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Interactive comment on "Greenland Ice Sheet discharge from 2000 to 2018" *by* Kenneth D. Mankoff et al.

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Summary: The authors use a variety of remotely-sensed datasets to develop a new automated method to extract flux gates to map spatio-temporal variations in Greenland glacier discharge, and construct time series of discharge for fast-flowing glaciers draining the ice sheet. They find some discrepancies with previous estimates that are attributed to different datasets and methodologies employed by each study. They also find that the ice sheet discharge has been relatively constant since ~2005, due to steady or decreasing discharge from most sectors that have been offset by a gradual increase in discharge from the NW portion of the ice sheet. Importantly, the authors have made all data and code available, hopefully leading to easier inter-comparison of future discharge estimates.

The paper is very well written and I really enjoyed some of the clever ways that the data were presented in the figures. Overall, I find that there are only a few minor points that should be addressed in the current version of the manuscript.

Major Comments: 1. Since one of the major arguments the authors make is that the use of flux gates that are picked in an automated way is superior over manually-traced gates, I'd like a bit more thorough description of the method used to pick the flux gates. I follow that you apply a 5000m buffer to all ice inland of the terminus but it is less clear what you mean when you say you "select" fast-flowing ice. Do you essentially place the flux gate at the 100m/yr flow contour? If this is the case, then I imagine that in some regions the flux gate is closer than 5000m from the terminus but the rest of section 3.2 suggests that the gates are a fixed location of 5000m inland of the terminus. The addition of a schematic to illustrate the method would be helpful because the few panels in Figure 1 have arcuate geometries that seem independent of flow speed. 2. For the interpolation/extrapolation of speed and thickness, why did you use linear interpolation techniques? For the speeds, linear interpolation may introduce considerable aliasing effects, particularly if there are large data gaps around times of rapid change (like the peak in speed in the SE in ~2005). For the thickness data, why did you use the average of the last 3 years with data to estimate thickness for 2017-2018? Was flow relatively steady during this time? Are your results considerably influenced if you would use only the last 1-2 years or expand to include a longer time period? For the speeds you simply use the closest observation at the ends of the time series. Why use a different approach for thickness?

Minor Line-by-Line Comments: p. 3, l. 11: Replace "200 m per pixel" with "200m pixel" p. 6, l. 19-25: This is a clever approach for dealing with the clearly incorrectly thin ice that I have also observed in some locations. p. 7, l. 5: If I understand this correctly, then all of your discharge uncertainty is from thickness uncertainty. Is this correct? p. 7, l. 24: Remove "both" p. 8, l. 3: Is there a particular reason why you use 150Gt/yr as the cutoff here? Is this the estimated balance discharge? p. 8, l. 15-21: The numbers presented in this section indicate that the flux is the area-normalized volume flow rate. Is this correct? I think that most readers would stumble in this section since it is not apparent from the start that the flux is normalized. I normally think of flux as a volume flow rate and I was perplexed by the seemingly contradictory statements in the first sentence until I looked at the flux units. p. 9, l. 19: The Enderlin et al. (2014) paper used bed elevations from radar picks. Examination of the original interpreted data for Koge Bugt suggest the bed was much deeper than the updated (and BedMachine) dataset. It is likely that the Bamber et al. (2013) bed map used the same radar data as Enderlin et al. (2014). (This comes up again on p. 11, l. 5.) p. 9, l. 26: The use of Khan et al. (2016) surface elevation adjustments may also play a role since the Enderlin et al. (2014) elevations are directly extracted from DEMs and Operation IceBridge lidar timeseries.

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