Supplement of "Multi-decadal evolution of Crary Ice Rise region, West Antarctica, amid modern ice-stream deceleration"

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OVERVIEW:

Figures in this document consist of a 20-year time series of ice surface-elevation change rate (dh/dt) estimates (Fig. S1), root mean square error of dh/dt estimates at each time series interval (Fig. S2), a time series of regional mean values of dh/dt in the Crary Ice Rise region (Fig. S3), a 20-year time series of anomalous dh/dt estimates (Fig. S4), time series of mean anomalous dh/dt and standard deviations within dh/dt anomaly regions (Fig. S5), and time series of mean anomalous geodetic mass balance and standard deviations within subregions (Fig. S6).

Figure S1: Full time series of dh/dt

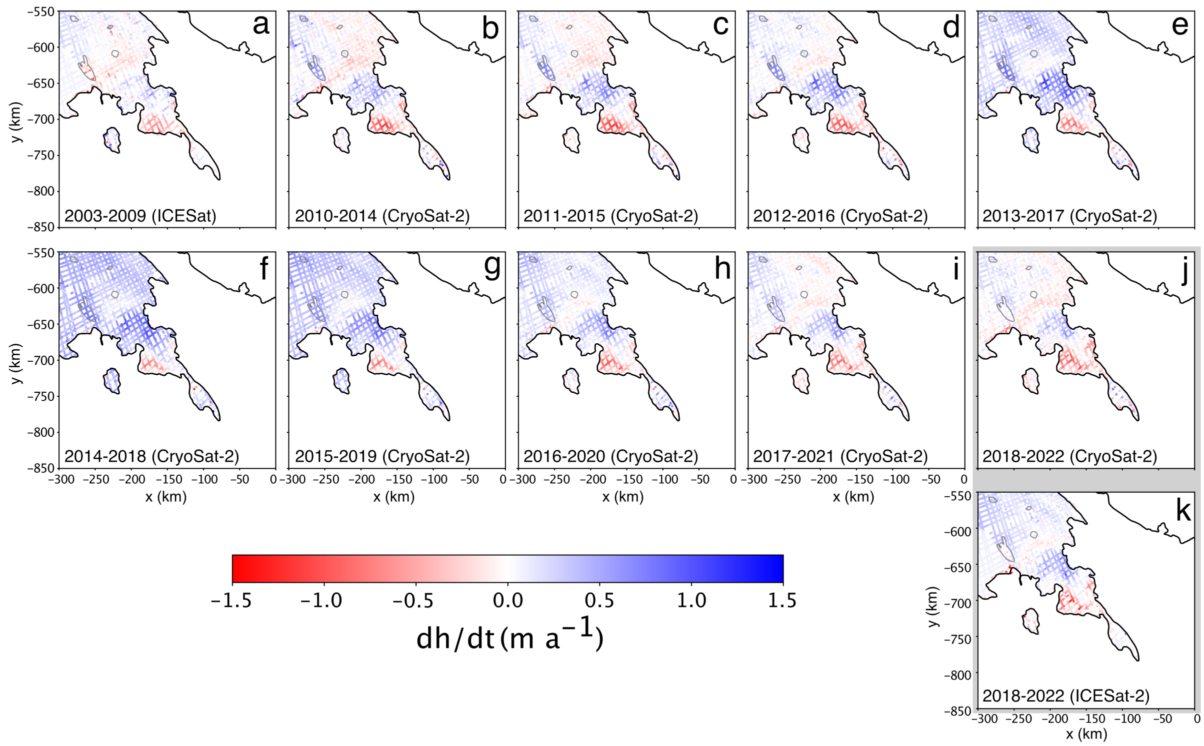

Fig. S1. The complete 20-year time series (2003–2022) of ice surface-elevation change rate (dh/dt) estimates over grounded ice in the Crary Ice Rise region from satellite altimetry. We sampled all altimetry missions to match locations of ICESat ad hoc reference tracks. We generated estimates of annual surface elevation change (m a^{-1}) from data partitioned in five-year periods. The panels represent along-track dh/dt estimates derived from ICESat, CryoSat-2, and ICESat-2 satellite altimetry observations. Satellite names and years of data used in each interval are located in the bottom left corner of each panel. Grounding line (Depoorter and others, 2013) shown in black. Subglacial lake geometries (compiled by Siegfried and Fricker, 2018) outlined in gray. Estimates of dh/dt over floating ice and the Transantarctic Mountains are excluded.

Figure S2: RMSE of dh/dt estimates

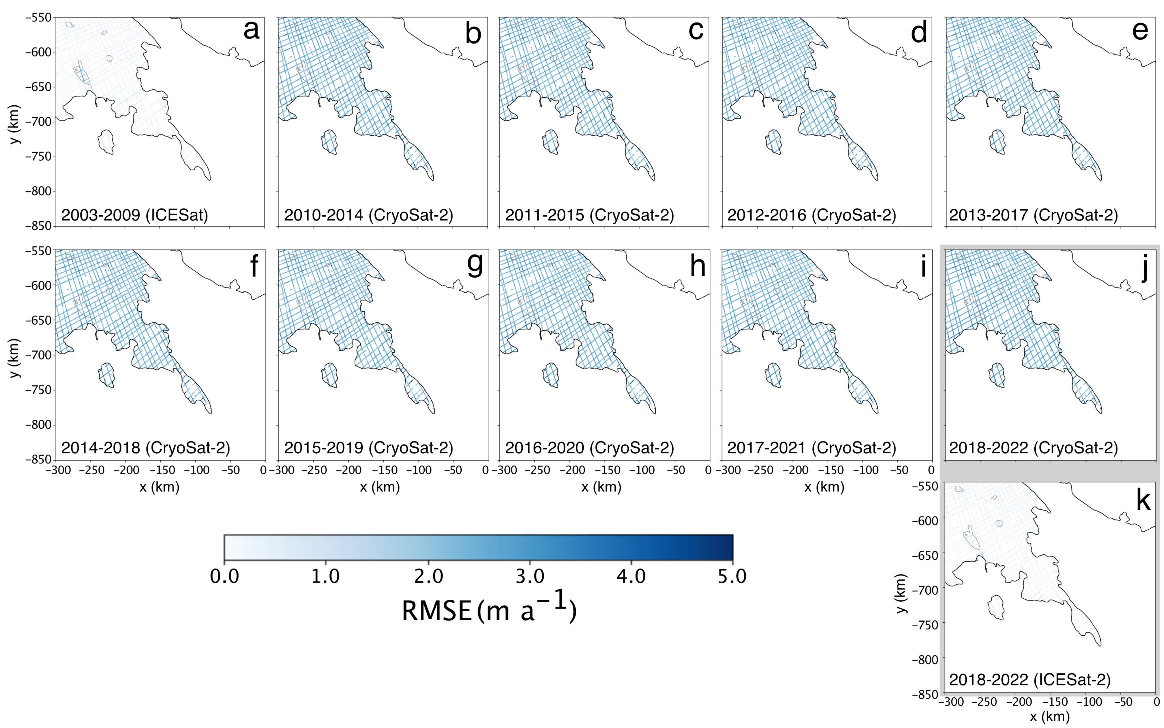

Fig. S2. Time series of root mean square error (RMSE) for each ice surface-elevation change rate (dh/dt) estimate. RMSE values indicate the fit of the model used to estimate dh/dt as compared to observations. Higher RMSE values were located near subglacial lake regions (outlined in gray; compiled by Siegfried and Fricker, 2018), which can experience substantial temporal variability of height changes during the five-year time period used for our dh/dt estimates. Due to the lower precision and denser spatial coverage of CryoSat-2 elevation observations (panels b-j), the RMSE values are higher than ICESat (panel a) or ICESat-2 (panel k). Grounding line (Depoorter and others, 2013) shown in black.

Figure S3: Time series of regional mean dh/dt

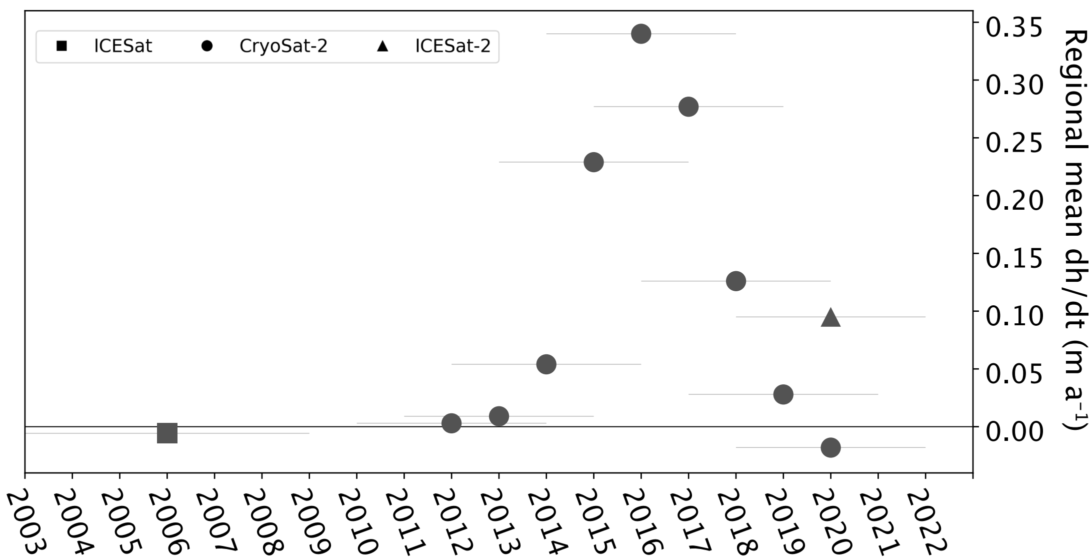

Fig. S3. The complete 20-year time series (2003–2022) of regional mean ice surface-elevation change rate (dh/dt) at each five-year data interval. ICESat data shown with a square symbol, CryoSat-2 data shown with circle symbol, and ICESat-2 data shown with a triangle symbol. X-axis positions of symbols represent the middle of the five-year data intervals and the y-axis positions represent the regional mean of dh/dt within the Crary Ice Rise region. Horizontal bars indicate the time period over which we calculated the regional average dh/dt estimate. Formal error of each regional mean dh/dt is smaller than the marker.

Figure S4: Full time series of anomalous dh/dt

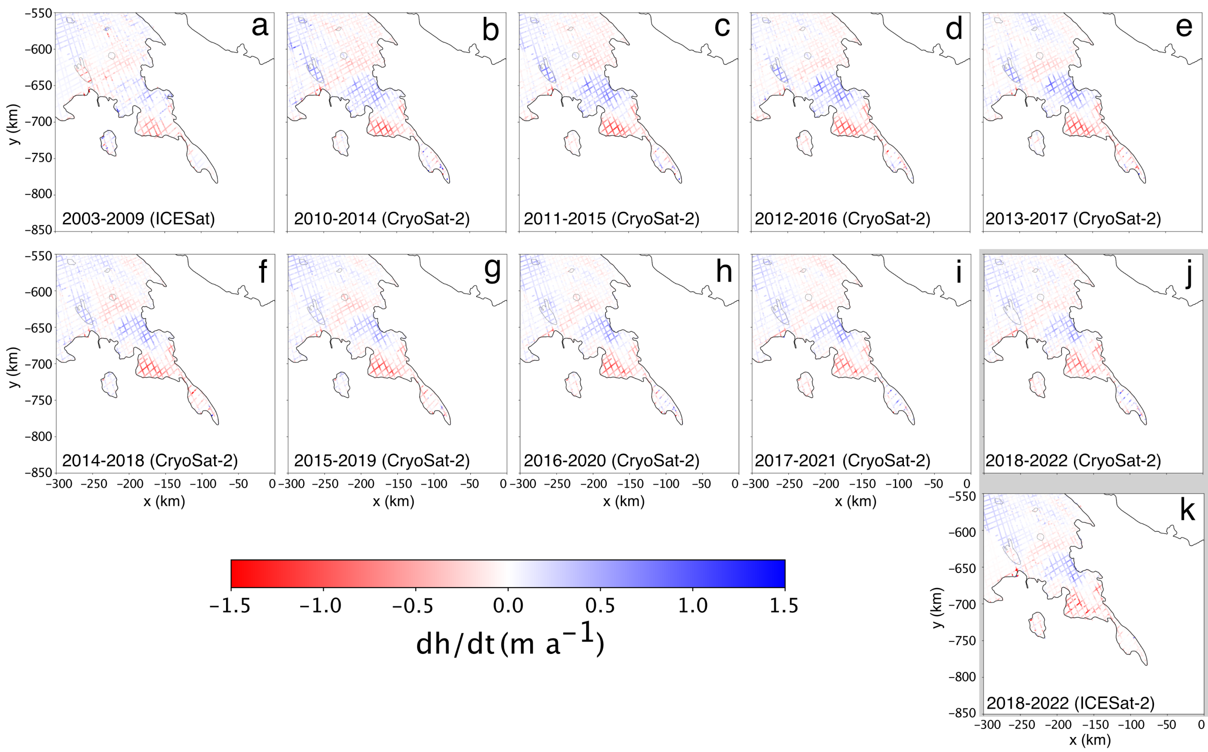

Fig. S4. The complete 20-year time series (2003–2022) of anomalous ice surface-elevation change rate (dh/dt) estimates after removing the regional mean dh/dt value of the corresponding five-year interval (all regional means that were removed are shown in Fig. S3). All missions sampled to match locations of ICESat ground tracks. The panels represent along-track anomalous dh/dt estimates derived from ICESat, CryoSat-2, and ICESat-2 satellite altimetry observations. Satellite names and years of data used in each interval are located in the bottom left corner of each panel. Grounding line (Depoorter and others, 2013) shown in black. Subglacial lake geometries outlined (compiled in Siegfried and Fricker, 2018) in gray. Estimates of anomalous dh/dt over floating ice and the Transantarctic Mountains are excluded.

Figure S5: Mean anomalous dh/dt estimates within the major dh/dt anomalies of the Crary Ice Rise region including standard deviations.

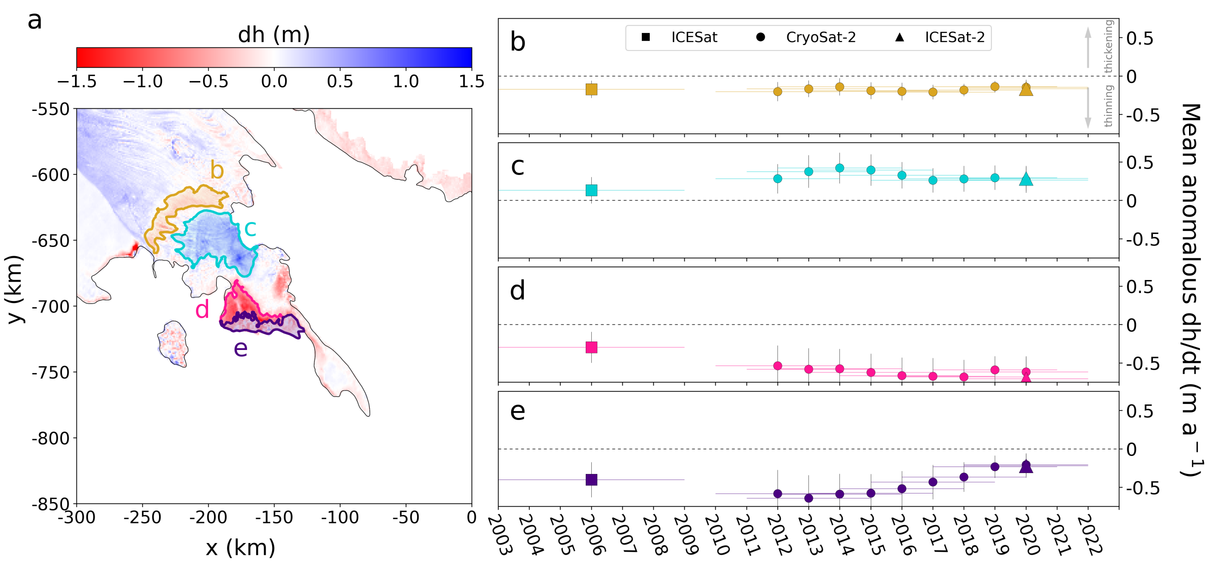

Fig. S5. Same as Figure 4 in the main text, but vertical bars in panels b–e represent one standard deviation from the mean.

Figure S6: Mean anomalous geodetic mass balance derived from anomalous dh/dt estimates within large subregions including standard deviations.

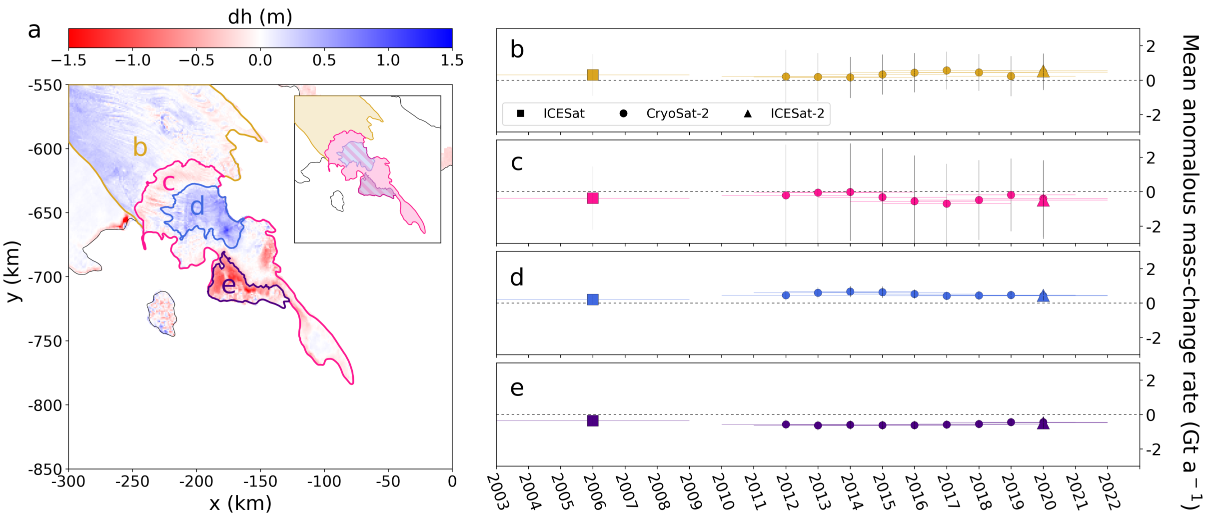

Fig. S6. Same as Figure 5 in the main text, but vertical bars in panels b–e represent one standard deviation from the mean.

REFERENCES

Depoorter MA and 6 others (2013) Calving fluxes and basal melt rates of Antarctic ice shelves. *Nature*, **502**(7469), 89–92 (doi: 10.1038/nature12567)

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