite visible in Colgan et al (2011, Fig. 13) and Joughin et al (2008, Fig 2) where we see, in the latter, a larger rise in velocity from ~DOY 235 to ~DOY 275 (difficult to identify precisely) compared to the subsequent winter period.

Furthermore, not only does the early autumn velocity minima vary between years but there are also considerable year-on-year variations in the precise overwinter velocity ‘recovery’ pattern both at and between sites (e.g. Colgan et al. 2011 and van de Wal et al 2015, Fig. 3). We therefore suggest that it is not the case that “If every one of our data sets were collected over the same 3-month period each winter, then the biases would have no effect on the trend since they would be approximately the same each winter”.

In summary, for this study to identify a slowdown trend, the processes driving any slowdown would have to occur during the October to April sampling period, but there remains a significant likelihood that slowdown (or indeed speedup) processes occur outside these baselines and/or that comparisons using varying baseline periods may mask specific trends. We therefore hope that this caveat will be explicitly addressed in the revised manuscript – it doesn’t invalidate either this study or T2015 but facilitates a more informed comparison to be made.