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Interactive comment on "The surface albedo of the Greenland Ice Sheet between 1982 and 2015, and its relationship to the ice sheet's surface mass balance and ice discharge" *by* Aku Riihelä et al.

Anonymous Referee #1

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This paper reconstructs the recent SMB decrease by using monthly albedo from a "new" satellite product (CLARA). The authors also try to correlate albedo with ice discharge. It is interesting but, however, I don't recommend to accept this paper in its present state because:

- albedo can be only used, scientifically speaking, as a proxy of melt extent and melt amount. Not as proxy of ice discharge (as shown by the authors) and not as proxy of summer SMB (also in part driven by summer snowfall anomalies, as also mentioned by the authors). Due to the delay between production of meltwater (highly correlated with albedo I agree) and runoff (depending of the snowpack meltwater retention), runoff

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can not be correlated with albedo at the monthly time scale. Using MAR outputs, at the summer time scale, it is true that MJJA SMB is correlated at -0.96 (-0.88 over 1980-1999) with runoff and 0.66 with snowfall over 1980-2015. But in May for example, SMB is correlated at 0.98 with snowfall and -0.13 with runoff, showing well that albedo can not be used as proxy of monthly SMB, althrough MAR is not "the true".

- the role of the albedo decrease and the bare ice expansion to the recent melt increase has already been shown a lot of time in previous publications (e.g. Box et al., 2013).

- the correlation between GBI and melt (approximated with albedo here) is also something which is known from a long time (see the Hanna et al., ...).

- the discussion about the cloud cover seem to be out of the purpose of this paper... and using MAR for this is certainly not a robust basis of validation.

To conclude, the authors try to correlate their "new" data with several previous studies/estimates but there is no new interesting scientific message in this paper deserving to accept this paper in TC. However, using this new satellite product deserves to be published, but I recommend to the authors to limit their correlations/comparisons to melt extent (from satellite) or modelled melt amount (as model validation data set). A comparison with the albedo/bare ice extent MODIS based product (notably used as bare ice albedo in RACMO/HIRHAM) will also be more interesting.

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