

# ***Interactive comment on “Thinning leads to calving-style changes at Bowdoin Glacier, Greenland” by Eef C. H. van Dongen et al.***

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## **1 General comments**

This study highlights the evolution of the Bowdoin glacier calving style towards buoyant calving. The shift in calving style is exposed through a multi method monitoring using both field based and remotely sensed data.

The paper first goes through the different dataset that have been acquired in great details before analysing those results to assess the timing of the ungrounding of the glacier. The analysis is then discussed in term of calving style before concluding on the effect on mass loss that can be measured from space.

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This study is clear and well written, I have just a few general comments and some minor points that are listed in Section 2.

In Section 4.1 I don't completely agree with the analyse of the thickness data evolution. From the presented figure it seems to me that the front thickened from 2014 to 2015 before starting to thin, isn't that the case? Did you use a global variable here that shows lowering during 2014?

Regarding the calving quantification, the calving area is reported to the annual discharge which is given in  $km^2 yr^{-1}$  and not  $km^3 yr^{-1}$  as one would expect. I suppose that this is due to the fact that the annual displacement has not been integrating over the ice thickness but that should be stated.

In Section 5.1 the effect of the tides are analysed to assess the flotation of the ice front. Have you considered to look at the strain measurements in correlation to tides to strengthen this case. It seems that at least on station 1 there is a signal in the strain that looks to be in phase with the tides with a compression regime at high tide. I also wonder if it would not be better to plot the instantaneous values rather than cumulative ones on Figure 8 to help with readability.

## 2 Specific comments

Bellow is a list of more specific comments throughout the manuscript given with line and page number:

- Line 19: Projections is missing a capital.
- Line 29: I am not sure that I get the meaning of "large-scale" here.
- Line 61: It is the glaciers fronts that advance and retreat depending on the season, not the glaciers themselves.

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## Interactive comment

- Line 71: Replacing “the submarine melt rate increases in summer in shallow fjords” by “in the shallower fjords submarine melt rate increases in summer” would make that sentence clearer in my opinion.
- Line 75: Shouldn’t King (2020) be added to the IMBIE team (2018) reference here.
- Line 212: The end of this sentence is a repetition from the one above and could be omitted.
- Line 230: “9b” should be “9d” twice on this line.
- Line 231: “9d” should be “9b”.
- Line 249: Is it annual “ice discharge” that is meant here?
- Line 305: “9e” should be “9a”.
- Line 307: A reference to Fig. 8a should be added.
- Line 309: “8e” should be “8a”.
- Line 313: A reference to Fig. 8d should be added.

King, M. D., Howat, I. M., Candela, S. G., Noh, M. J., Jeong, S., Noël, B. P. Y. and Negrete, A. 2020. Dynamic ice loss from the greenland ice sheet driven by sustained glacier retreat. *Communications Earth & Environment*. 10.1038/s43247-020-0001-2

IMBIE team. 2018. Mass balance of the Antarctic Ice Sheet from 1992 to 2017. *Nature*. 10.1038/s41586-018-0179-y 10.1038/s41586-018-0179-y

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