Global Biogeochemical Cycles

Supporting Information for

Meltwater discharge from marine-terminating glaciers drives biogeochemical conditions in a Greenlandic fjord

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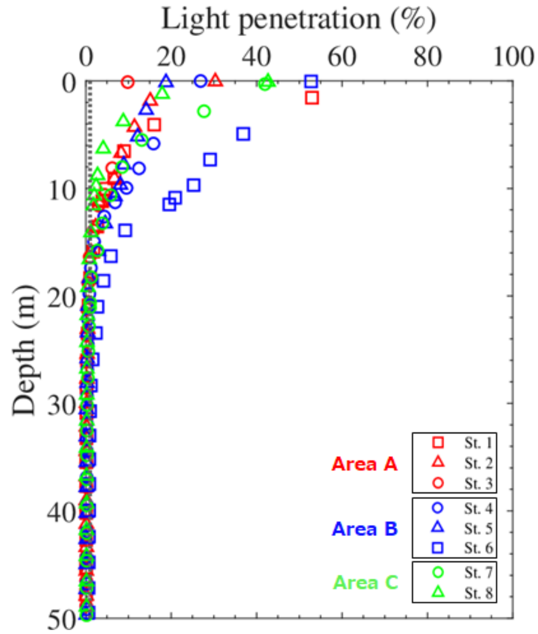
Introduction

The table and figures provide additional information supporting the understanding of the main text. Values of $\delta^{18}O$, $FDOM_H$ level, and the concentrations of DOC and nutrients in iceberg-ice samples were summaraized in Appendix Table 1. Vertical profile of light penetration in Areas A–C was presented in Appendix Figure 1. Oceanic vertical stability (N^2) in the studied fjord was shown in Appendix Figure 2. Timeseries of air temperature at the Pituffik/Thule Air Base, runoff from Qaanaaq Glacier, and liquid water discharge from two regional climate models from northwestern Greenland were shown in Appendix Figure 3. Satelite images in northwestern Greenland in the summers of 2018 and 2019 were presented in Appendix Figure 4.

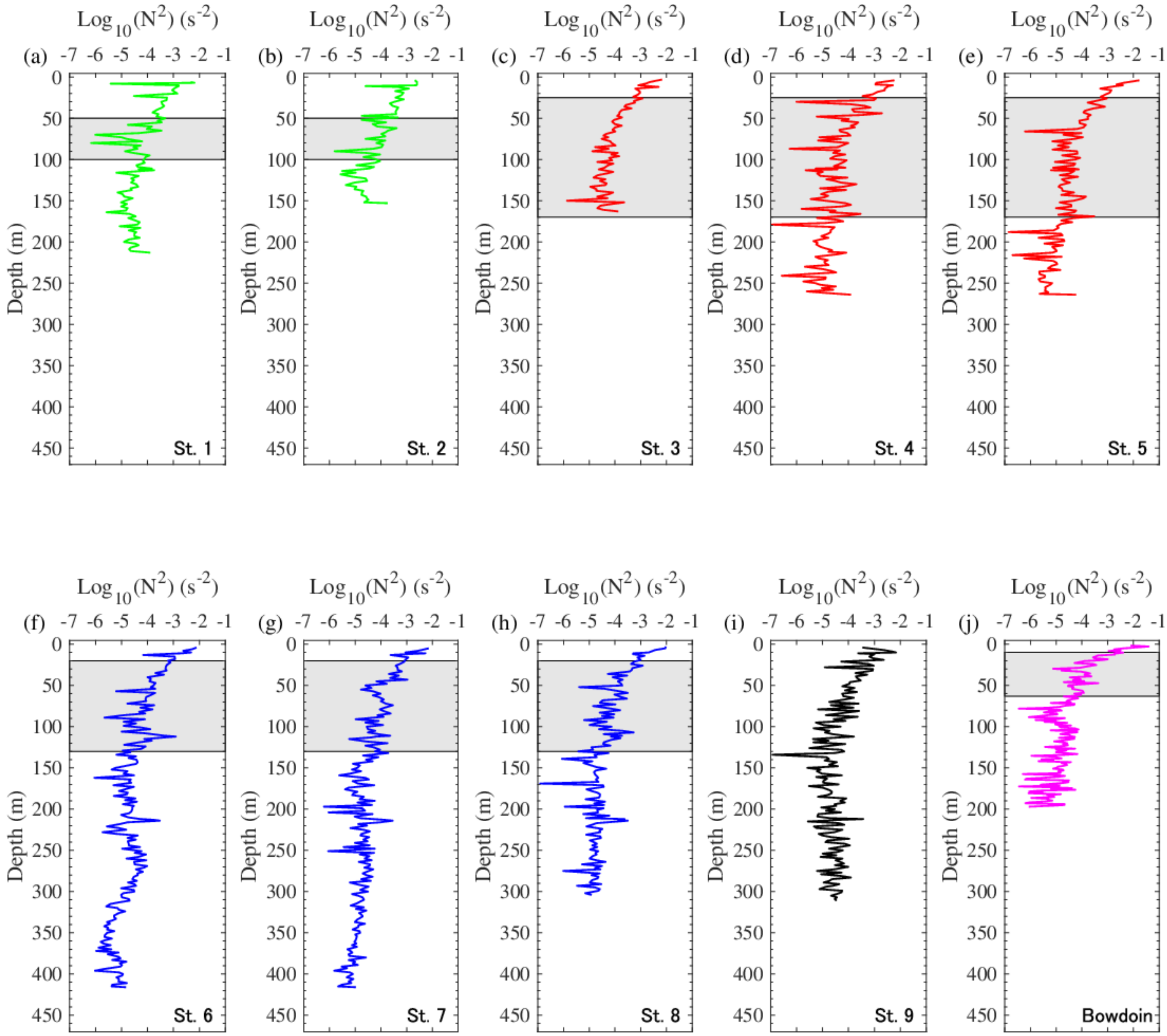
Appendix Table 1 Average and standard deviation of $\delta^{18}O$, $FDOM_H$ level, and the concentrations of DOC and nutrients in iceberg-ice samples. *n* denotes the number of samples

	$\delta^{18}O$ (‰)	$FDOM_H$ (RU_{320})	DOC ($\mu mol\ L^{-1}$)	Nitrate+nitrite ($\mu mol\ kg^{-1}$)	Phosphate ($\mu mol\ kg^{-1}$)	Silicate ($\mu mol\ kg^{-1}$)
Icebergs	-27.1 ± 1.1 ($n = 8$)	$5 \times 10^{-4} \pm 4 \times 10^{-4}$ ($n = 8$)	9.4 ± 4.6 ($n = 8$)	0.9 ± 0.8 ($n = 8$)	<0.04 ($n = 8$)	1.4 ± 0.1 ($n = 8$)



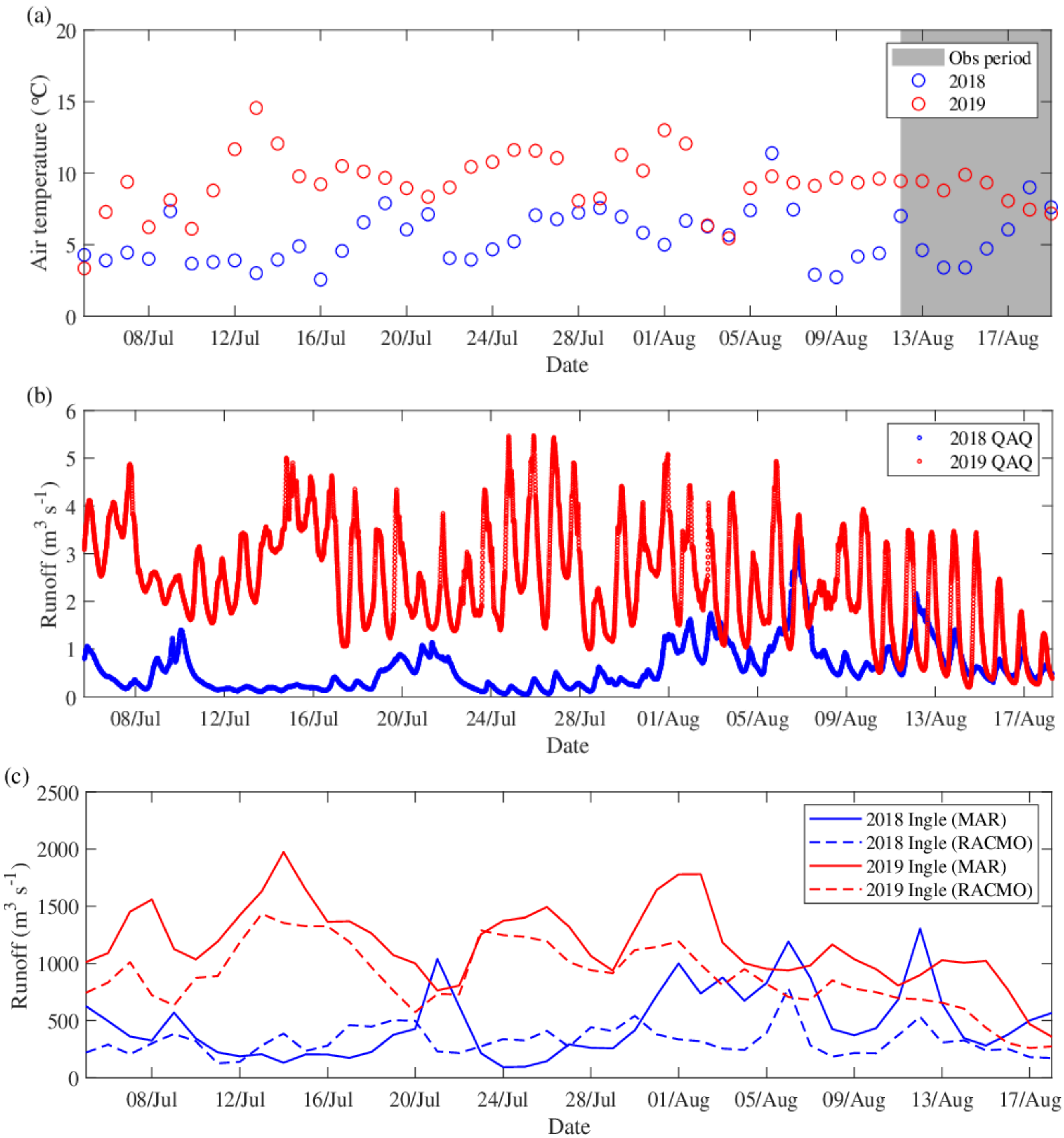
Appendix Figure 1

Vertical profile of light penetration in Areas A–C. Dotted vertical line represents 1% of light penetration. A photometer (DEFI2-L, JFE Advantech) was lowered into the studied fjord to measure vertical distributions of irradiance at approximately 2-m intervals. The precision of the photon flux measurement was ±4.0% of the full-scale range (0−2000 µmol $[m^2\ s]^{-1}$). Light penetration in seawater was calculated as a proportion of the measured irradiance on board at each station. The irradiance was not measured at St. 9 due to an instrumental problem.



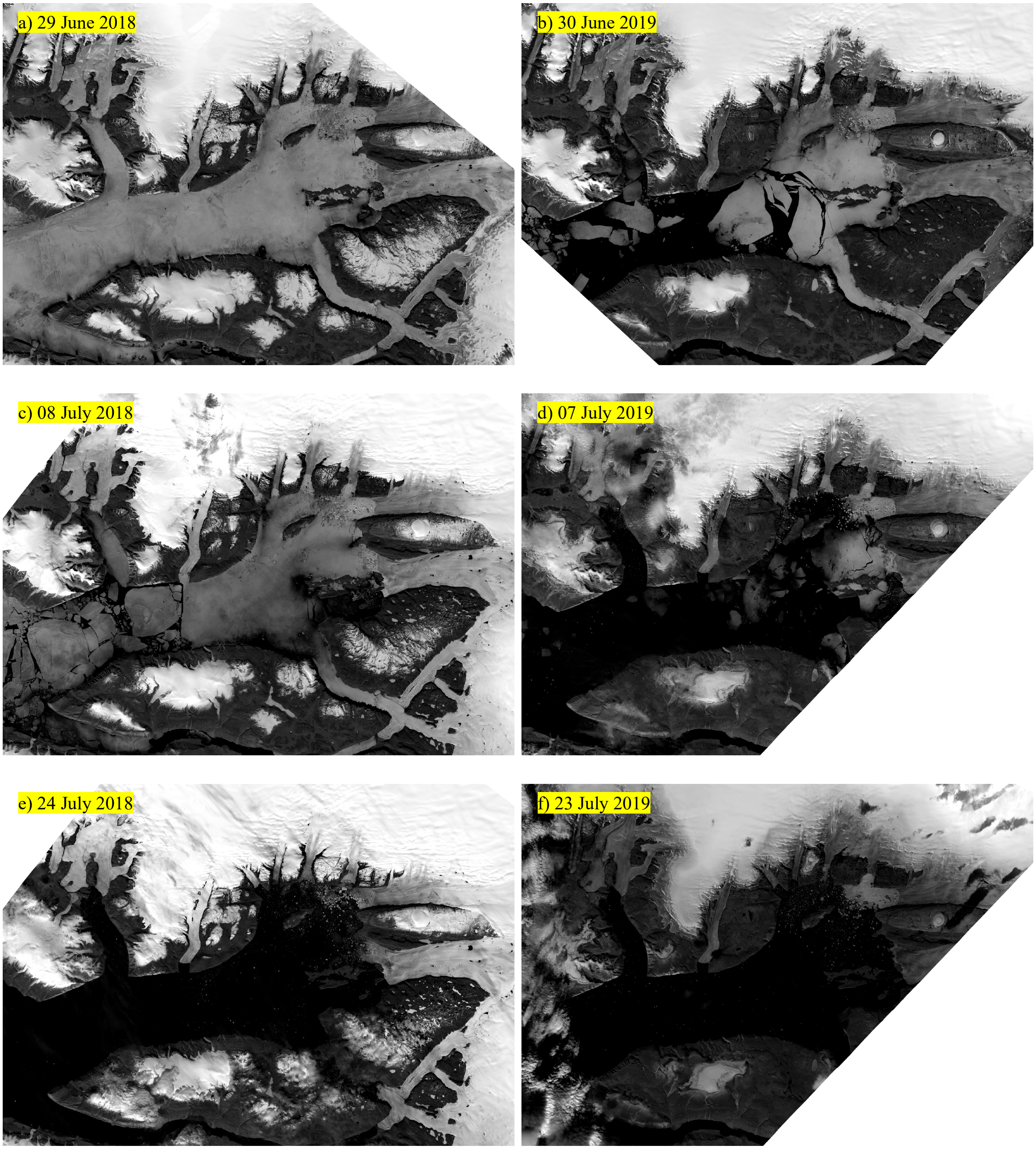
Appendix Figure 2

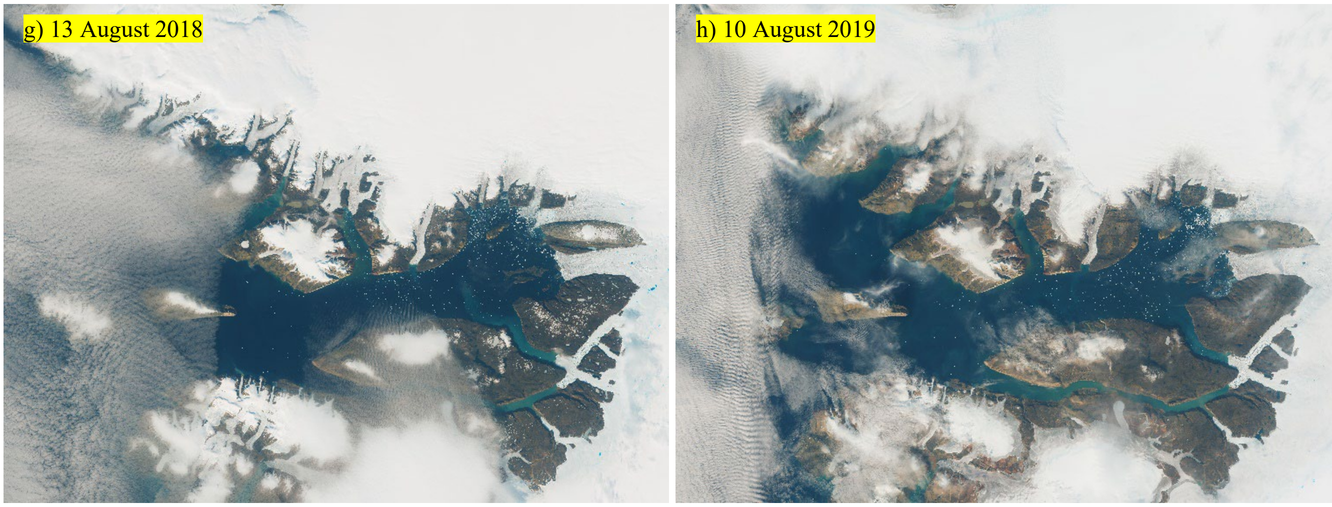
Vertical profiles of $\log_{10}(N^2)$ in seawater. Data of (j) is from Kanna et al. (2020). Shaded area shows the depth range of plume water as described in the text



Appendix Figure 3

Timeseries of (a) air temperature at the Pituffik/Thule Air Base (76°32′ N, 68°42′ W), (b) runoff from Qaanaaq Glacier (QAQ), as reported by Kondo et al. (2021), and (c) liquid water discharge from two regional climate models (MAR and RACMO) from northwestern Greenland (77.3–77.9° N, 70.0–65.0° W), as reported by Mankoff et al. (2020). Shaded area represents our observation period


a) 29 June 2018
b) 30 June 2019
c) 08 July 2018
d) 07 July 2019
e) 24 July 2018
f) 23 July 2019



Appendix Figure 4

(a–f) Landsat images and (g–h) Copernicus Sentinel images in Inglefield Bredning in the summers of 2018 and 2019. Landsat images were downloaded from the US Geological Survey Earth Explorer http://earthexplorer.usgs.gov/. The sentinel images were processed with Sentinelflow (https://github.com/juseg/sentinelflow).

References:

1. Kanna, N., Sugiyama, S., Fukamachi, Y., Nomura, D., & Nishioka, J. (2020). Iron Supply by Subglacial Discharge Into a Fjord Near the Front of a Marine-Terminating Glacier in Northwestern Greenland. Global Biogeochemical Cycles, 34(10), e2020GB006567.
2. Kondo, K., Sugiyama, S., Sakakibara, D., & Fukumoto, S. (2021). Flood events caused by discharge from Qaanaaq Glacier, northwestern Greenland. Journal of Glaciology, 67(263), 500-510. doi:10.1017/jog.2021.3
3. Mankoff, K. D., Noël, B., Fettweis, X., Ahlstrøm, A. P., Colgan, W., Kondo, K., . . . Fausto, R. S. (2020). Greenland liquid water discharge from 1958 through 2019. Earth System Science Data, 12(4), 2811-2841.