

Supplementary materials for “Dynamic response of lake-terminating glaciers to the abrupt drainage of Lago Greve in the Southern Patagonia Icefield”

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Introduction

The auxiliary materials for “Dynamic response of lake-terminating glaciers to the abrupt drainage of Lago Greve in the Southern Patagonia Icefield”.

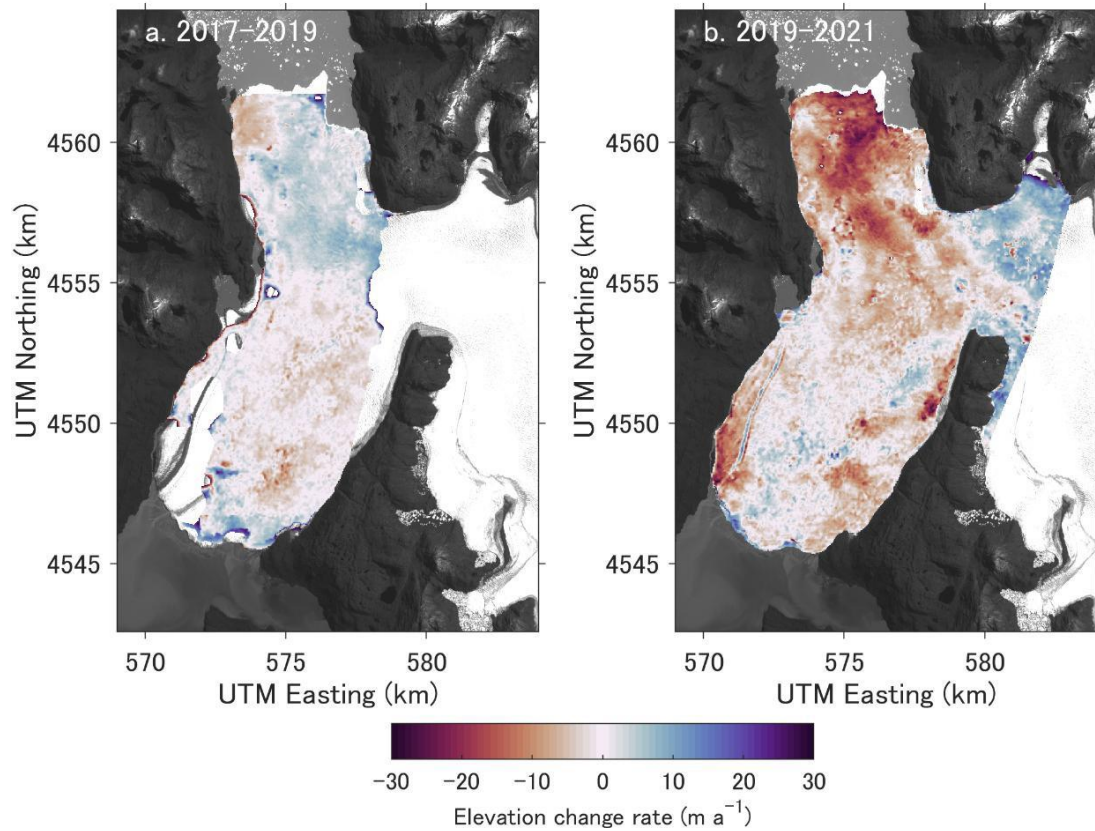


Figure S1. The rate of elevation changes of Glaciar Pío XI (a) from April 2017 to August 2019, and (b) from August 2019 to March 2021.

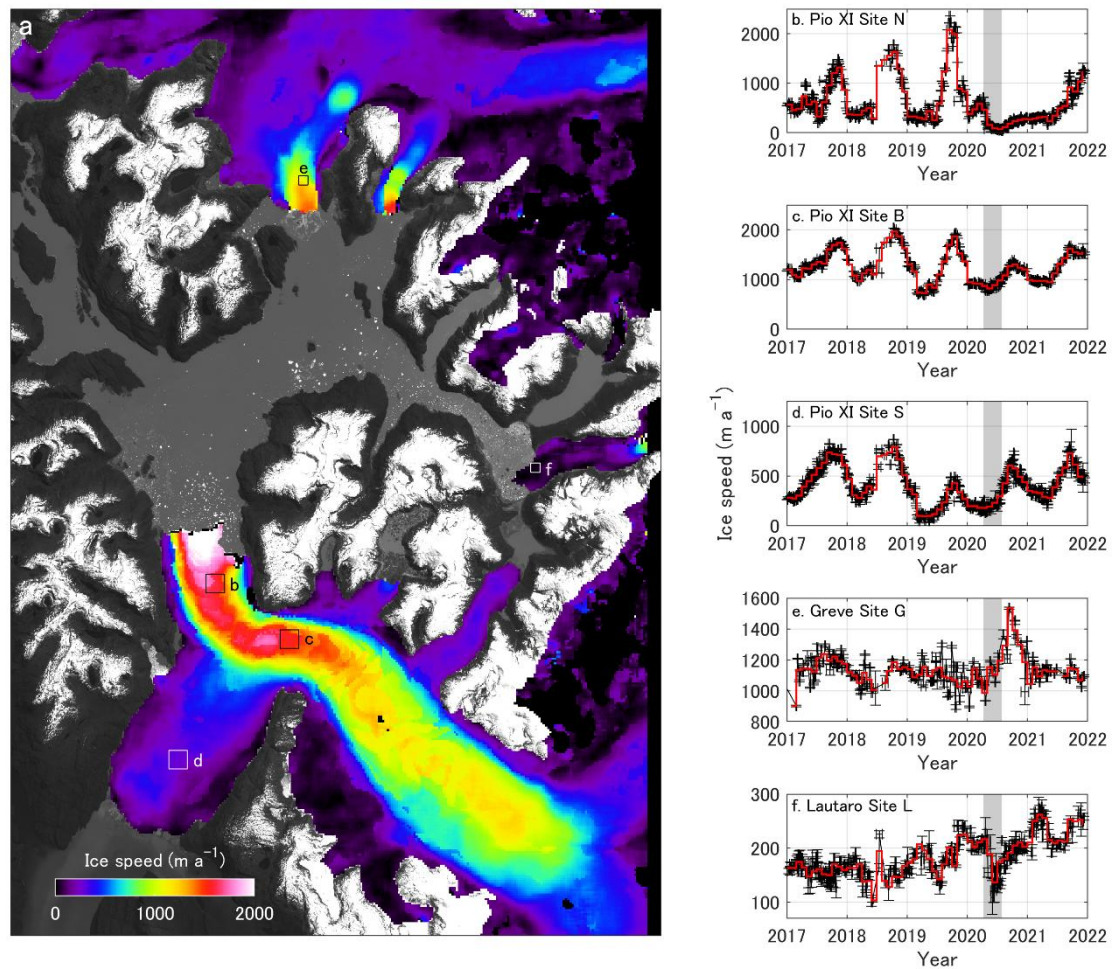


Figure S2. (a) Spatial distribution of surface flow velocity obtained from the Sentinel-2 image pair of 12 August and 6 September 2019. Background is a Sentinel-2 image acquired on 1 November 2020. (b-f) Timeseries of flow velocities at five selected regions, (b) Site N, (c) Site B, (d) Site S of Glaciar Pío XI, (e) Site G of Glaciar Greve, (f) Site L of Glaciar Lautaro. The black makers show velocities obtained from image pairs and the red line shows monthly mean velocity. Grey hatch represents the period of the drainage event.

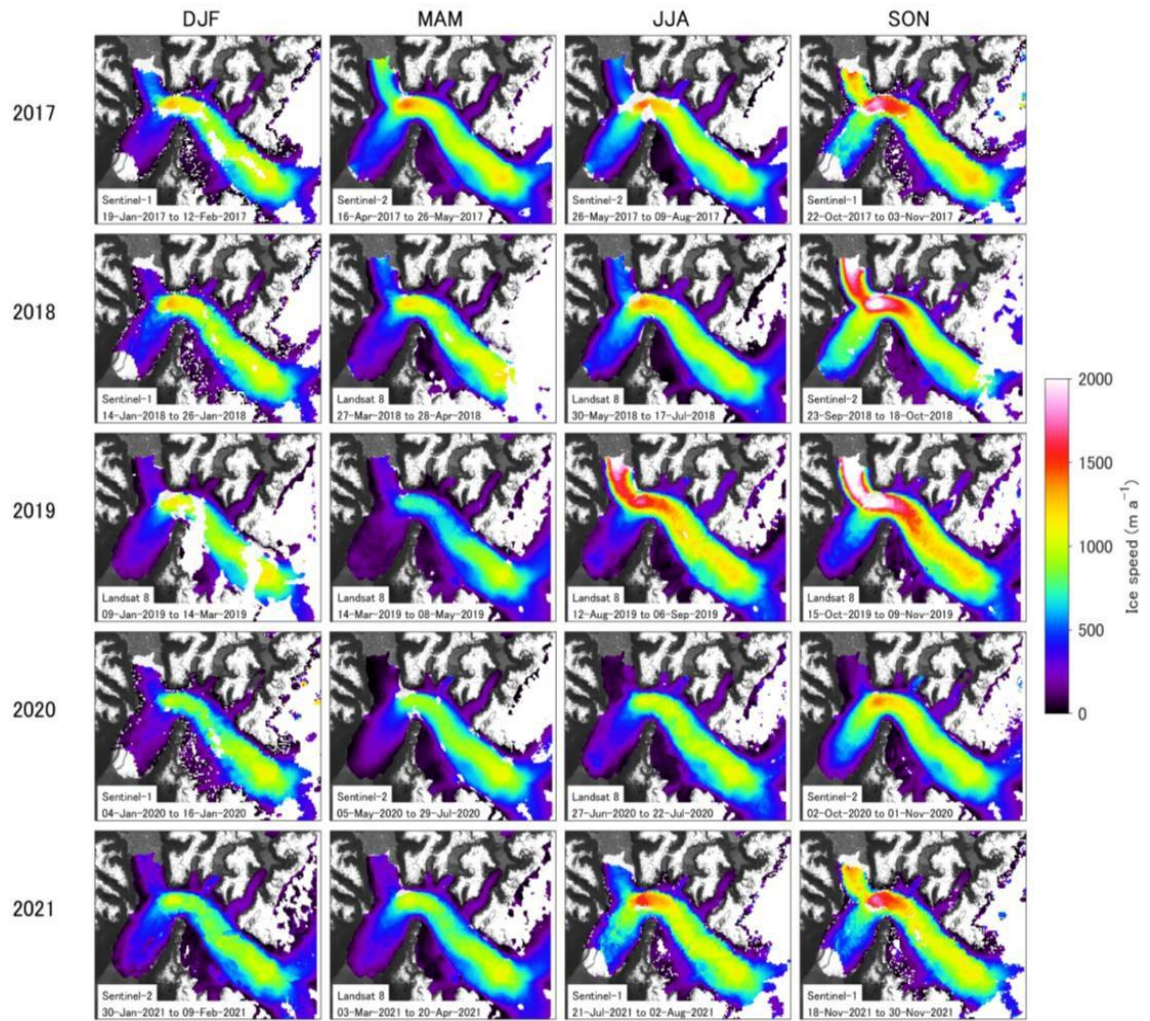


Figure S3. Spatial variation of Glaciar Pío XI ice speed from 2017 to 2021. Each column represents the corresponding months as DJF (December, January, and February), MAM (March, April, and May), JJA (June, July, and August), and SON (September, October, and November), respectively. The source image and date used to construct velocity field is indicated in each panel.

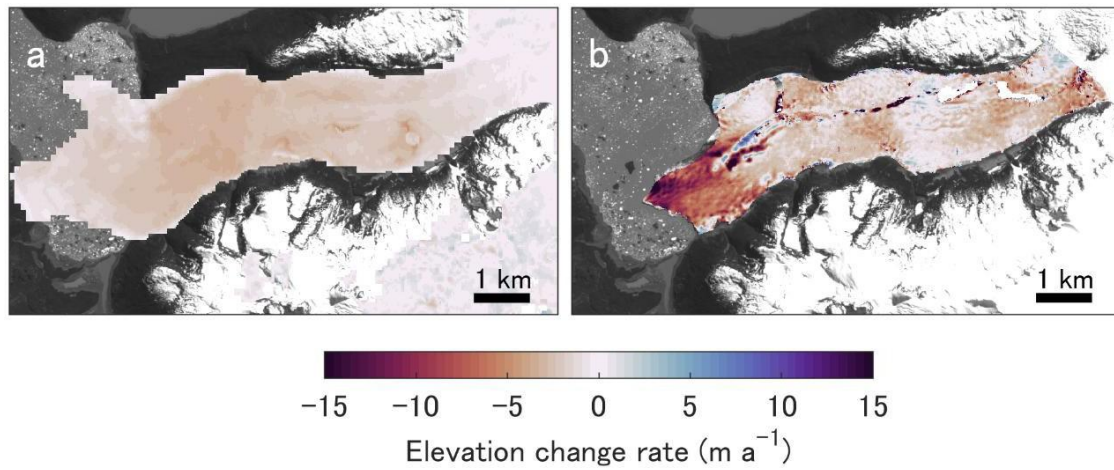


Figure S4. The rate of elevation changes of Glaciar Lautaro (a) from February 2000 to 2019 (Minowa et al., 2021), and (b) from August 2019 to February 2021 (This study).

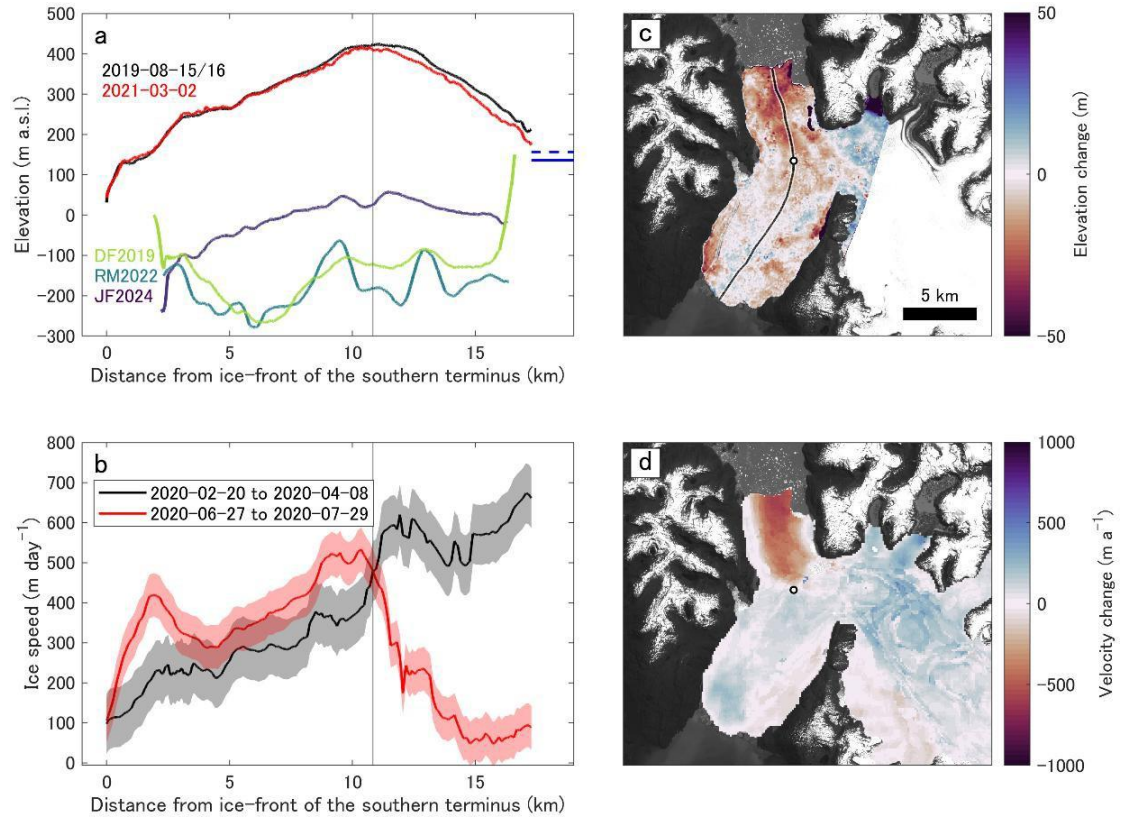


Figure S5. (a) The surface and bed topography, and (b) flow velocity along a profile shown in (c). Blue lines in (a) show the altitude of the lake surface before (solid) and after (dashed) the drainage event at Lago Greve. (c) The elevation difference between 15/16 August 2019 and 2 March 2021 (same as Figure 2a). (d) The spatial distribution of velocity difference between two velocity fields 20 February 2020 to 8 April 2020, and 27 June 2020 to 29 July 2020. The vertical line in (a, b) is a position of the white circle in (c, d), indicating ice speed difference between the two velocities in (b) was 0.

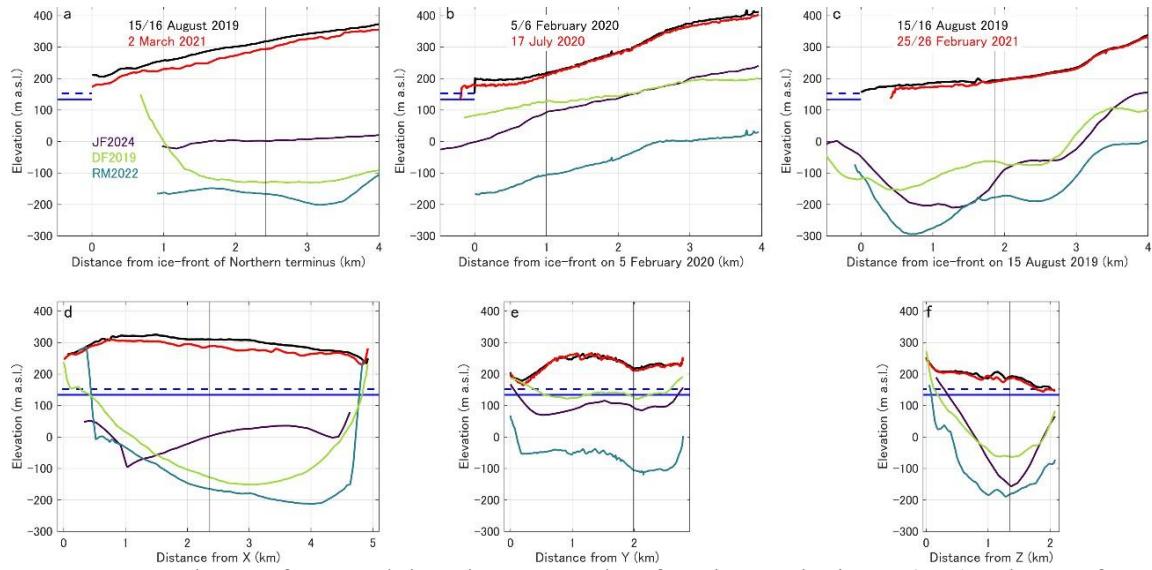


Figure S6. The surface and basal topography for three glaciers. (a–c) The surface elevations and bed-elevation along glacier flow for (a) Glaciar Pio XI, (b) Glaciar Greve, and (c) Glaciar Lautaro. (d–f) Similar plots but for elevation along cross profiles. (a) and across flow (b) of Glacier Pío XI. (c, d) Same plot for Glaciar Greve of along flow (c) and (d) across flow. (e, f) Same plot for Glaciar Lautaro: (e) along flow and (f) across flow. Vertical lines in (a–c) indicate the location of the cross profiles shown in (d–f), respectively. Vertical lines in (d–f) are vice versa. Profiles are indicated in Figure 1, 4a, 4f, and 4k. Blue lines show the altitude of lake surface before (solid) and after (dashed) the drainage event at Lago Greve. Green, blue, and purple lines indicate the bed elevation estimated by models; DF2019: Farinotti et al. (2019), RM2022: Millan et al. (2022), and JF2024: Fürst et al. (2024).