Tracking icebergs with time-lapse photography and sparse optical flow, LeConte Bay, Alaska, 2016–2017 – Supplementary Material
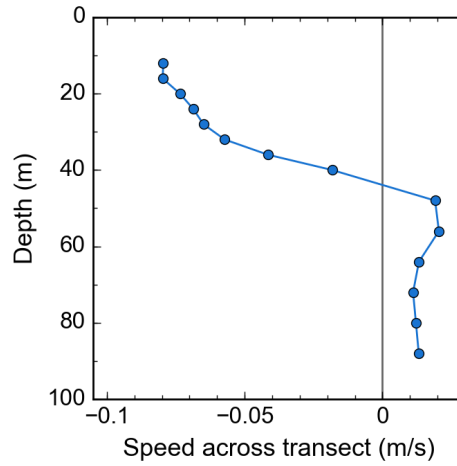
S-1 Supplementary figures

Figure S1: Average speeds at selected mooring ADCP depth levels (depth range 12–88 m) over the period 10 May–25 August 2017. Only data overlapping with time-lapse camera footage was used, ~620 hours in total. The speeds are perpendicular to transect 2, with negative speeds indicating downfjord flow. Note the vertical shear around 40 m depth.
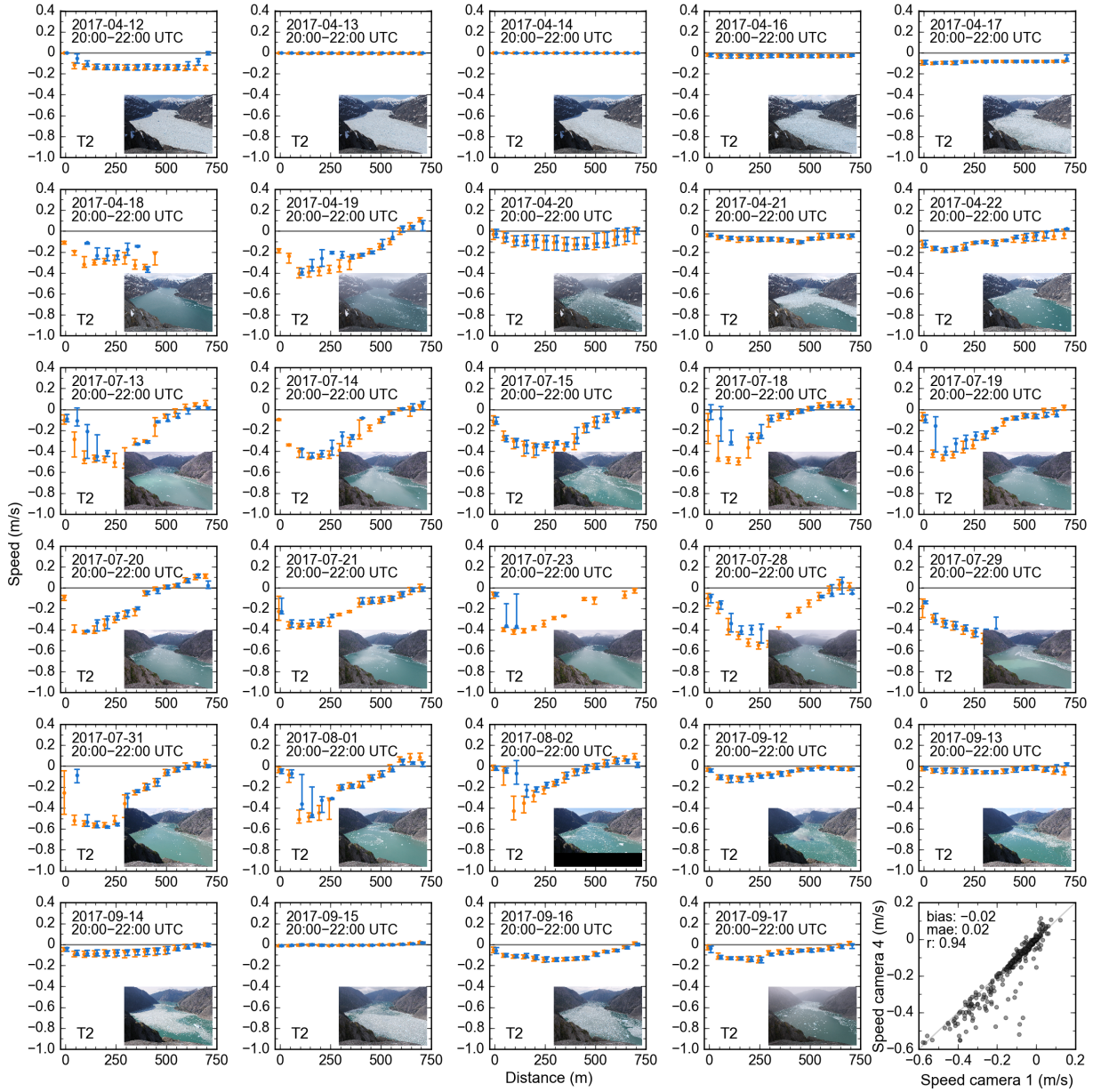
Figure S2: Camera 1-derived speeds (blue, 0.5 min^{-1} frame rate) versus camera 4-derived speeds (orange, 1 min^{-1} frame rate) measured along transect 2. Each panel represents the 20:00–22:00 UTC time period for one day. The inset photos taken from camera 4 show the fjord at 21:00. Points describe the median speeds per 50 m bin (perpendicular to the transect); error bars represent the corresponding first and third quartiles. For better readability, the points are shifted slightly to the left (camera 4, orange) and to the right (camera 1, blue). The scatterplot (lower right corner) compares camera 1- and camera 4-derived speeds and provides corresponding statistical parameters. The points represent median speeds per 50 m bins.
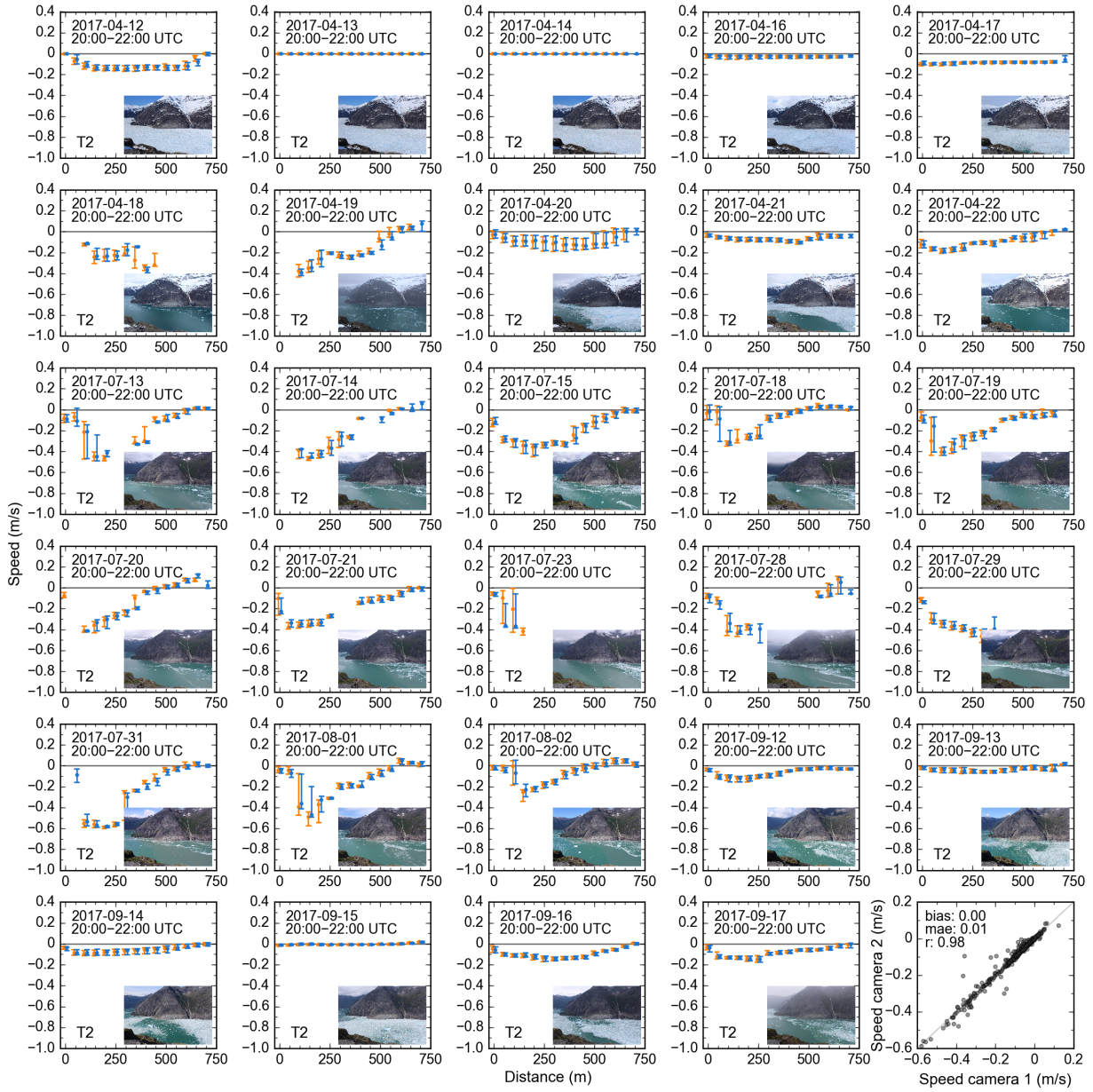
Figure S3: Same as Figure S2, but comparing cameras 1 (blue) and 2 (orange). The inset photos are taken from camera 2.
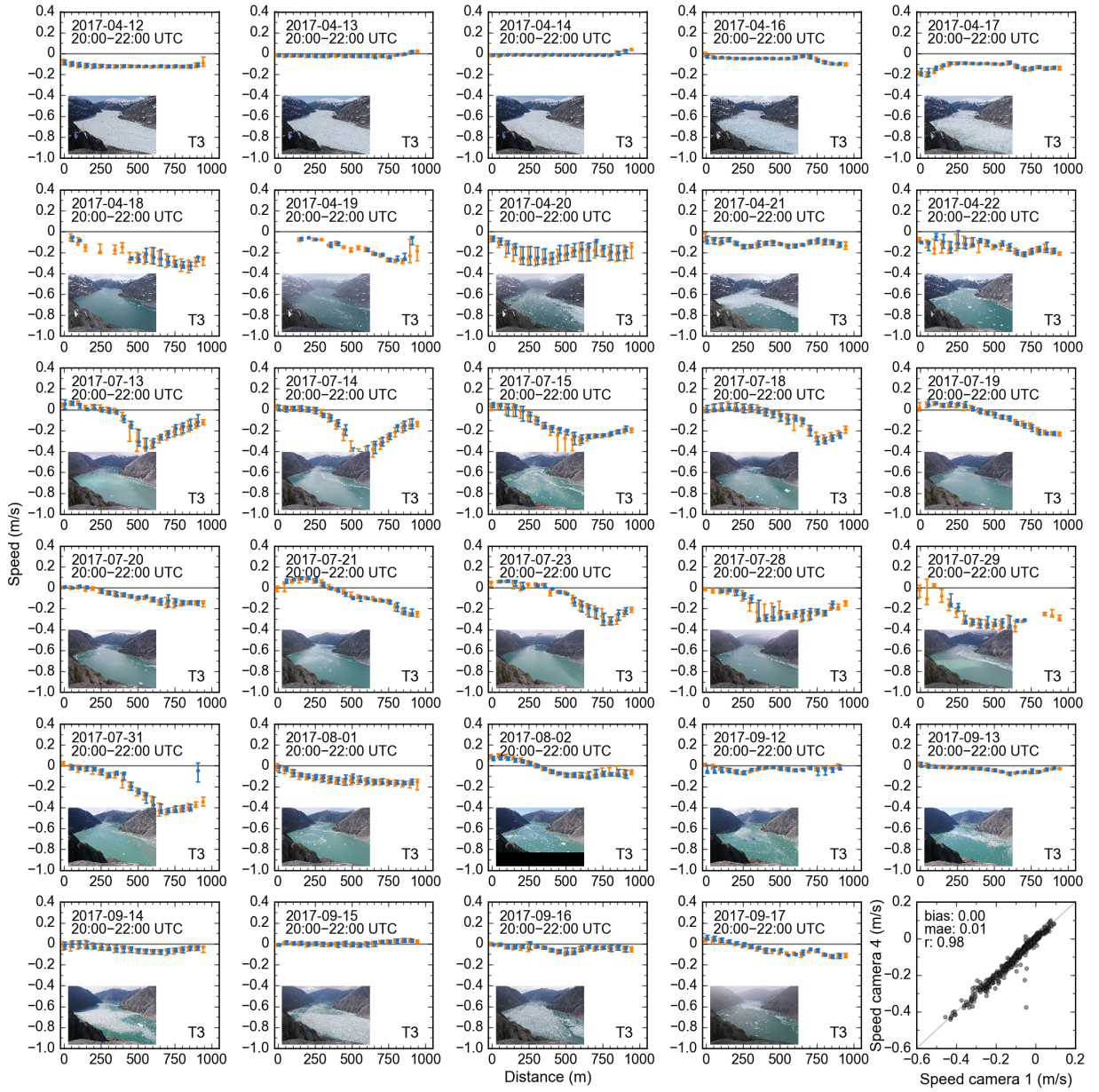
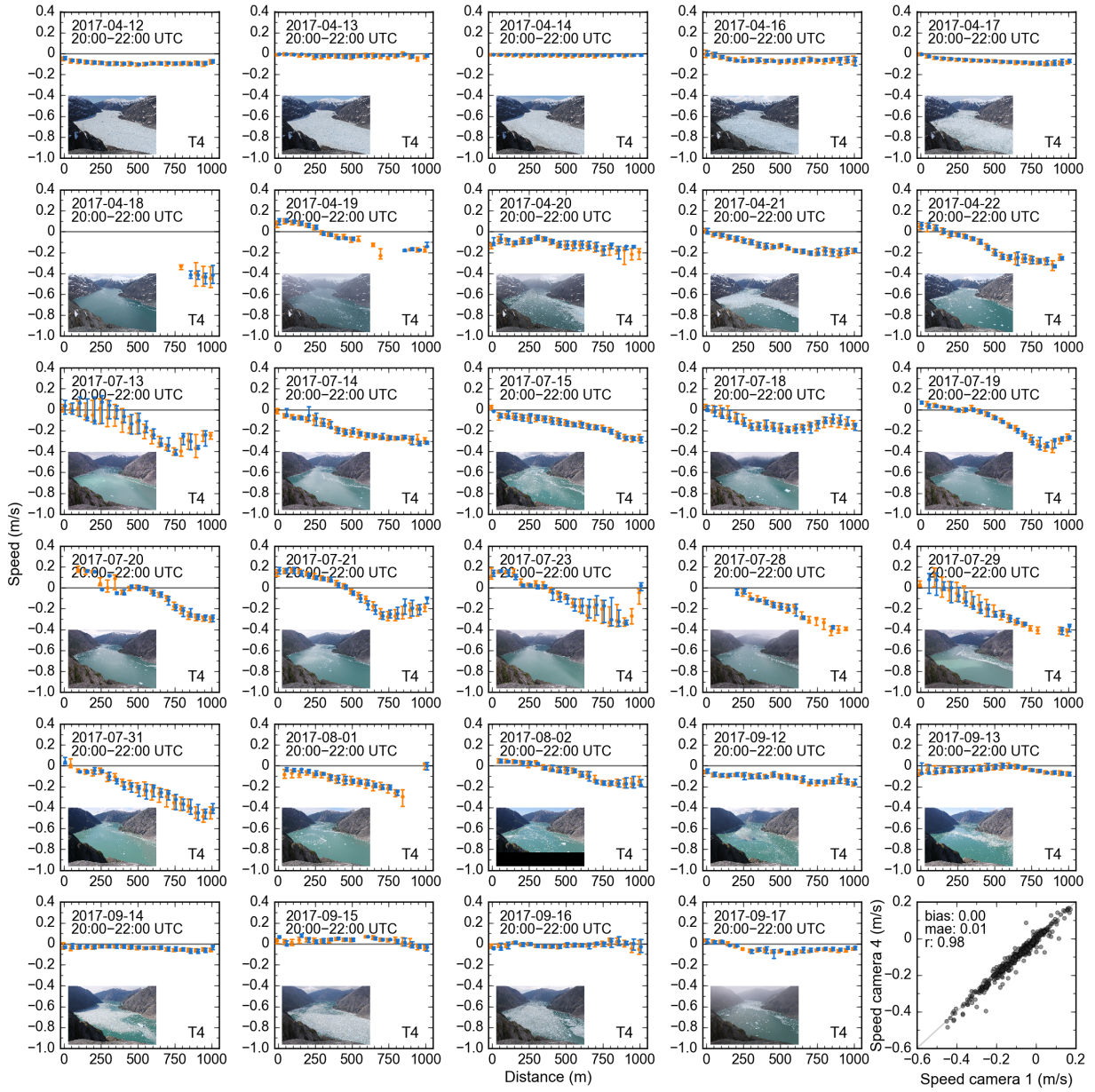Figure S4: Same as Figure S2, but for transect 3.

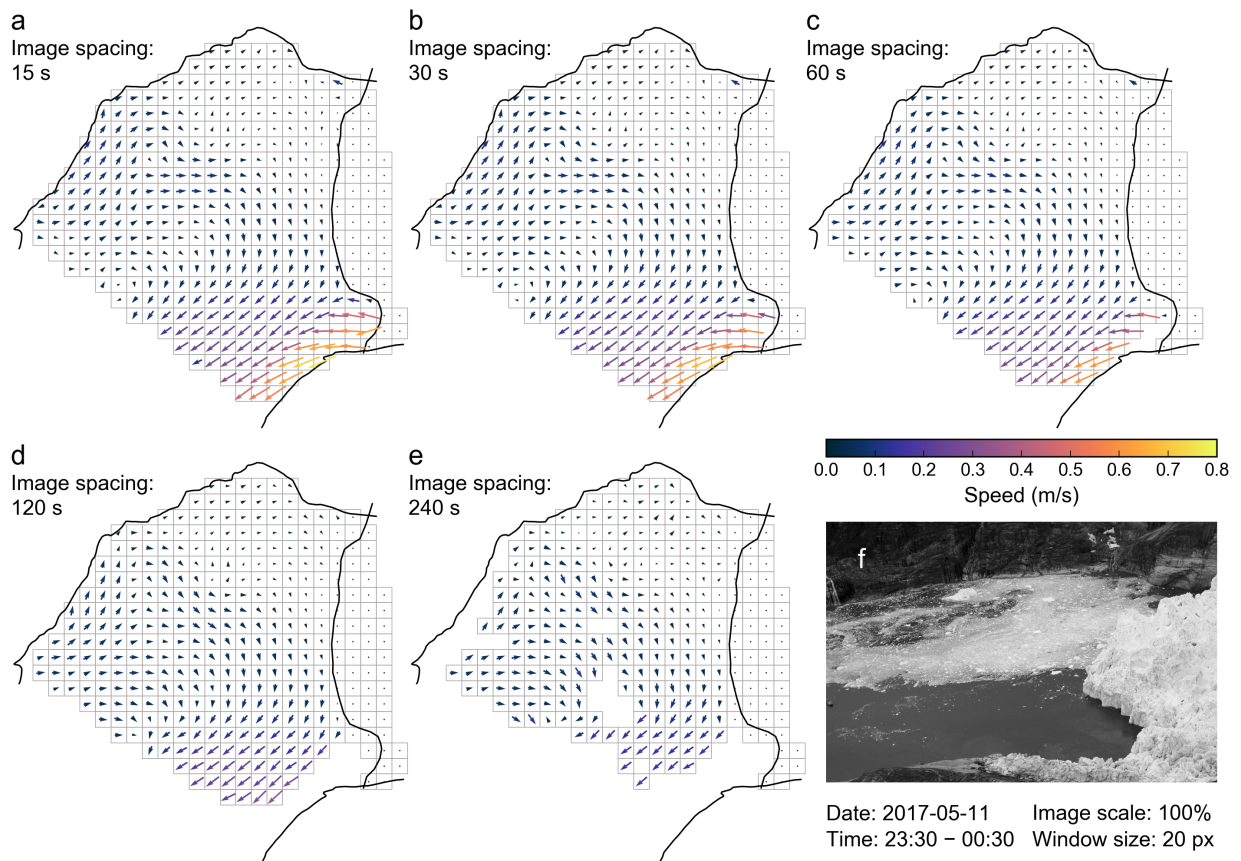Figure S5: Same as Figure S2, but for transect 4.

Figure S6: Results from simulation runs at camera 5, varying the time-lapse interval from (a) 15 s to (e) 240 s. The velocity fields reflect averages over an hour (here 23:30–00:30 UTC) and a 50 × 50 m grid. The photo in panel (f), captured by camera 5, shows the fjord at 23:30 UTC.
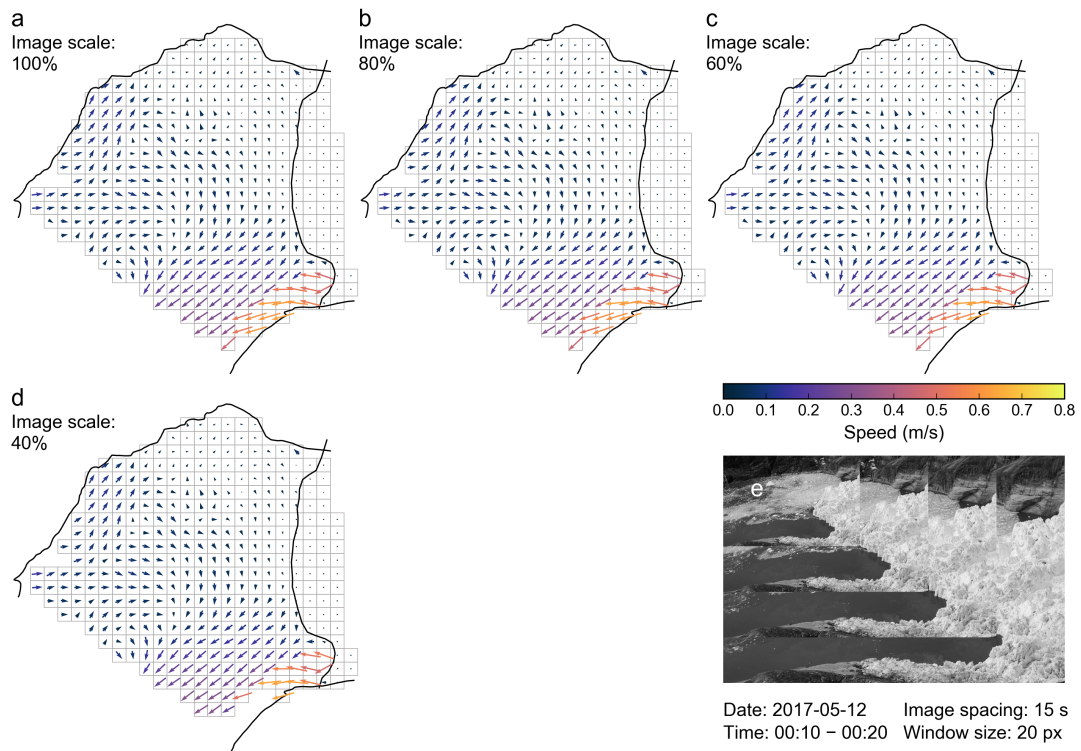
Figure S7: Simulation of different image sizes at camera 5. The scenarios range between (a) 100% and (d) 40% of the original image size (4752 × 3168 pixels). The original trajectories are averaged over 10 minutes temporally and a 50 × 50 m grid spatially. The photos in (f) reflects the fjord conditions during the simulation (00:10 UTC), scaled to their respective sizes used through a–d. The time-lapse interval is 15 s throughout the panels.
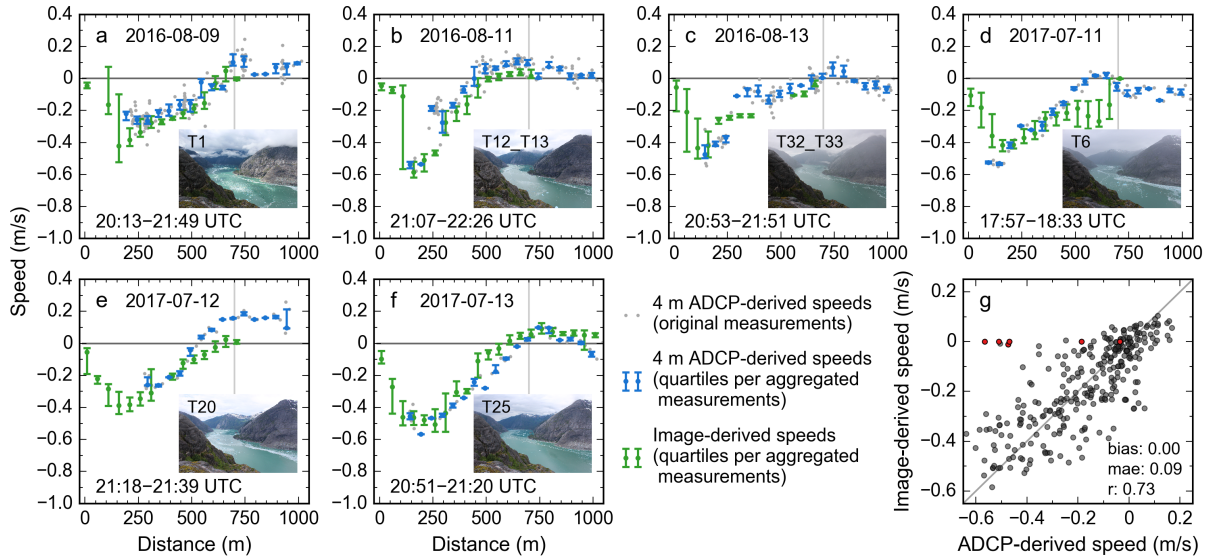
Figure S8: (a–f) Image- versus 4 m ADCP-derived speeds along transect 2. Each panel shows one ADCP survey (representing 4 m depth) with corresponding speeds derived from cameras 1 and 2 (a–e) and 1, 2, and 4 (f). Panels (a–c) represent three selected surveys from the August 2016 campaign, (d–f) three selected surveys from the July 2017 campaign. Inset images taken from camera 1 show fjord conditions halfway through the ADCP survey. Times show the start and completion times of the ADCP surveys. Gray dots show individual ADCP measurements. Green and blue dots describe median speeds per 50 × 100 m bin; corresponding error bars show the first and third quartiles. For better readability, dots and error bars are shifted slightly to the left (ADCP-derived speeds) and to the right (image-derived speeds). Areas beyond 700 m (gray vertical line) are only visible from camera 4, which was operational only during ADCP surveys on 13 July 2017. (g) ADCP- versus image-derived speeds, with corresponding statistical parameters. Semi-transparent black dots represent median speeds per 50 × 100 m bin, collected from 32 ADCP surveys. Red dots indicate outliers caused by two icebergs stranded on 12 and 14 August 2016, yielding image-derived speeds of zero. The gray line is the 1:1 line.
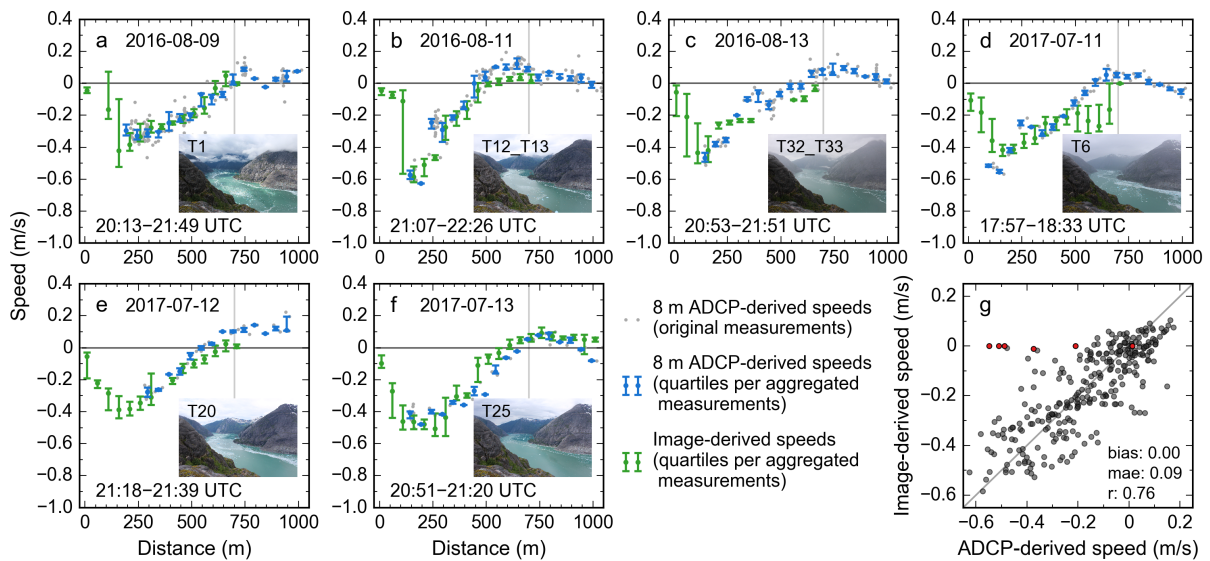

Figure S9: Same as Figure S8, but comparing image-derived speeds to the 8 m ADCP-derived speeds.
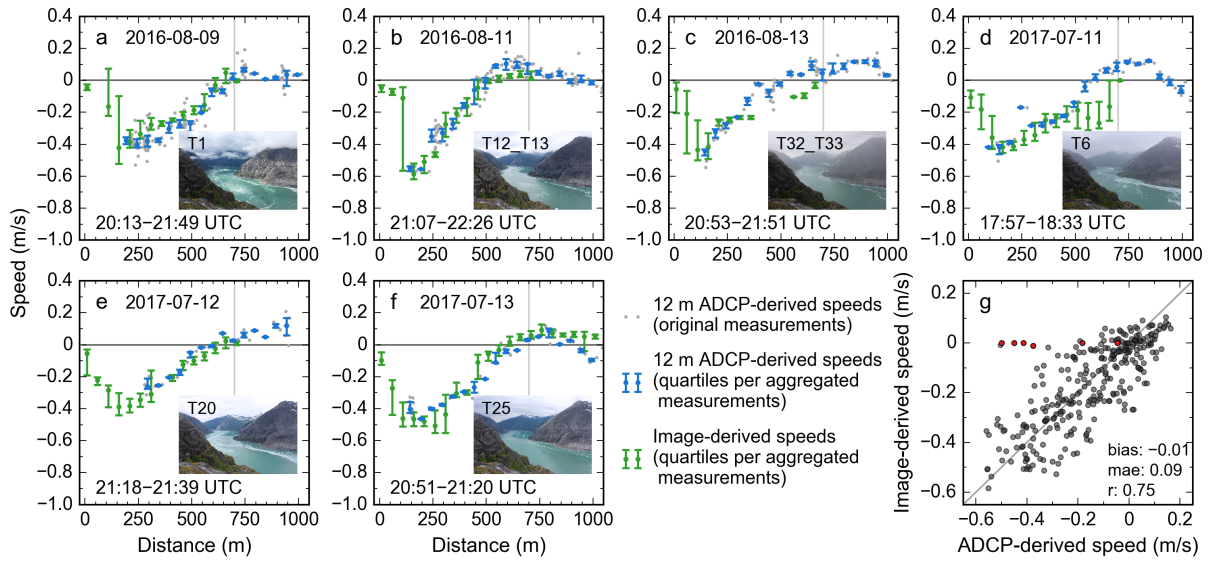
Figure S10: Same as Figure S8, but comparing image-derived speeds to the 12 m ADCP-derived speeds.
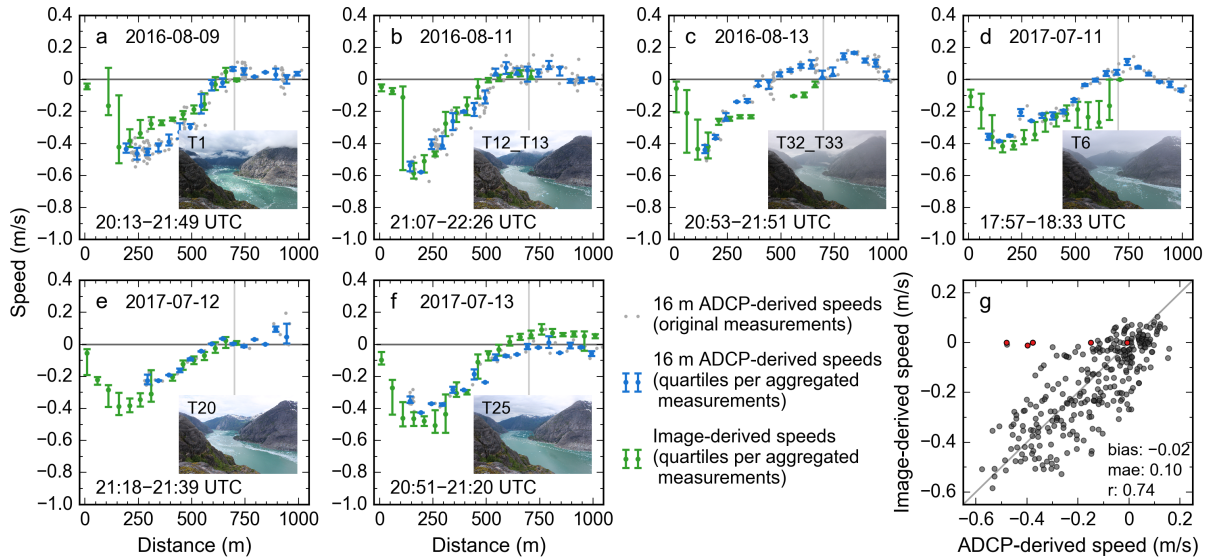

Figure S11: Same as Figure S8, but comparing image-derived speeds to the 16 m ADCP-derived speeds.
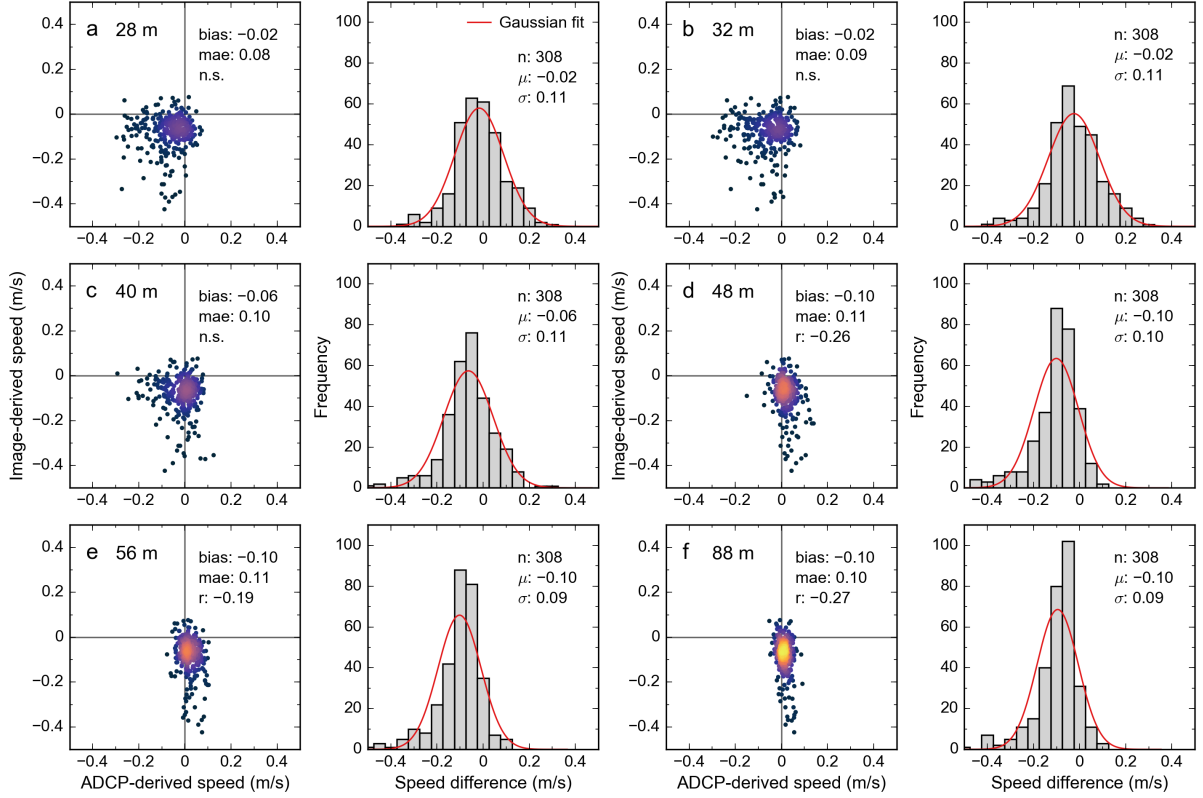
Figure S12: (a–f) Comparison of image-derived velocities (from cameras 1, 2, and 4) and corresponding mooring-mounted ADCP measurements for six depth levels, ranging between 28 and 88 m. Scatterplots (left panels) compare the speeds measured at the mooring depths to the image-derived speeds. The speeds are perpendicular to transect 2, with negative values indicating downfjord flow. Colors represent point density, with lighter colors indicating higher numbers of overlapping points. r values are given in the case of significant relationships ($p < 0.01$), "n.s." otherwise. Histograms (right panels) show the corresponding frequency distributions of speed differences (image-derived speeds – ADCP-derived speeds), including Gaussian fits. Bin size is 0.05 m/s. μ and σ values represent means and standard deviations of the Gaussians.