

SUPPLEMENTARY INFORMATION
FOR

--

Oscillatory response of Larsen C Ice Shelf flow to the calving of iceberg A-68

--

Katherine A. Deakin¹, Frazer D.W. Christie^{1,2}, Karla Boxall¹ and Ian C. Willis¹

¹Scott Polar Research Institute, University of Cambridge, Cambridge CB2 1ER, UK

²Airbus Defence and Space Ltd., Newcastle upon Tyne, UK

Corresponding author: Frazer D. W. Christie (fc475@cam.ac.uk)

Contents:

Figures S1-5

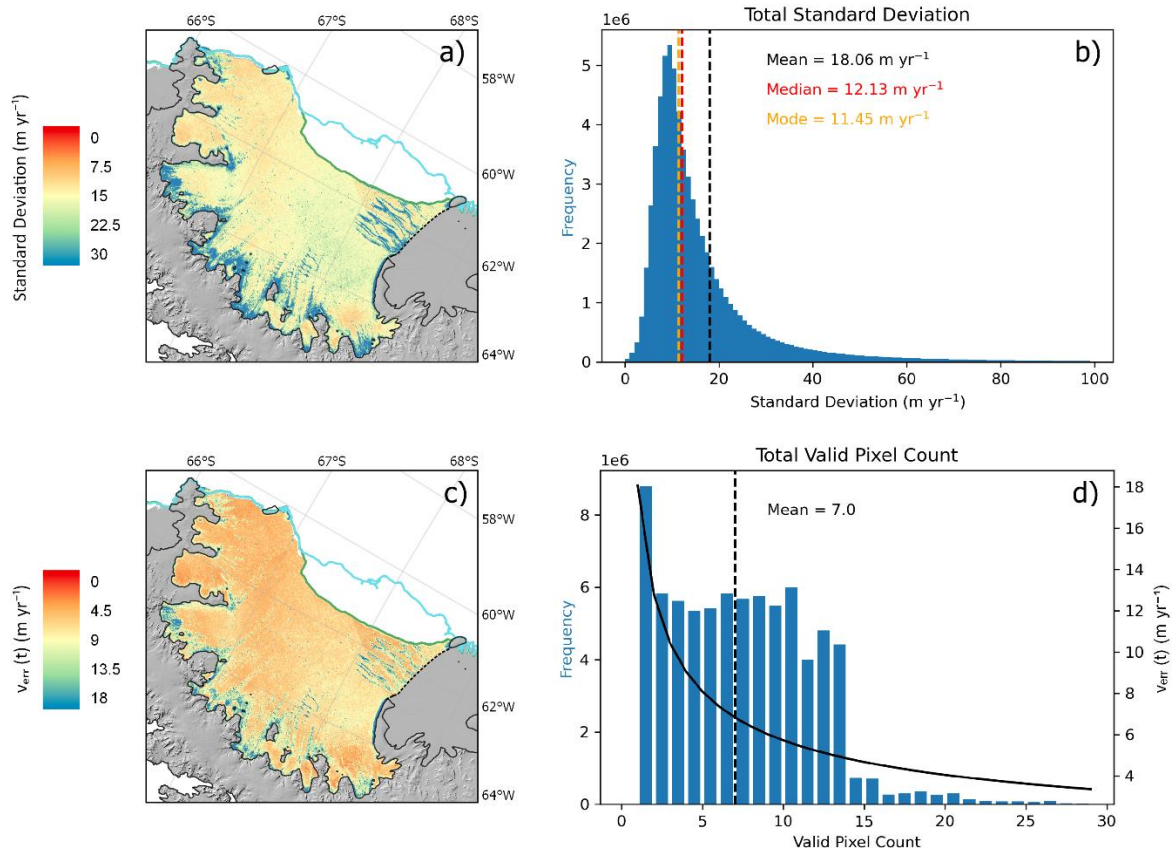


Figure S1. Velocity uncertainty and standard error over Larsen C Ice Shelf, 2014–2020. a) shows mean monthly uncertainty (m yr^{-1}) on a per-pixel basis for all ‘valid pixels’ acquired between November 2014 and December 2020, inclusive. b) shows frequency distribution of all valid pixels used in the production of a). c) mean monthly standard error, $v_{err}(t)$ (m yr^{-1}), on a per-pixel basis, calculated as a function of mean monthly valid pixel count (i.e., the average number of non-NaN velocity observations per pixel per month) using Eq. 1. d) Histogram showing valid pixel count between 2014 and 2021. Black dashed line denotes the mean. Black curve shows $v_{err}(t)$ (m yr^{-1}) as a function of the number of valid pixels, N , acquired over a single calendar month for an assumed uncertainty value of 18.06 m yr^{-1} .

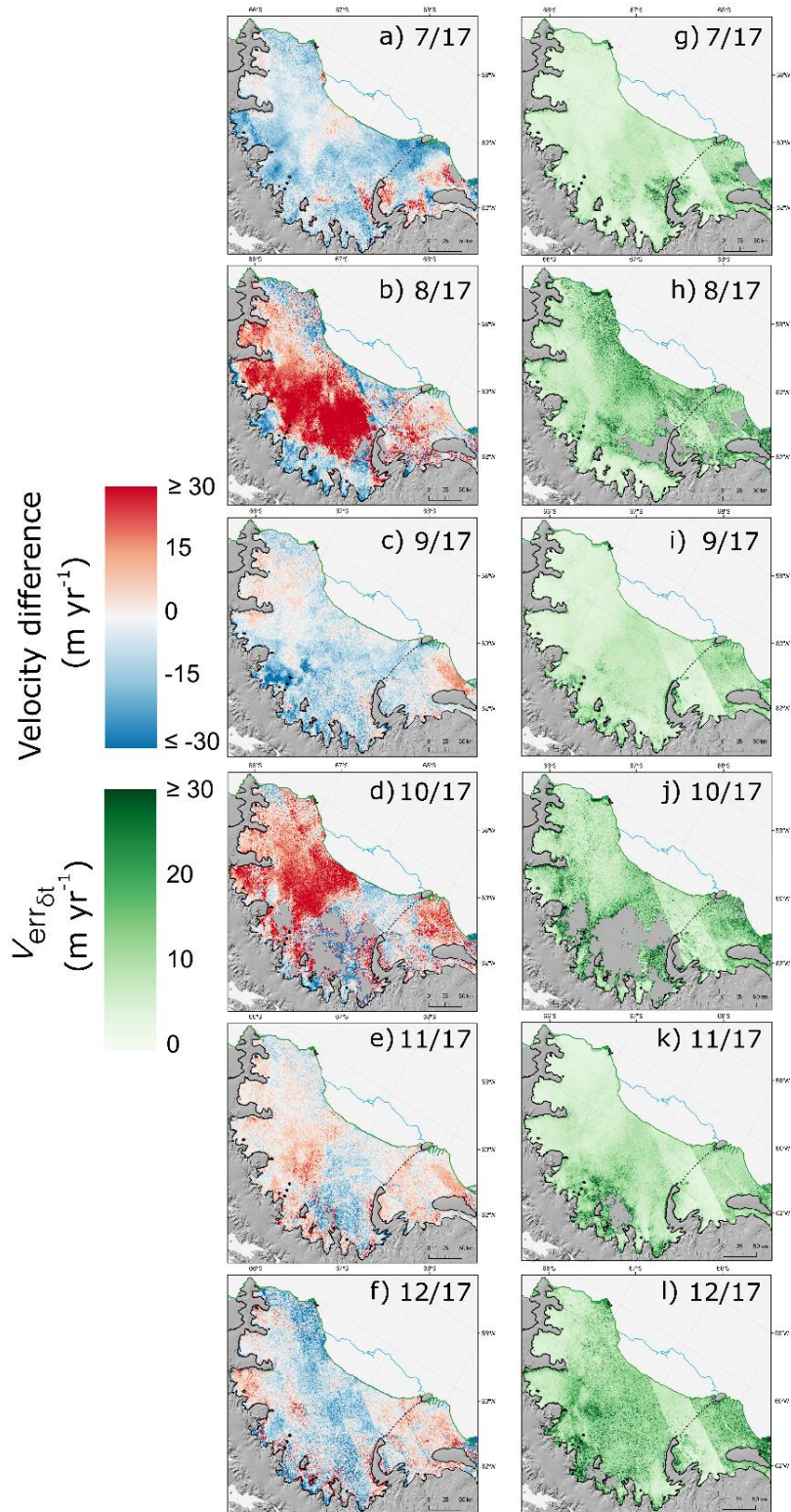


Figure S2 | Change in ice-shelf velocity for each of the six months following the breakaway of iceberg A-68 relative to January-June 2017, and their associated errors. a) to f) show unmasked monthly velocity anomaly maps for July (7/17) to December (12/17), corresponding to Figure 2. g) to l) show associated $v_{err_{\delta t}}$ error values calculated using Eq. (2) (cf. Section 3.4). Black lines indicate the position of the grounding line in 2019 (Christie and others, 2022b); cyan and green lines, the position of the ice-shelf front in January 2017 and January 2018, respectively (Christie and others, 2022c). Data are superimposed over a hillshaded version of REMA DEM (Howat *and others*, 2019).

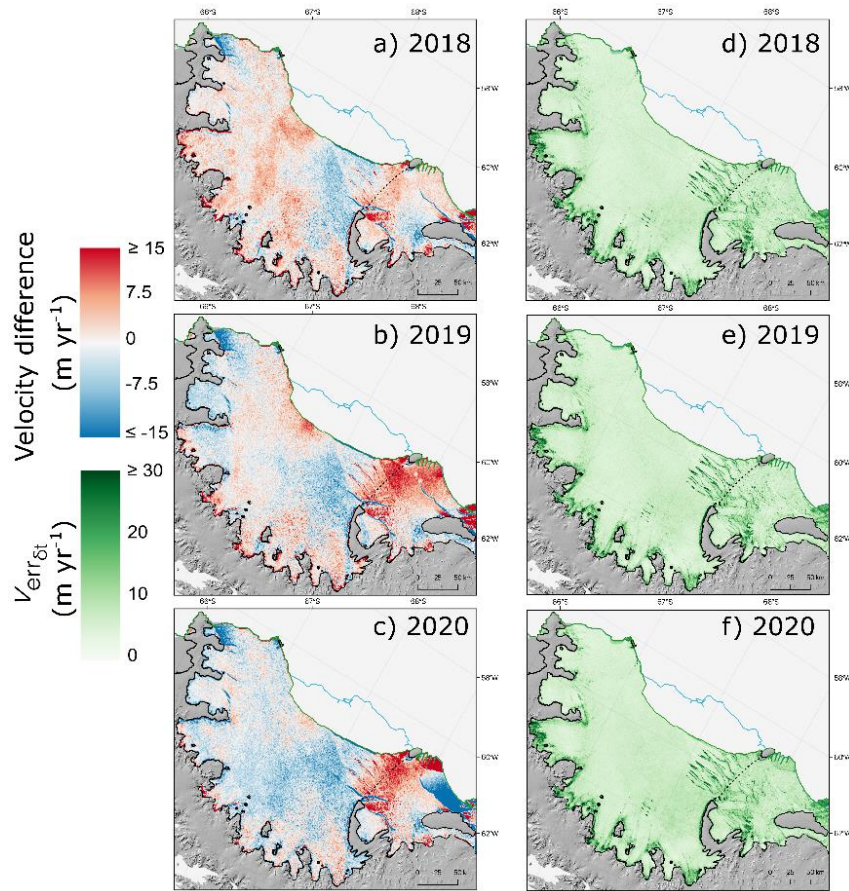


Figure S3 | Change in ice-shelf velocity for the three years following A-68’s calving relative to all months spanning October 2014–December 2016, and their associated errors. a) to c) show the unmasked median ice-velocity change for each post-calving year, corresponding to Figure 3. d) to f) show associated $v_{err\delta t}$ error values calculated using Eq. (3) (cf. Section 3.4). Black lines indicate the position of the grounding line in 2019 (Christie and others, 2022b); cyan and green lines, the position of the ice-shelf front in January 2017 and January 2018, respectively (Christie and others, 2022c). Data are superimposed over a hillshaded version of REMA DEM (Howat *and others*, 2019).

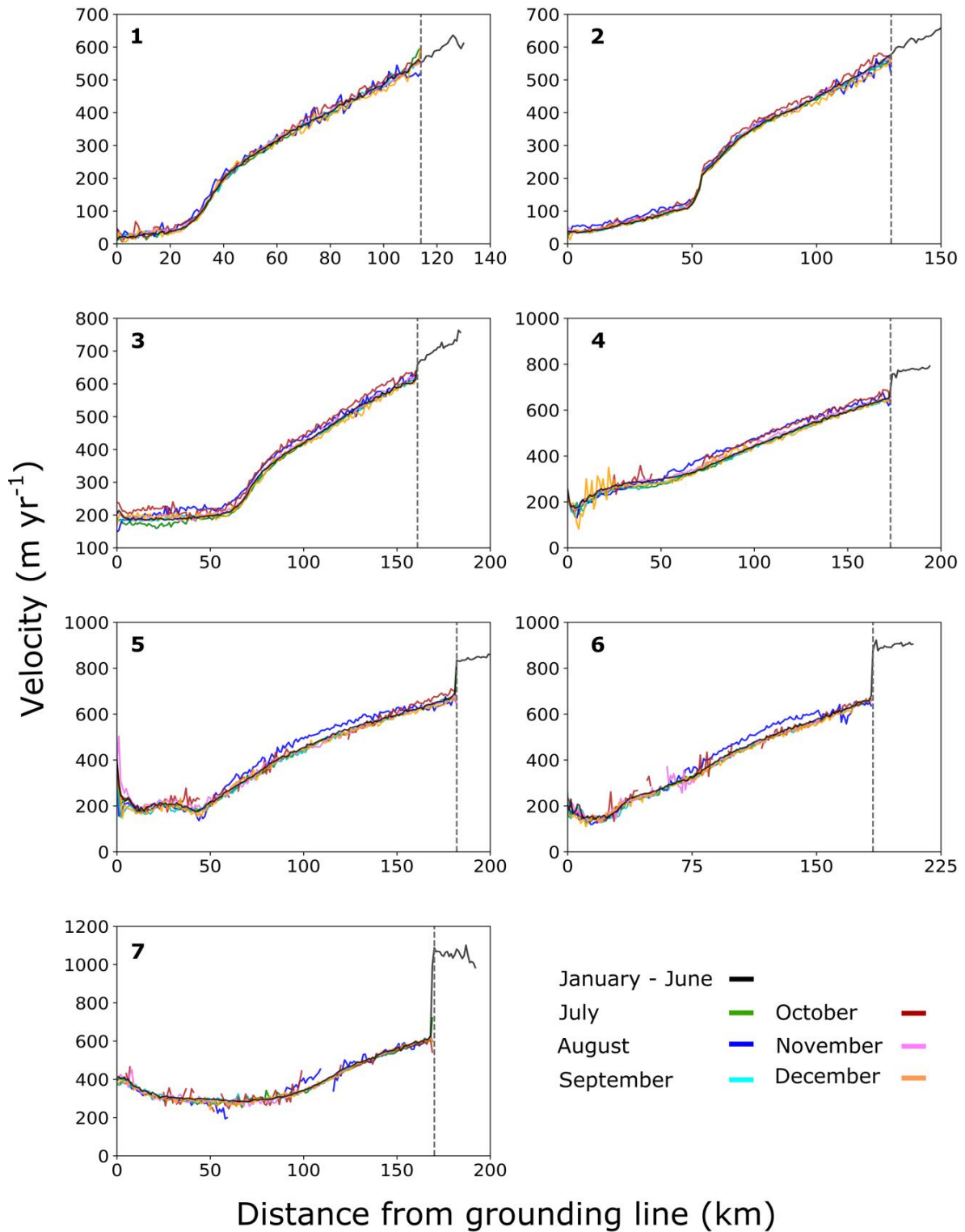


Figure S4 | Surface velocities along flowlines 1-7 in the six months following iceberg A-68's calving. See Figure 1 for the location of each flowline. For reference, the median velocity spanning January-June 2017 is shown in black. In all panels, dashed vertical lines denote LCIS' calving front location following the breakaway of iceberg A-68.

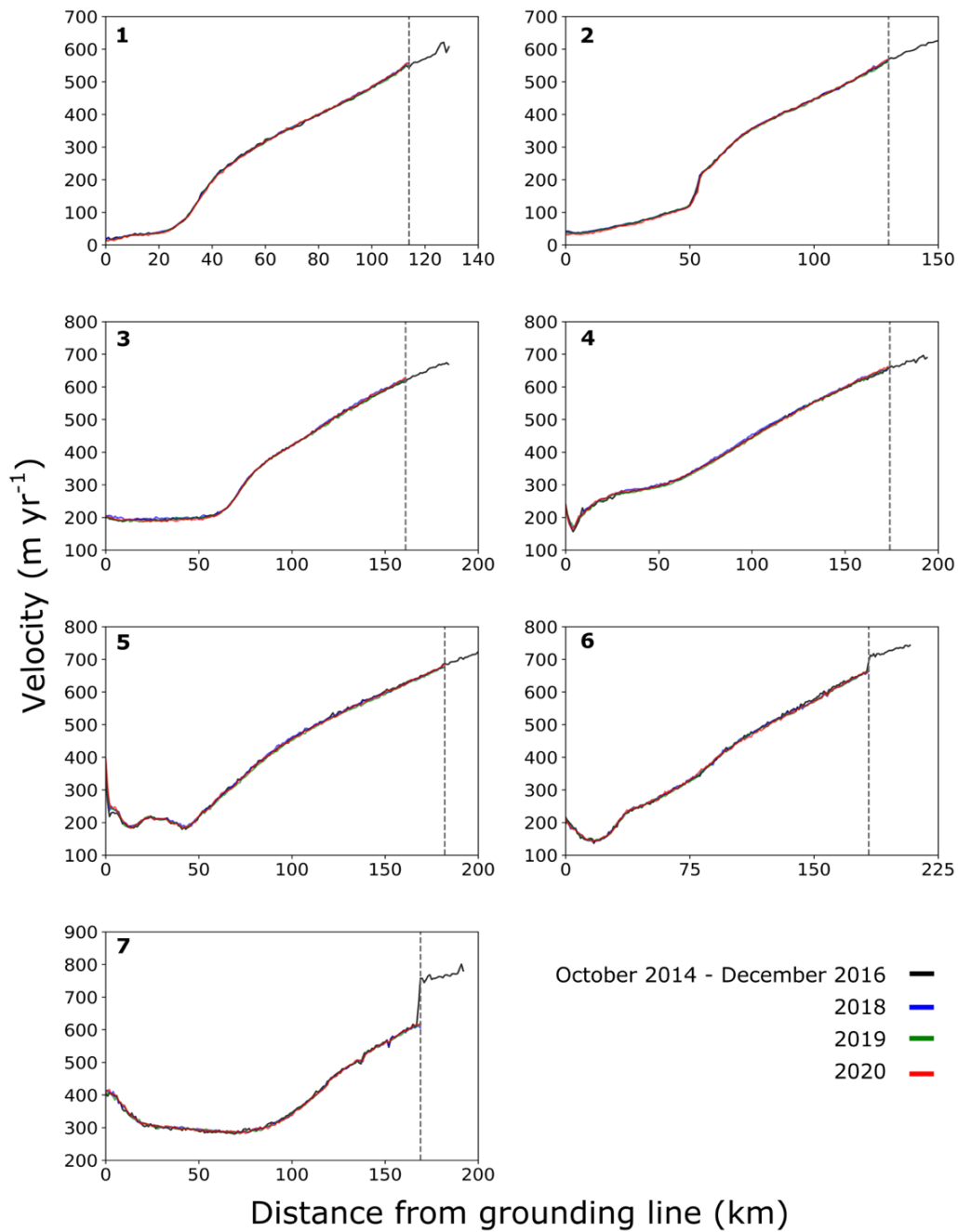


Figure S5 | Surface velocities along flowlines 1-7 in the years following iceberg A-68's calving. Observations reflect the median of all months within each calendar year (cf. Section 3.3). See Figure 1 for the location of each flowline. For reference, the median velocity spanning all months between October 2014 to December 2016 (inclusive) is shown in black. In all panels, dashed vertical lines denote LCIS' calving front location following the breakaway of iceberg A-68.