

Interactive comment on “Seasonal to decadal variability in ice discharge from the Greenland Ice Sheet” by Michalea D. King et al.

Anonymous Referee #2

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Review of King, Howat et al. This is an excellent, clearly written and carefully considered observational paper on the relationship of ice flow and discharge with a number of variables from climate or ice geometry for the Greenland Ice Sheet. I can be accepted as it is.

While strong in its observational detail, it raises a heap of questions about how the system works in detail, now that we ‘see’ the real details. Untangling these will give rise to a number of papers in the future, and I suspect many of them will cite this paper as a basis for general statements about what the observational data (and observation-driven modelling, RACMO) have to say about the ice sheet.

P7L23-34 This would seem to be the crux of the paper. The identification of a ‘ubiquitous’ seasonal variability, for all Greenland glaciers on average, around 6% when

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normalized per glacier, begs for some kind of explanation. Moreover, the fixed timing of the seasonal peak is curious since several causes of the seasonal increase are identified – loosening of sea ice / mélange in the fjords, seasonal component of ice front retreat, meltwater drainage and lubrication, ocean-driven basal melting (to the extent that it is seasonal), and possibly some sort of R-channel closure late in the season (e.g. Jacobshavn second peak). In the last sentence of this section, the uniformity of the timing of the peak argues that the dominant cause of variation is summer melting somehow - yet runoff peaks are different from D peaks. You discuss this in 3.4, but seem to point to a process or mechanism (maybe more than one) that sits between a direct correlation of D and runoff, since the size of runoff seems to have less impact on the size of seasonal max in D and timing can vary (is this because runoff timing in heavy snow areas like the SE is not the same as peak melting?)

Minor comments P1L 24, remove comma after ‘variability’. P1L30-P2L3, note that these lines may need to be revised if certain publications make it to press before this is accepted/published. The past two years have seen a remarkable slowdown in ice loss in GIS. P2L27 suggest putting the phrase following (SMB) into the parens with SMB, i.e. “(SMB; the sum of the mass gained from . . .)” P6L23 do you discuss / speculate as to the cause of the second peak? P7L26 suggest ‘As noted before, there is. . .’

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