

Interactive comment on “Multi-year surface velocities and sea-level rise contribution of the Basin-3 and Basin-2 surges, Austfonna, Svalbard” by Thomas Schellenberger et al.

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Schellenberger et al. provide a detailed extension to the growing glacier velocity record of the Basin-3 and Basin-2 surge events Austfonna, Svalbard. The amount of data that has been synthesized for this paper is impressive and provides the observational data needed to identify the causal mechanisms resulting in several large coincident surges in the area. Figures 4 and 6 that provide a detailed temporal record of ice flow are particularly impressive. I do however agree with Reviewer 1 that the study struggles to provide new insights and falls short of linking observed changes in velocity to changes in the force balance of the glacier. The paper already provides a strong observational record of extraordinary changes in glacier behavior. All that is needed is a cleaning

C1

up the text, removing many of the velocity and mass change numbers from the text that are better dealt with in the figures and table, and an enhanced discussion of likely mechanisms driving the observed changes, particularly with Phase-4 of the glacier surge, which is uniquely observed in this manuscript.

Specific Comments: Title – The title should focus on the interesting dynamics of the surge and not the sea-level contribution, which is negligible

P1L15 – precision with which mass change is being reported is not supported but the errors, I would recommend rounding to the nearest Gt.

P1L23 – instead of sea-level rise equivalent you could say added x Gt/yr. to ocean mass and displaced another y Gt/yr. SLE units are in units of height and are not appropriate for such a small contribution.

P2L19 – I'm not convince cryo-hydrolic warming plays a role here... from Figure 4 it doesn't seem like there is any strong relationship between speedup and DPDD.

P2L38 – “that also overarching external factors can play an important role” to “that overarching external factors can also play an important role”

P3L17 – “at the” to “at their”

P3L25 - “prolonged” to “extended”

P4L13 – delete “using Matlab”

P4L31 – did you define IDW? Maybe I missed it.

P5L4 - “prolonged” to “extended”

P5L12toL19 – The error should be characterized by RMSE, not linear fits and the standard deviation.

P6L24 – should this be Figure 4 not Figure 3?

P7L4 – incorrect propagation of errors 33.2 ± 11.5 minus $11.0 \pm 3.4 = 22.2 \pm$

C2

$\sqrt{11.5^2 + 3.4^2} = 12$. Check throughout manuscript.

P7L13 – delete “neighboring”

P7L20 – delete “up to”

P7L25 – “also short enormous summer” to “also showed large summer”

P7L30 – “July 2016 to . . .” to “July 2016 to be”

P8L24 – “this had also influence” to “This also had an influence on”

P8L29 – Figure 1c shows a radar image not a Landsat 8 image

P9L12 – “but velocity increased instead steadily” to “but velocity instead increased steadily”

P9L33 – “indicate thus that also external” to “indicate that external”

P10L2 – “high arctic or” to “high Arctic, or”

P10L17 – delete “also here”

P10L18 – “mechanism to summer melt which triggered the Basin-3 surge plays an important role.” to “mechanism to summer melt, which triggered the Basin-3 surge, plays an important role here as well.”

P10L20 – “surge to still last for a few years.” to “surge to last for a few years longer.”

P10L22&23 – delete “even”

P10L24 – delete “especially.”

Figure 2: RMSE is the most relevant statistic

Figure 3 – accurately define “distance along flowline”.

Figure 5 – wrong figure here. . .

C3

Figure 6 – I would suggest including the basin boundaries shown in Figure 1.. would make it easier to flow between panels

Figure 10 & 11- great figures

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C4