Supplement of The Cryosphere, 19, 525–540, 2025
https://doi.org/10.5194/tc-19-525-2025-supplement

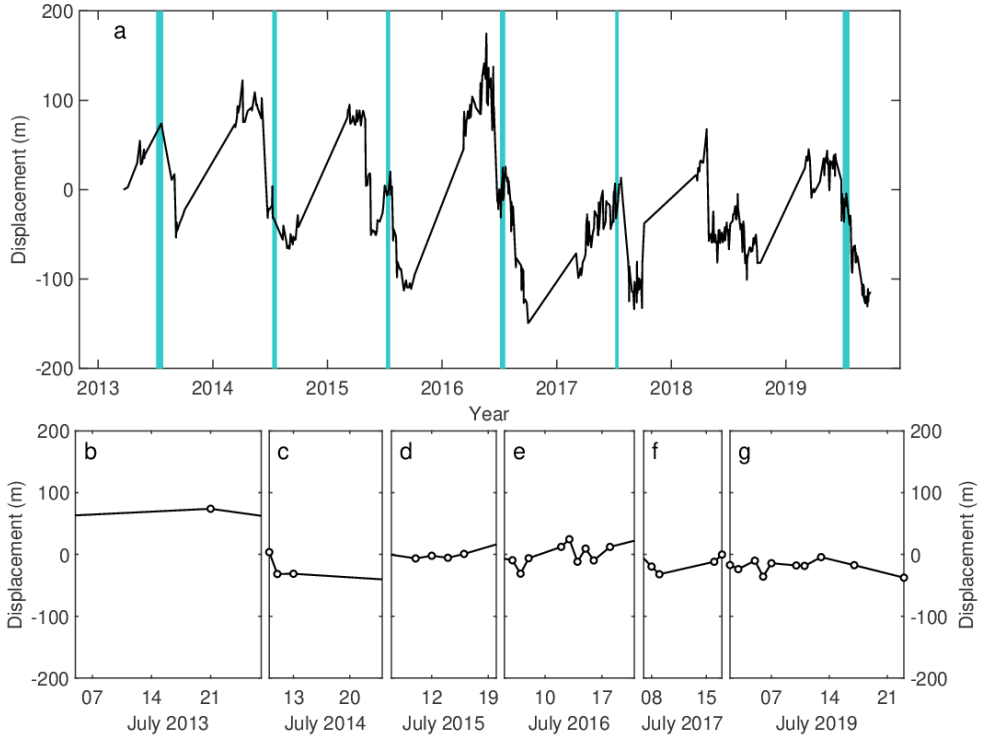

The Cryosphere Open Access EGU

*Supplement of*

# Ice speed of a Greenlandic tidewater glacier modulated by tide, melt, and rain

**Shin Sugiyama et al.**

*Correspondence to:* Shin Sugiyama (sugishin@lowtem.hokudai.ac.jp)




15 Figure S1. (a) Ice front displacement of Bowdoin Glacier relative to the position in March 2013. (b–g) The displacement during the field measurement periods in 2013–2017 and 2019. The front position data were obtained from Zhang et al. (2023) and processed based on the box method using software provided by Lea (2018).

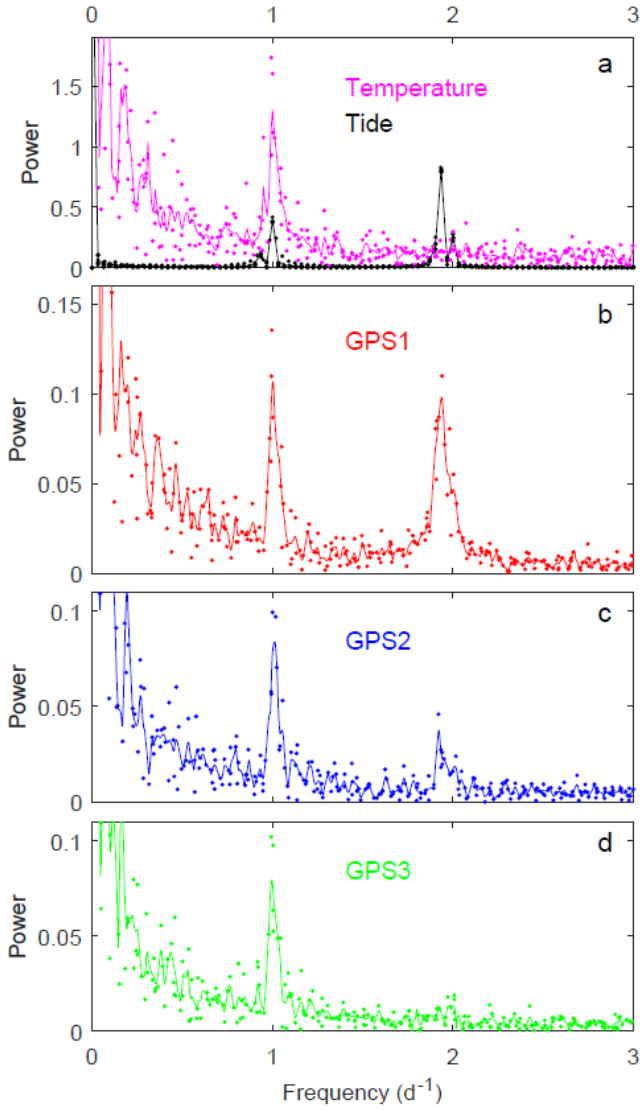



Figure S2. Frequency analysis of air temperature, tide, and ice speed. Power spectral diagrams for (a) air temperature (magenta) and tide (black), (b) ice speed at GPS1, (c) ice speed at GPS2, and (d) ice speed at GPS3. Solid curves were obtained by filtering power (dots) computed by Fourier transformation of the data for 2013–2017 and 2019.

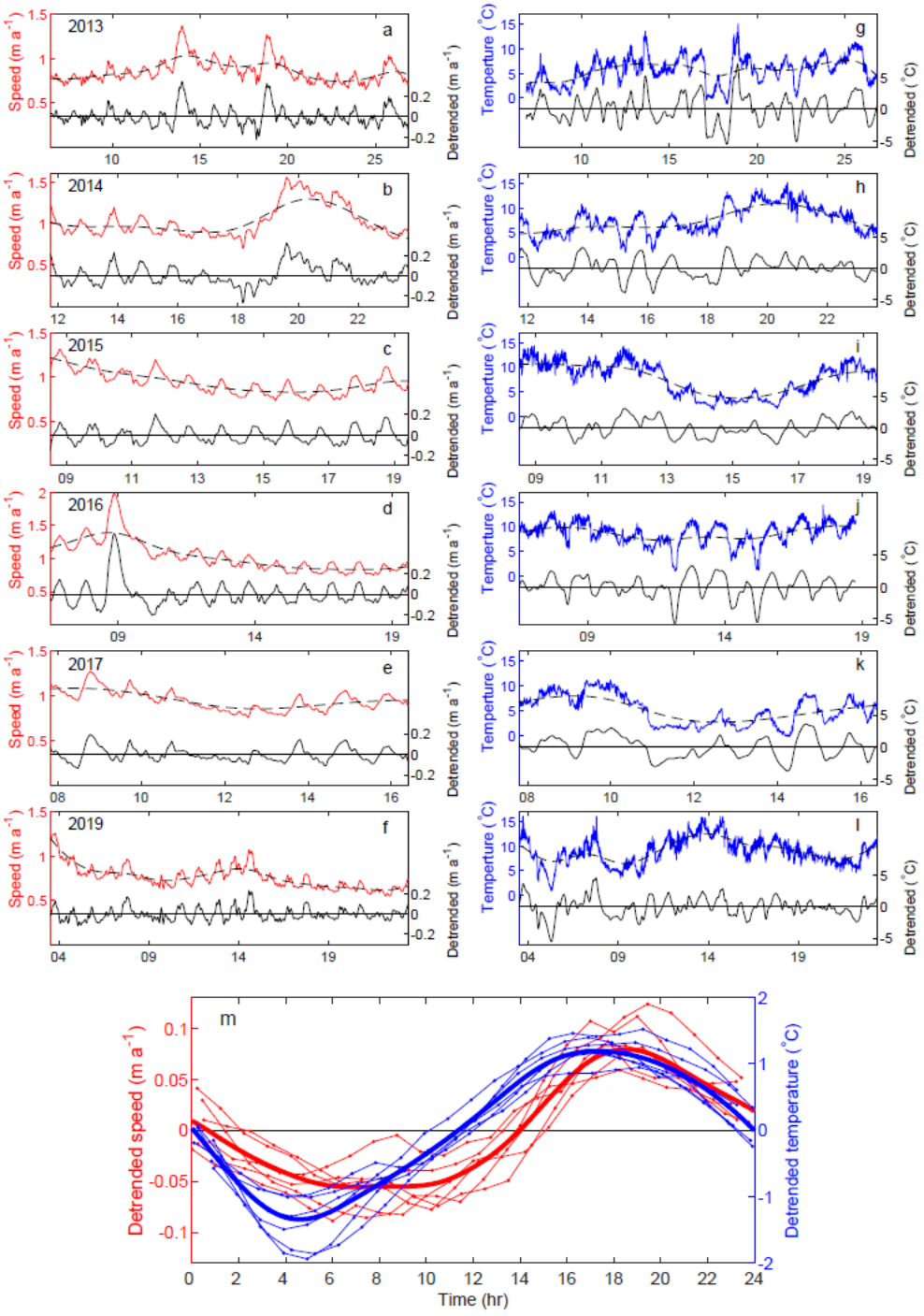



Figure S3. Diurnal pattern analysis of ice speed and air temperature. (a–f) Ice speeds at GPS3 in July 2013–2017 and 2019. Detrended speed (solid black line) was obtained by subtracting a trend (dashed black line) from the data (red). (g–l) Same as (a–f) but for air temperature. (m) Diurnal variations in the detrended ice speed (red) and temperature (blue). Each curve was obtained by connecting values averaged in each year. The thick curves are the mean of the six years.

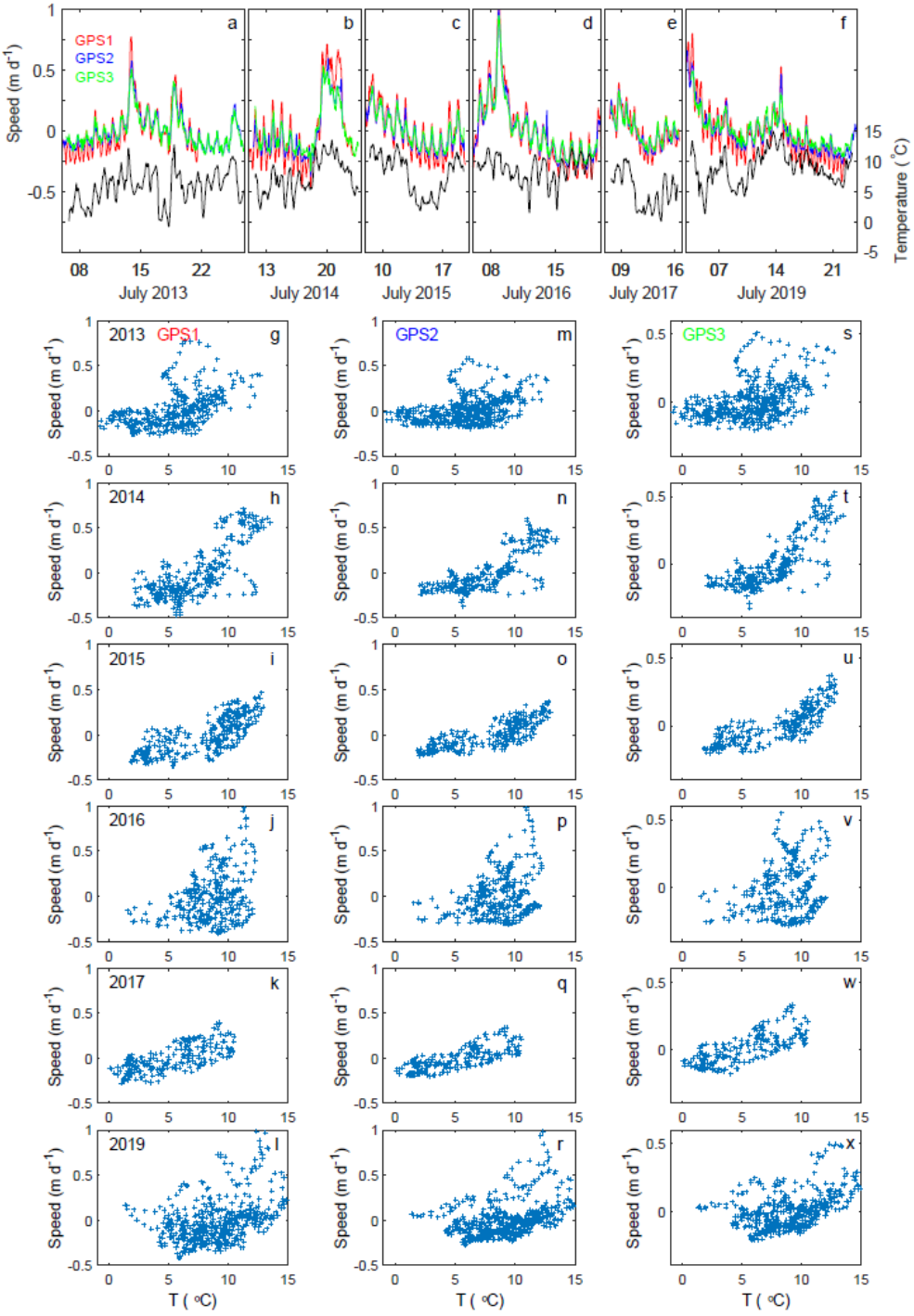



Figure S4. Ice speed and air temperature variations. (a–f) Detrended ice speed at GPS1–3 (red, blue, and green) and air temperature. (g–x) Scatter plots of air temperature and detrended hourly mean ice speed at (g–l) GPS1, (m–r) GPS2, and (s–x) GPS3.

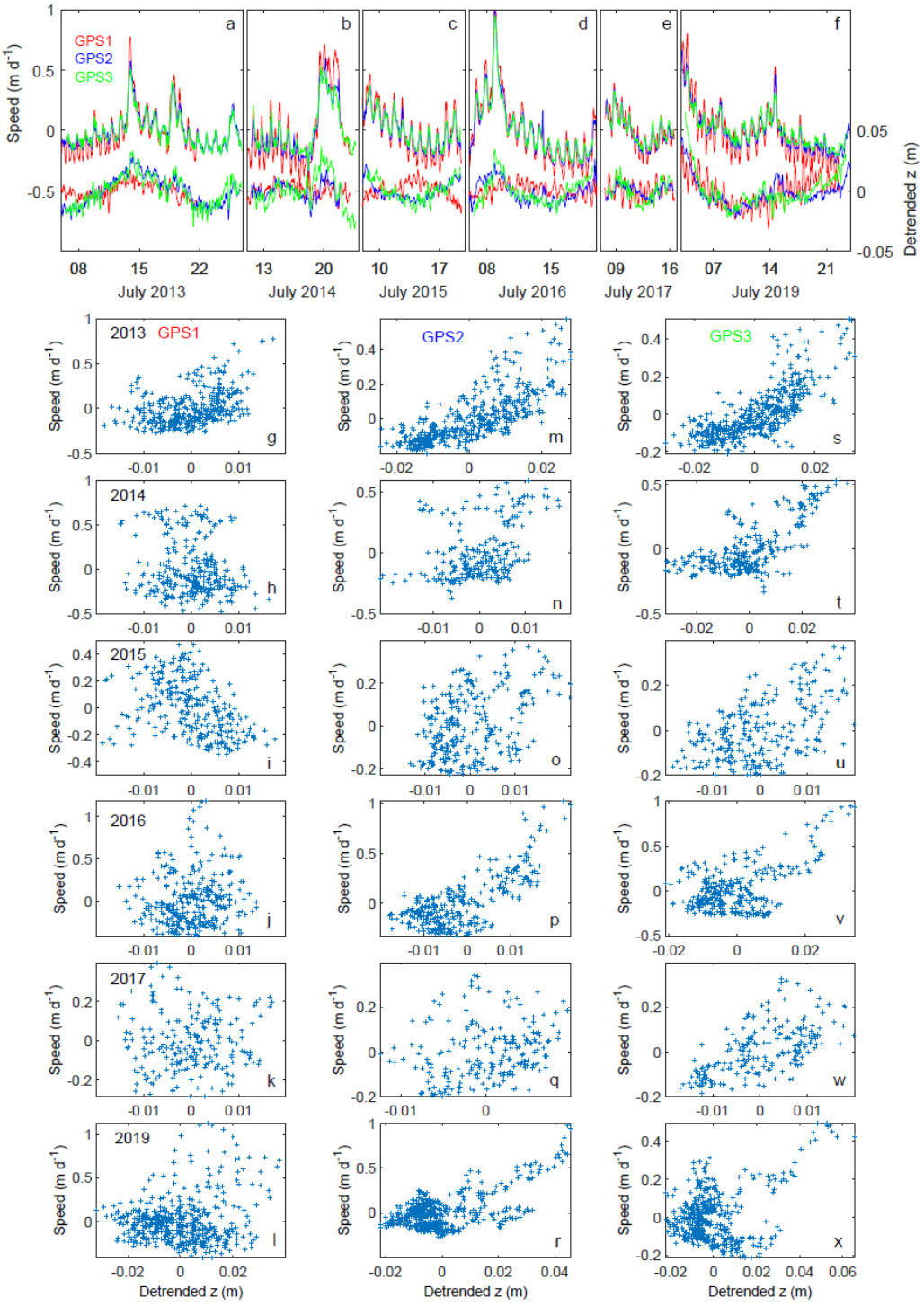



Figure S5. Ice speed variations and glacier surface uplift. (a–f) (top) Detrended ice speed and (bottom) vertical coordinate at GPS1–3 (red, blue, and green). (g–i) Scatter plots of detrended hourly mean ice speed and the vertical coordinate at (g–l) GPS1, (m–r) GPS2, and (s–x) GPS3. Note that the *x*- and *y*-axis scales are different in each panel.

**References**

Lea, J. M.: The Google Earth Engine Digitisation Tool (GEEDiT) and the Margin change Quantification Tool (MaQiT) – simple tools for the rapid mapping and quantification of changing Earth surface margins, Earth Surf. Dynam., 6, 551–561, https://doi.org/10.5194/esurf-6-551-2018, 2018.

Zhang, E., Catania, G., and Trugman, D. T.: AutoTerm: an automated pipeline for glacier terminus extraction using machine learning and a "big data" repository of Greenland glacier termini, The Cryosphere, 17, 3485–3503, https://doi.org/10.5194/tc-17-3485-2023, 2023.