

Brief communication: ICESat-2 reveals seasonal thickness change patterns of Greenland Ice Sheet outlet glaciers for the first time

Christian J. Taubenberger^{1,2}, Denis Felikson^{1,3}, Thomas Neumann¹

¹Cryospheric Sciences Laboratory, NASA Goddard Space Flight Center, Greenbelt, Maryland, 20771, United States of America

²Atmospheric, Oceanic & Earth Sciences Dept., George Mason University, Fairfax, Virginia, 22030, United States of America

³Goddard Earth Sciences Technology and Research Studies and Investigations, Universities Space Research Association, Columbia, MD 21046, United States of America

Correspondence to: Christian J. Taubenberger (ctaubenberger@gmail.com)

Supplementary Figures

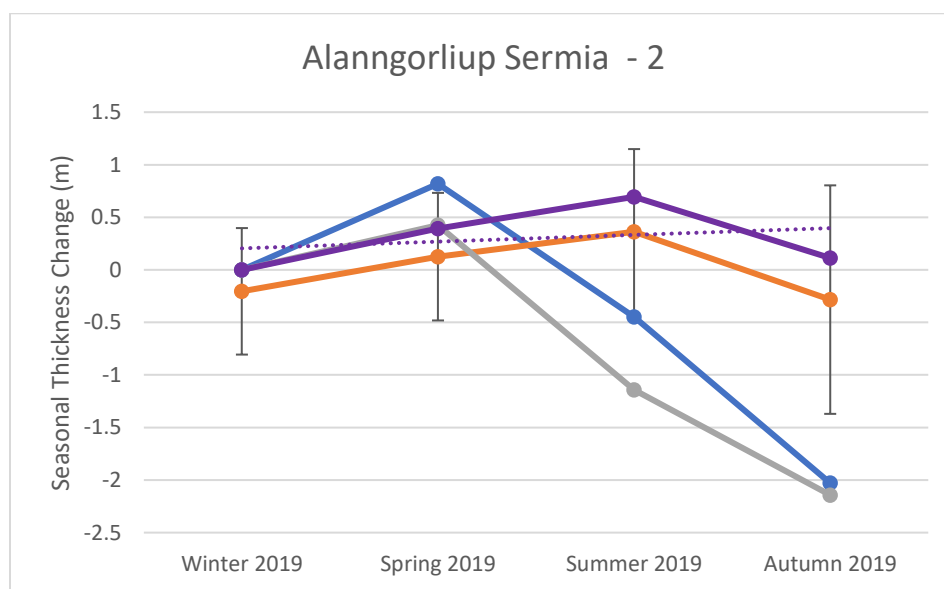


Figure S1: Seasonal thickness change of Alanngorliup Sermia. Total thickness change (blue), SMB (grey), and dynamic (purple) are displayed with their annual trend retained, alongside the trendline for the dynamic component (dashed-purple). The detrended dynamic component is shown (orange) with error bars.

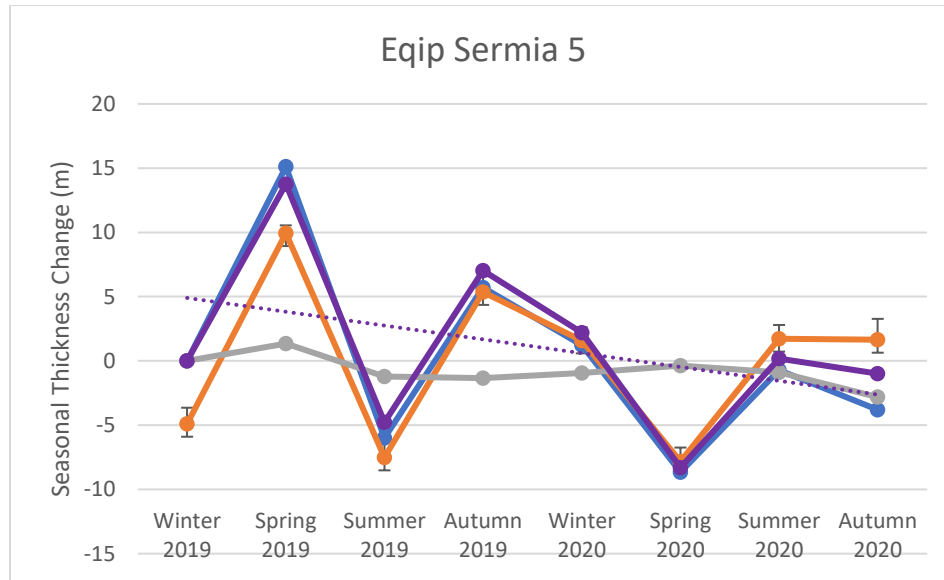


Figure S2: Seasonal thickness change of Eqip Sermia. Total thickness change (blue), SMB (grey), and dynamic (purple) are displayed with their annual trend retained, alongside the trendline for the dynamic component (dashed-purple). The detrended dynamic component is shown (orange) with error bars.

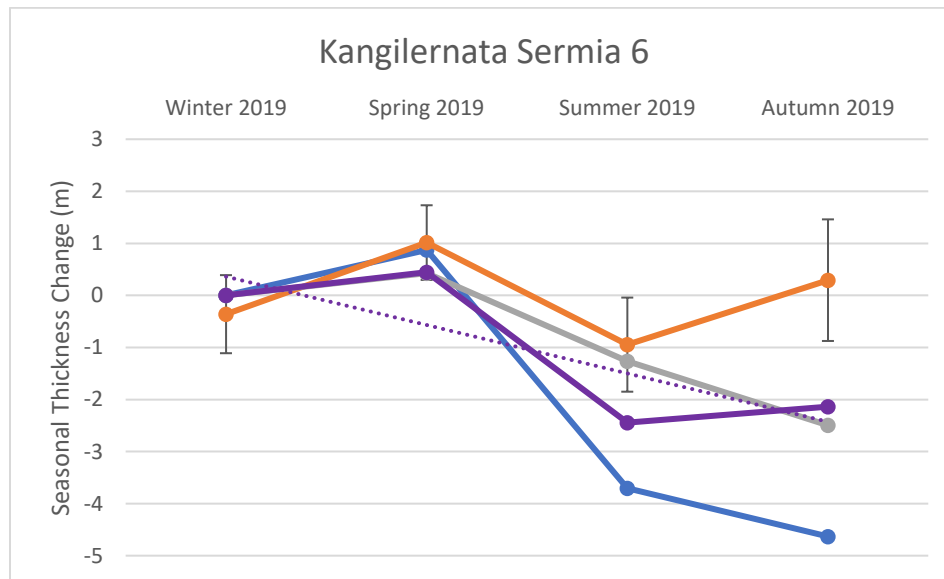


Figure S3: Seasonal thickness change of Kangilernata Sermia. Total thickness change (blue), SMB (grey), and dynamic (purple) are displayed with their annual trend retained, alongside the trendline for the dynamic component (dashed-purple). The detrended dynamic component is shown (orange) with error bars.

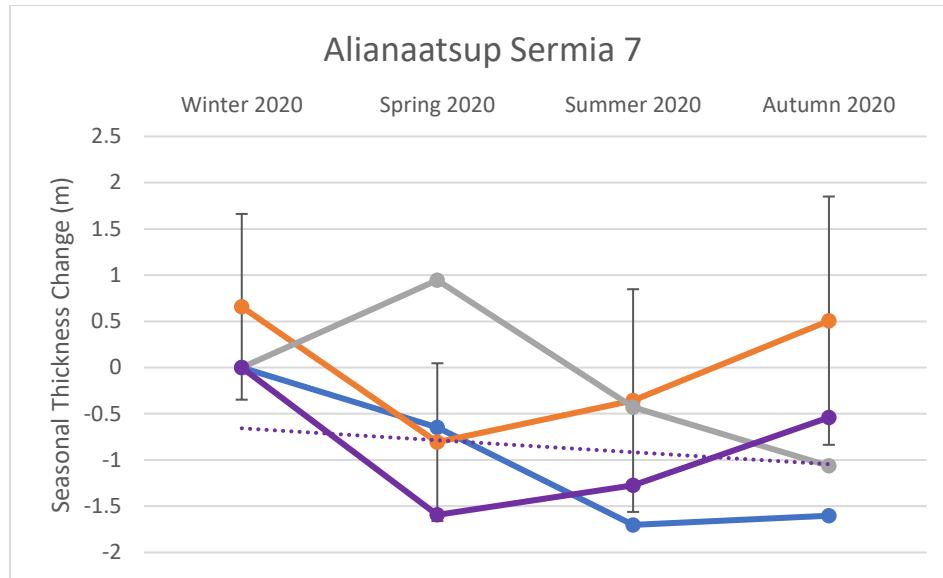


Figure S4: Seasonal thickness change of Alianaatsup Sermia. Total thickness change (blue), SMB (grey), and dynamic (purple) are displayed with their annual trend retained, alongside the trendline for the dynamic component (dashed-purple). The detrended dynamic component is shown (orange) with error bars.

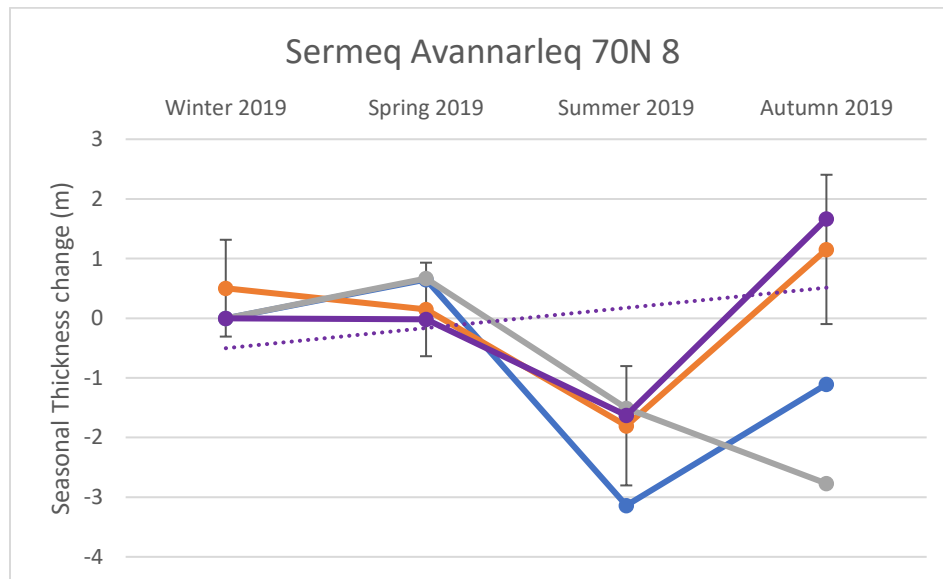


Figure S5: Seasonal thickness change of Sermeq Avannarleq 70N. Total thickness change (blue), SMB (grey), and dynamic (purple) are displayed with their annual trend retained, alongside the trendline for the dynamic component (dashed-purple). The detrended dynamic component is shown (orange) with error bars.

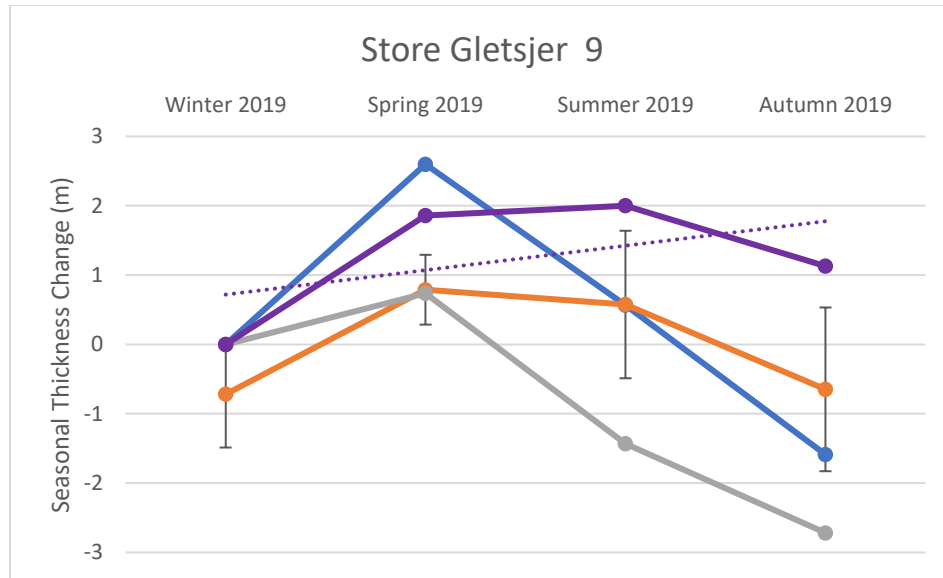


Figure S6: Seasonal thickness change of Store Gletsjer. Total thickness change (blue), SMB (grey), and dynamic (purple) are displayed with their annual trend retained, alongside the trendline for the dynamic component (dashed-purple). The detrended dynamic component is shown (orange) with error bars.

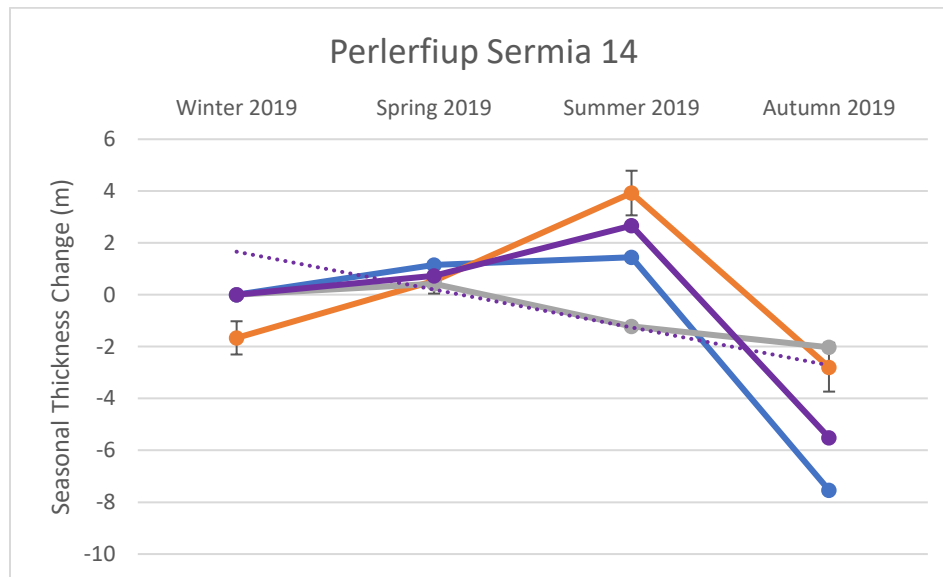


Figure S7: Seasonal thickness change of Perlerfiup Sermia. Total thickness change (blue), SMB (grey), and dynamic (purple) are displayed with their annual trend retained, alongside the trendline for the dynamic component (dashed-purple). The detrended dynamic component is shown (orange) with error bars.

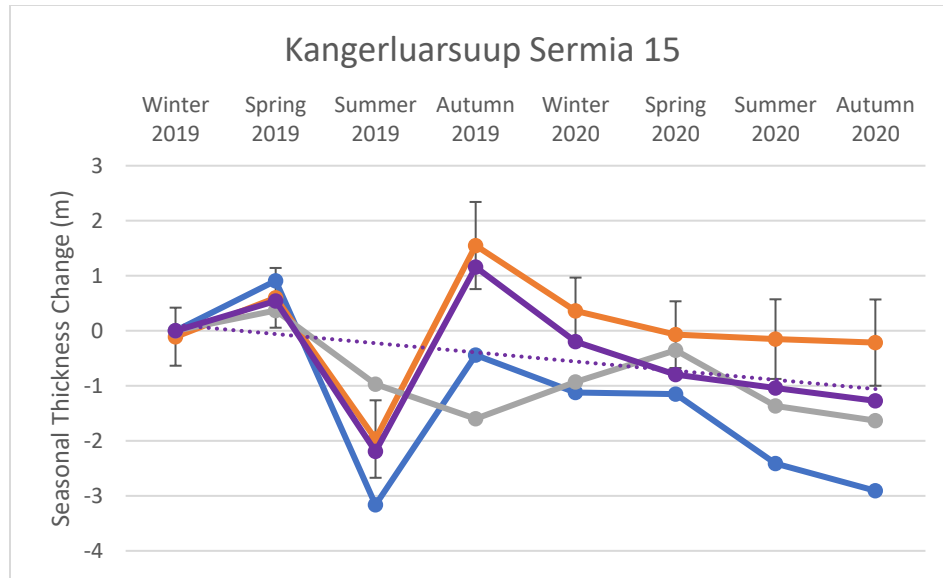


Figure S8: Seasonal thickness change of Kangerluarsuup Sermia. Total thickness change (blue), SMB (grey), and dynamic (purple) are displayed with their annual trend retained, alongside the trendline for the dynamic component (dashed-purple). The detrended dynamic component is shown (orange) with error bars.

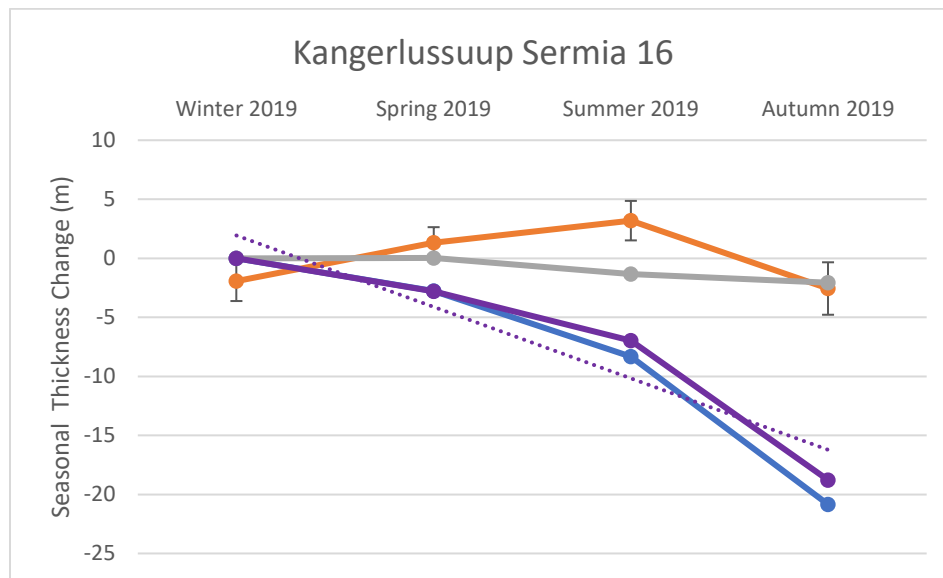


Figure S9: Seasonal thickness change of Kangerlussuup Sermia. Total thickness change (blue), SMB (grey), and dynamic (purple) are displayed with their annual trend retained, alongside the trendline for the dynamic component (dashed-purple). The detrended dynamic component is shown (orange) with error bars.

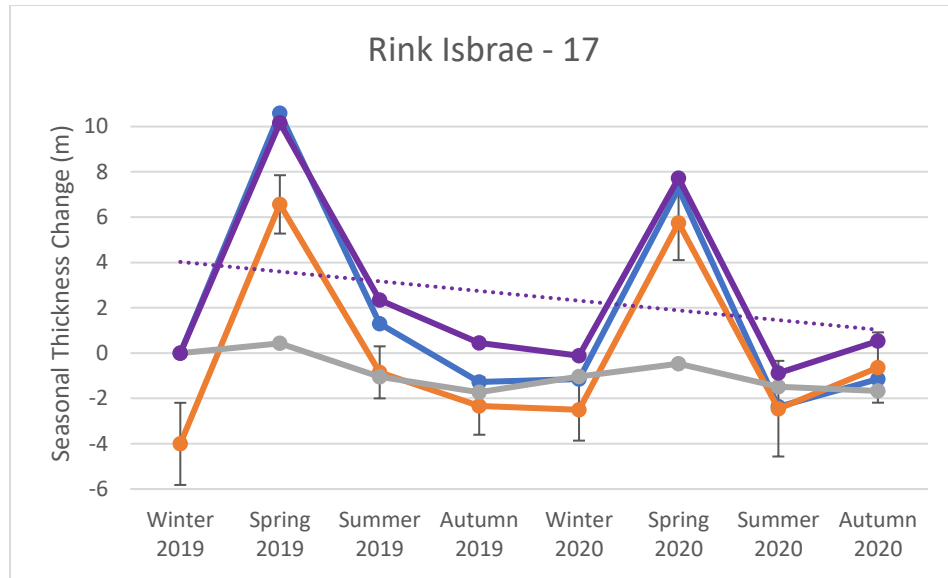


Figure S10: Seasonal thickness change of Rink Isbrae. Total thickness change (blue), SMB (grey), and dynamic (purple) are displayed with their annual trend retained, alongside the trendline for the dynamic component (dashed-purple). The detrended dynamic component is shown (orange) with error bars.

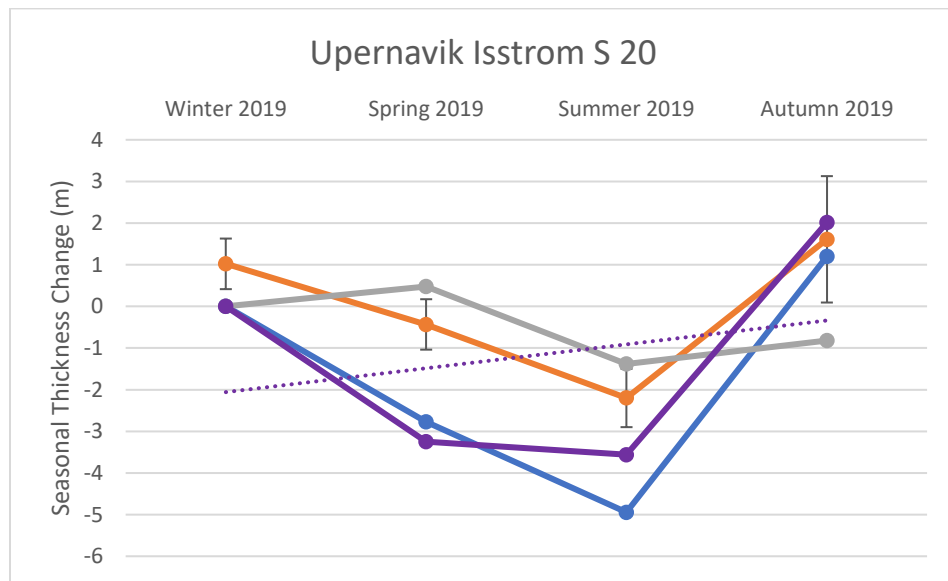


Figure S11: Seasonal thickness change of Upernavik Isstrom S. Total thickness change (blue), SMB (grey), and dynamic (purple) are displayed with their annual trend retained, alongside the trendline for the dynamic component (dashed-purple). The detrended dynamic component is shown (orange) with error bars.

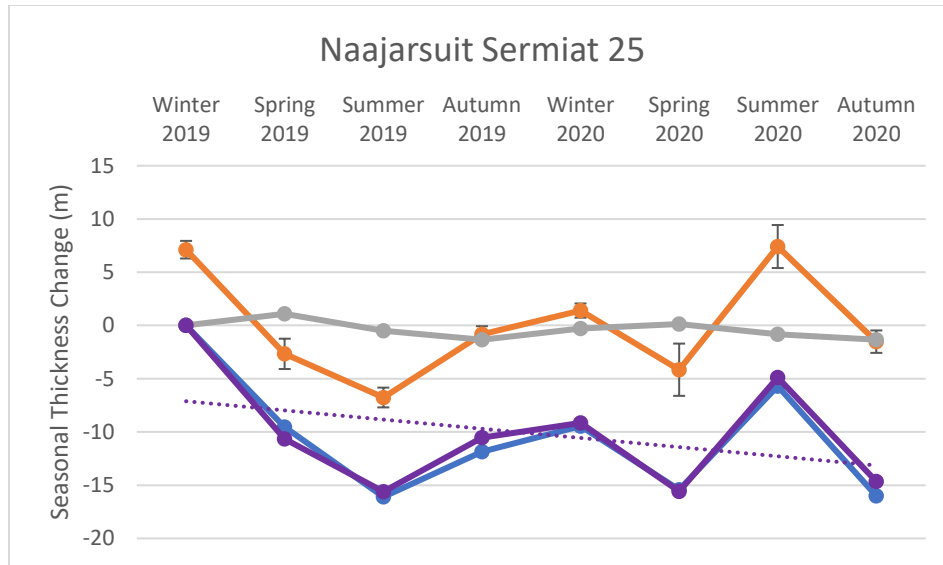


Figure S12: Seasonal thickness change of Naajarsuit Sermiat. Total thickness change (blue), SMB (grey), and dynamic (purple) are displayed with their annual trend retained, alongside the trendline for the dynamic component (dashed-purple). The detrended dynamic component is shown (orange) with error bars.

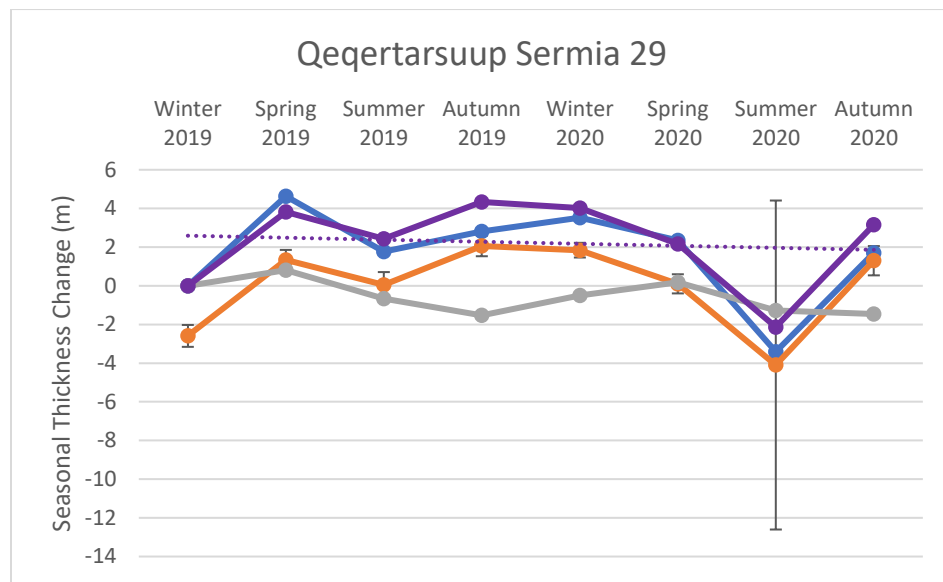


Figure S13: Seasonal thickness change of Qeqertarsuup Sermia. Total thickness change (blue), SMB (grey), and dynamic (purple) are displayed with their annual trend retained, alongside the trendline for the dynamic component (dashed-purple). The detrended dynamic component is shown (orange) with error bars.

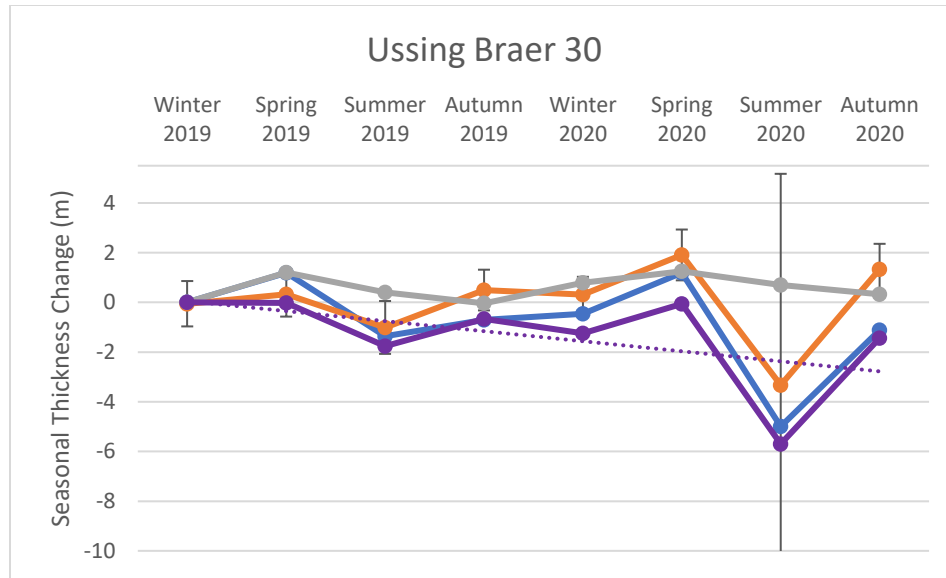


Figure S14: Seasonal thickness change of Ussing Braer. Total thickness change (blue), SMB (grey), and dynamic (purple) are displayed with their annual trend retained, alongside the trendline for the dynamic component (dashed-purple). The detrended dynamic component is shown (orange) with error bars.

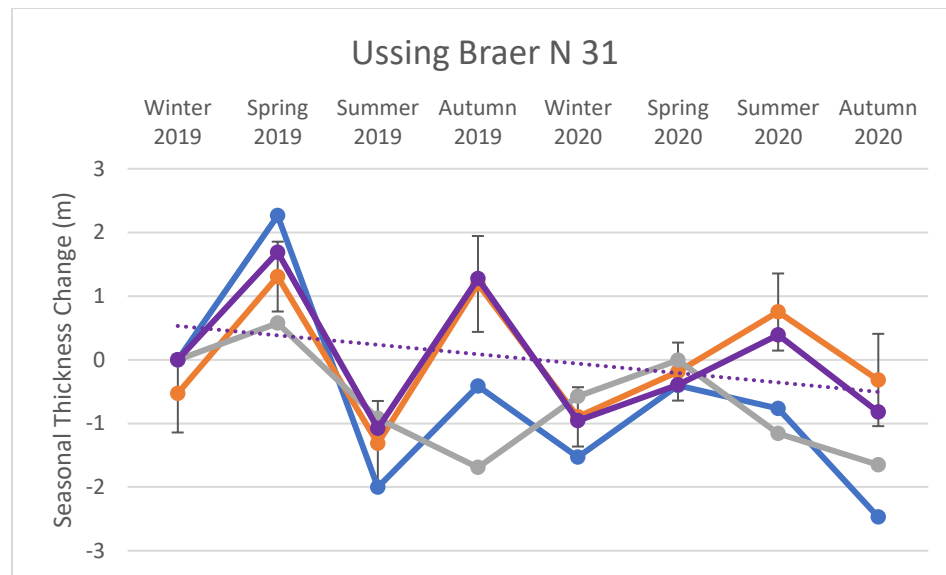


Figure S15: Seasonal thickness change of Ussing Braer N. Total thickness change (blue), SMB (grey), and dynamic (purple) are displayed with their annual trend retained, alongside the trendline for the dynamic component (dashed-purple). The detrended dynamic component is shown (orange) with error bars.

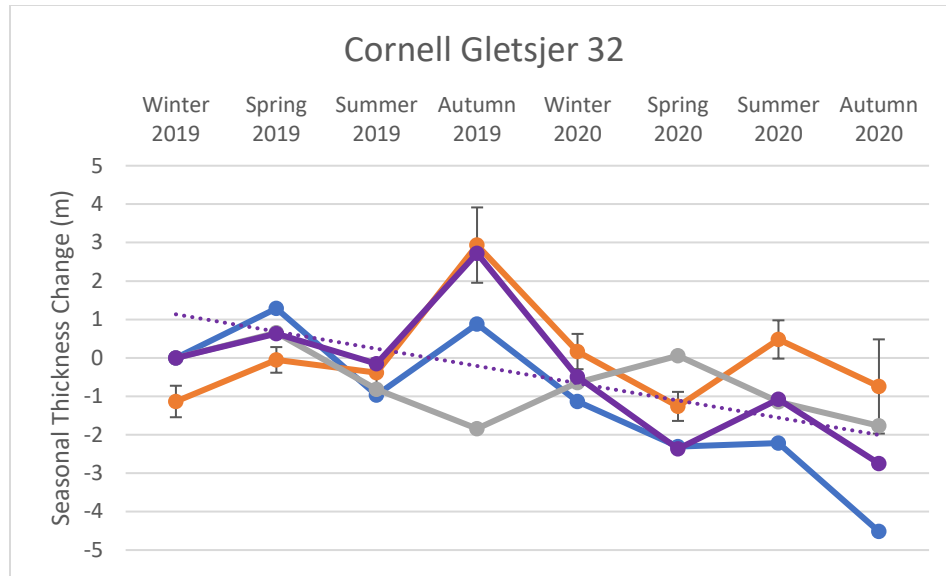


Figure S16: Seasonal thickness change of Cornell Gletsjer. Total thickness change (blue), SMB (grey), and dynamic (purple) are displayed with their annual trend retained, alongside the trendline for the dynamic component (dashed-purple). The detrended dynamic component is shown (orange) with error bars.

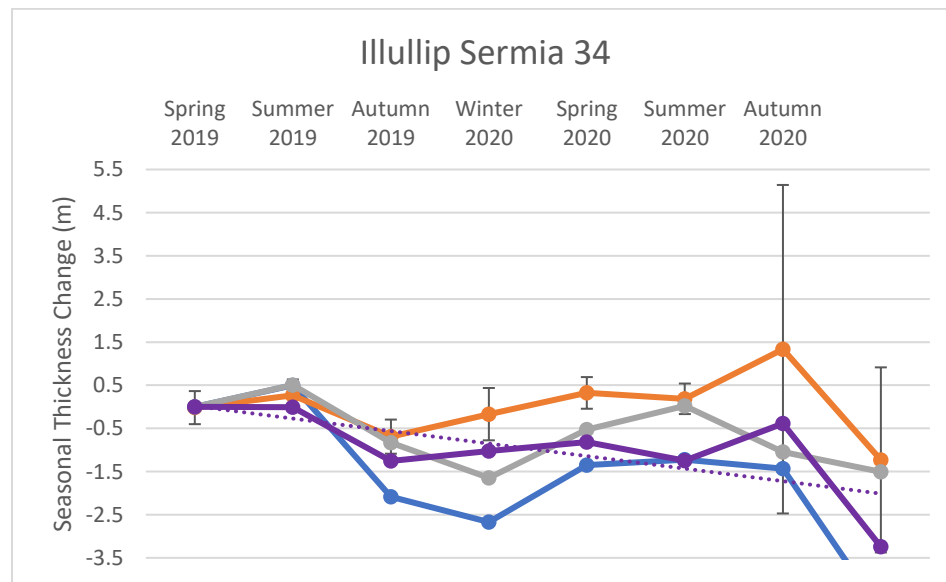


Figure S17: Seasonal thickness change of Illullip Sermia. Total thickness change (blue), SMB (grey), and dynamic (purple) are displayed with their annual trend retained, alongside the trendline for the dynamic component (dashed-purple). The detrended dynamic component is shown (orange) with error bars.

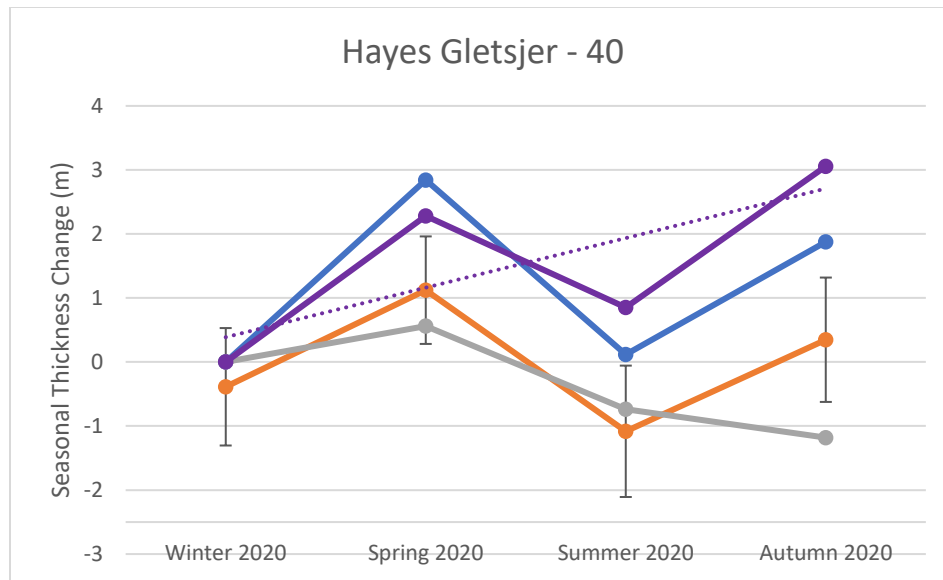


Figure S18: Seasonal thickness change of Hayes Gletsjer. Total thickness change (blue), SMB (grey), and dynamic (purple) are displayed with their annual trend retained, alongside the trendline for the dynamic component (dashed-purple). The detrended dynamic component is shown (orange) with error bars.

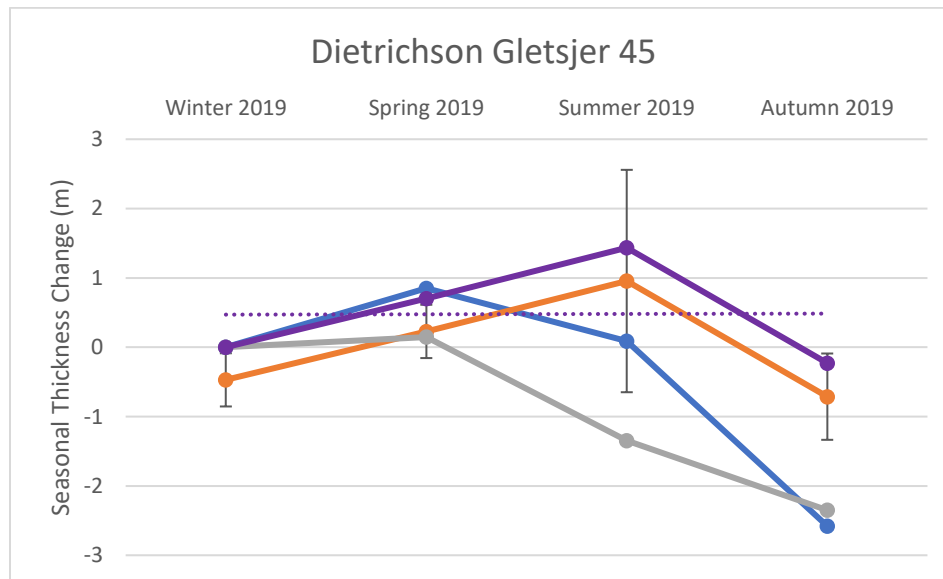


Figure S19: Seasonal thickness change of Dietrichson Gletsjer. Total thickness change (blue), SMB (grey), and dynamic (purple) are displayed with their annual trend retained, alongside the trendline for the dynamic component (dashed-purple). The detrended dynamic component is shown (orange) with error bars.

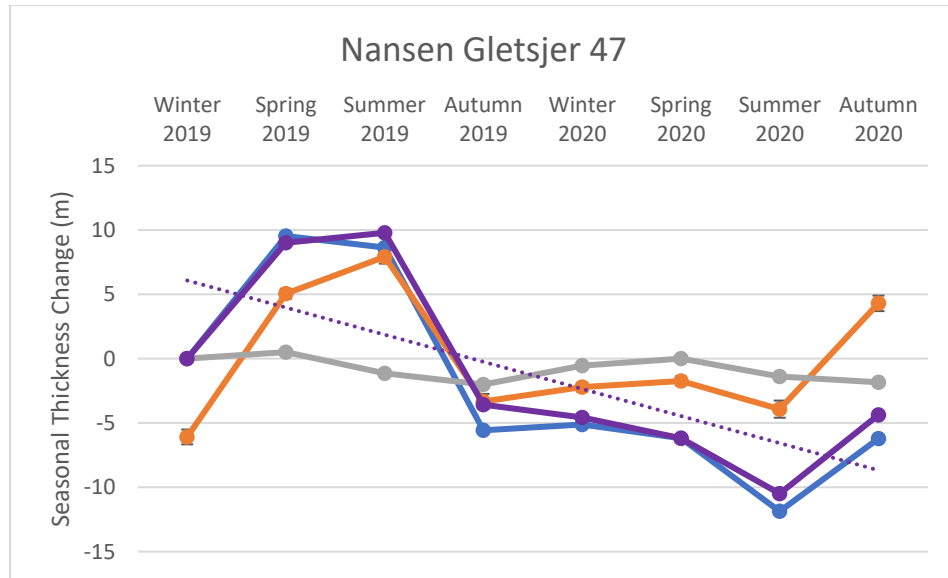


Figure S20: Seasonal thickness change of Nansen Gletsjer. Total thickness change (blue), SMB (grey), and dynamic (purple) are displayed with their annual trend retained, alongside the trendline for the dynamic component (dashed-purple). The detrended dynamic component is shown (orange) with error bars.

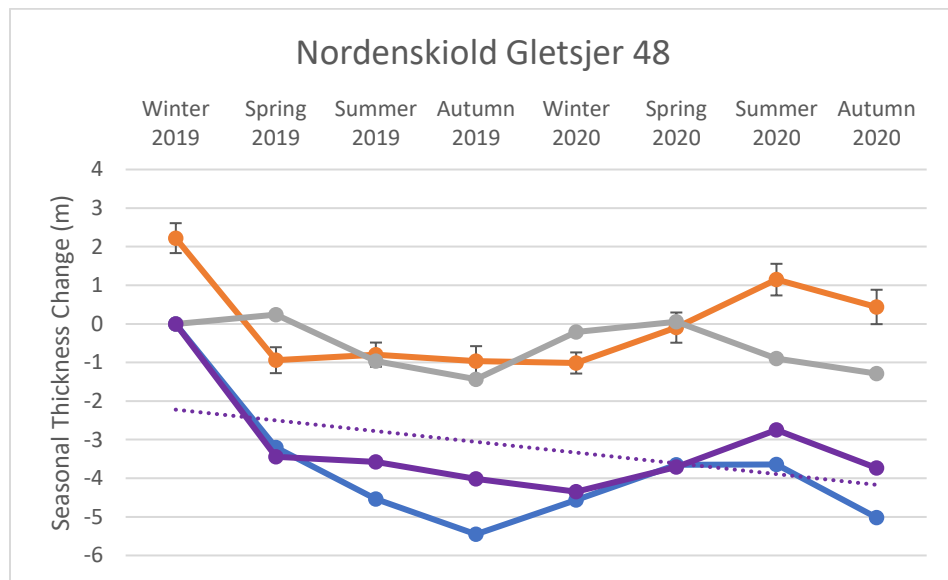


Figure S21: Seasonal thickness change of Nordenskiöld Gletsjer. Total thickness change (blue), SMB (grey), and dynamic (purple) are displayed with their annual trend retained, alongside the trendline for the dynamic component (dashed-purple). The detrended dynamic component is shown (orange) with error bars.

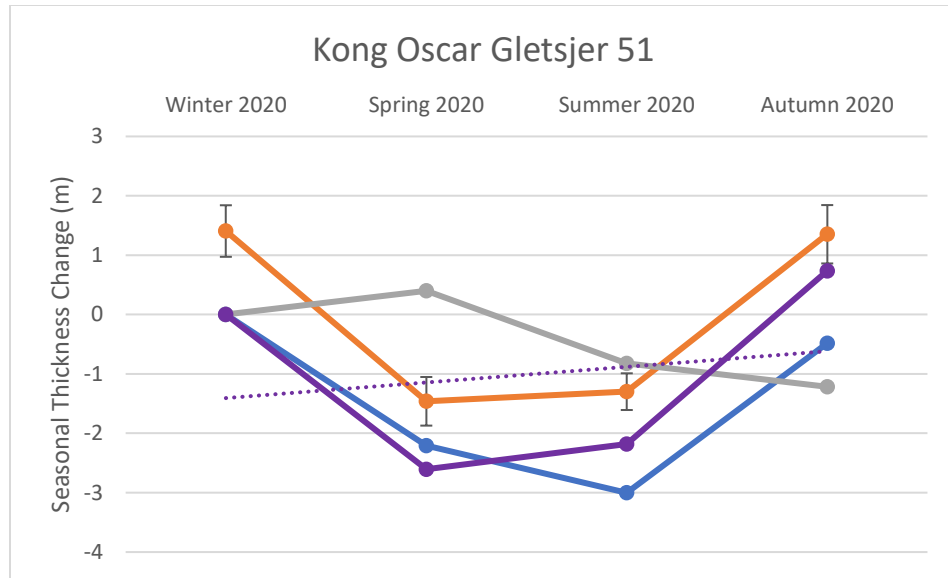


Figure S22: Seasonal thickness change of Kong Oscar Gletsjer. Total thickness change (blue), SMB (grey), and dynamic (purple) are displayed with their annual trend retained, alongside the trendline for the dynamic component (dashed-purple). The detrended dynamic component is shown (orange) with error bars.

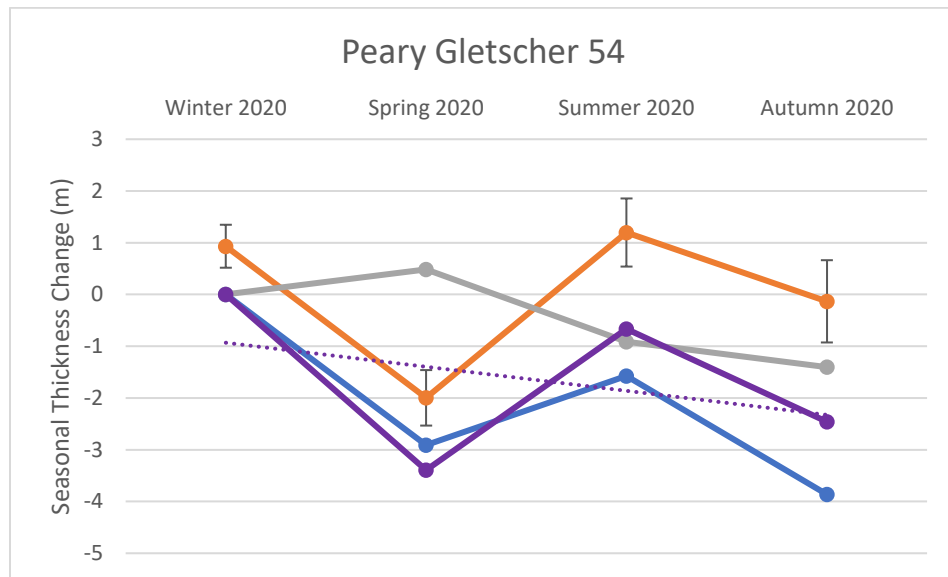


Figure S23: Seasonal thickness change of Peary Gletscher. Total thickness change (blue), SMB (grey), and dynamic (purple) are displayed with their annual trend retained, alongside the trendline for the dynamic component (dashed-purple). The detrended dynamic component is shown (orange) with error bars.

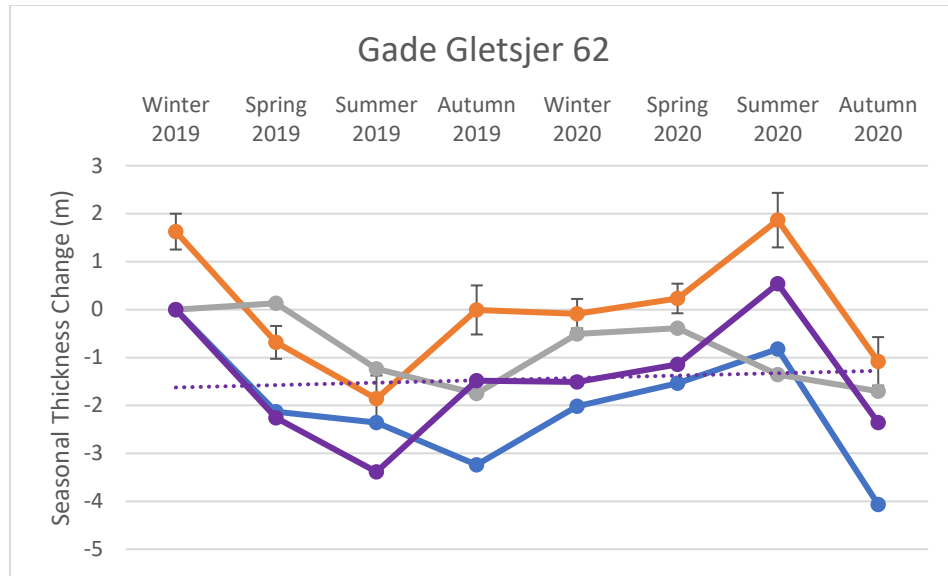


Figure S24: Seasonal thickness change of Gade Gletsjer. Total thickness change (blue), SMB (grey), and dynamic (purple) are displayed with their annual trend retained, alongside the trendline for the dynamic component (dashed-purple). The detrended dynamic component is shown (orange) with error bars.

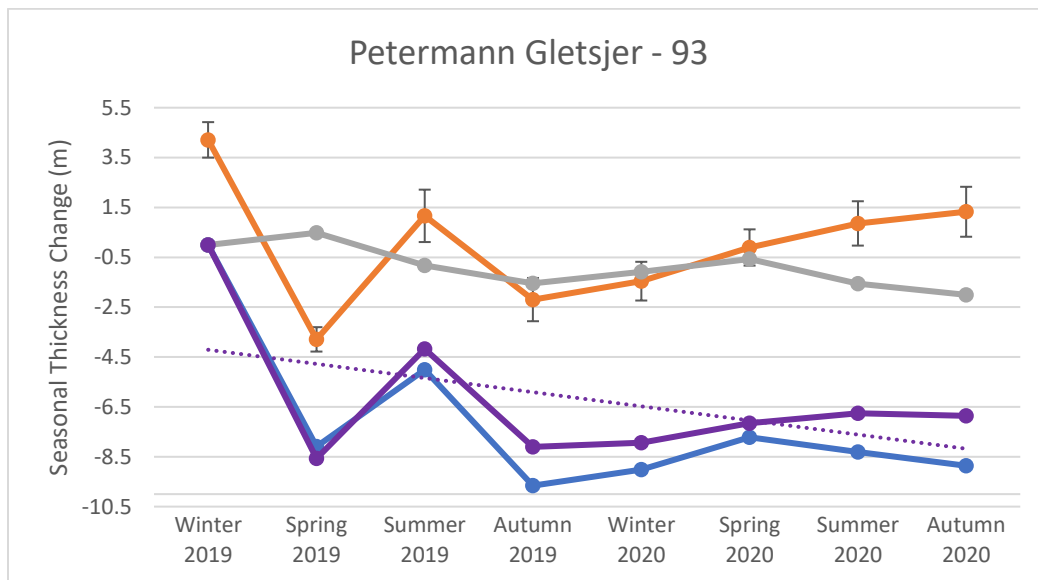


Figure S25: Seasonal thickness change of Petermann Gletsjer. Total thickness change (blue), SMB (grey), and dynamic (purple) are displayed with their annual trend retained, alongside the trendline for the dynamic component (dashed-purple). The detrended dynamic component is shown (orange) with error bars.

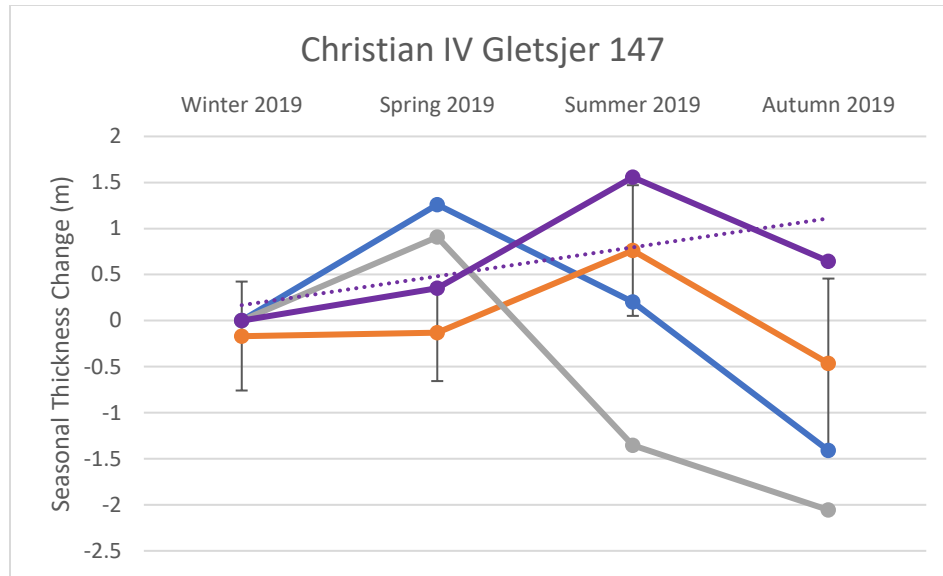


Figure S26: Seasonal thickness change of Christian IV Gletsjer. Total thickness change (blue), SMB (grey), and dynamic (purple) are displayed with their annual trend retained, alongside the trendline for the dynamic component (dashed-purple). The detrended dynamic component is shown (orange) with error bars.

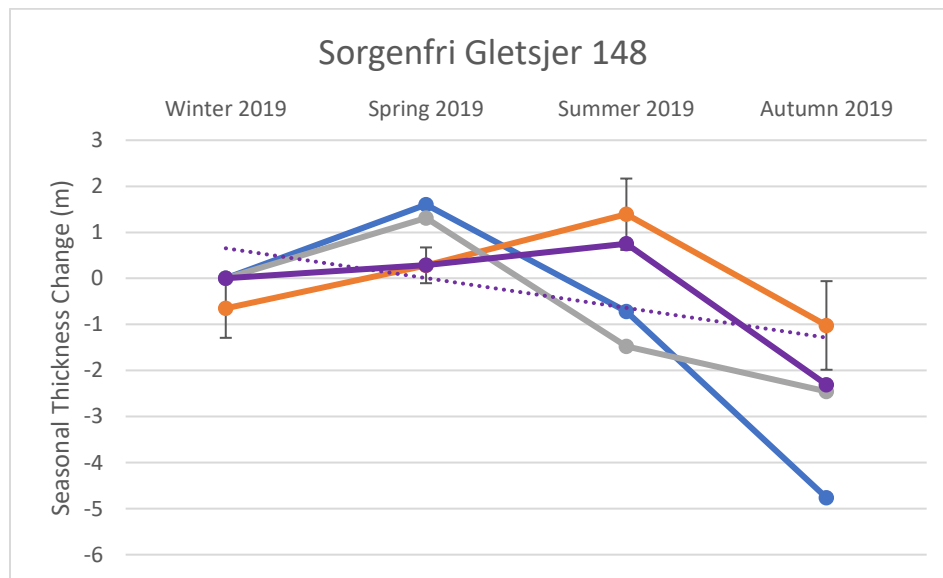


Figure S27: Seasonal thickness change of Sorgenfri Gletsjer. Total thickness change (blue), SMB (grey), and dynamic (purple) are displayed with their annual trend retained, alongside the trendline for the dynamic component (dashed-purple). The detrended dynamic component is shown (orange) with error bars.

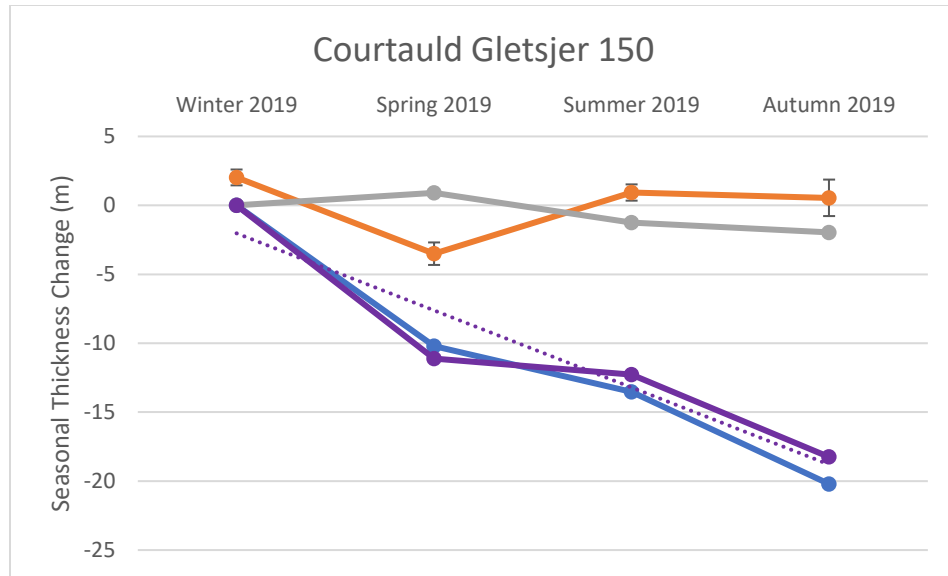


Figure S28: Seasonal thickness change of Courtauld Gletsjer. Total thickness change (blue), SMB (grey), and dynamic (purple) are displayed with their annual trend retained, alongside the trendline for the dynamic component (dashed-purple). The detrended dynamic component is shown (orange) with error bars.

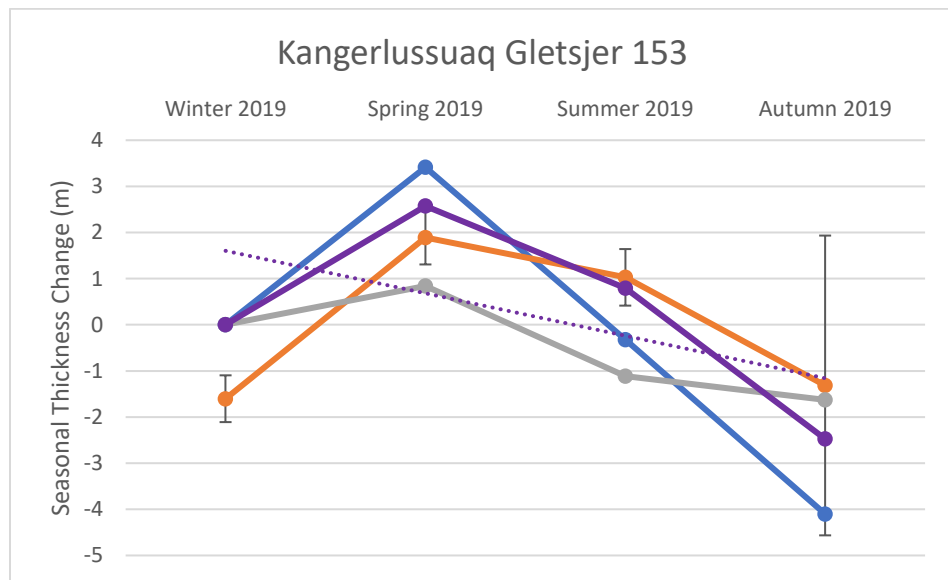


Figure S29: Seasonal thickness change of Kangerlussuaq Gletsjer. Total thickness change (blue), SMB (grey), and dynamic (purple) are displayed with their annual trend retained, alongside the trendline for the dynamic component (dashed-purple). The detrended dynamic component is shown (orange) with error bars.

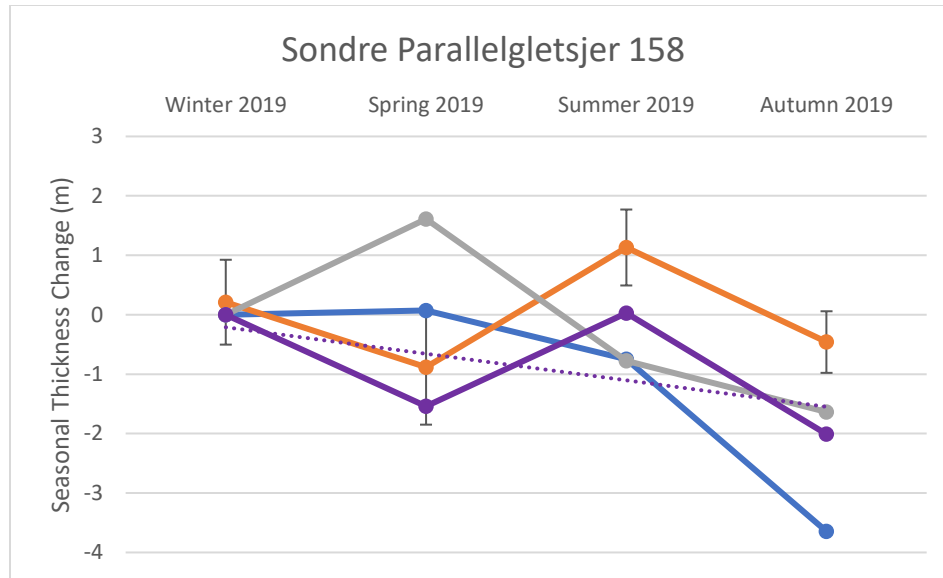


Figure S30: Seasonal thickness change of Sondre Parallelgletsjer. Total thickness change (blue), SMB (grey), and dynamic (purple) are displayed with their annual trend retained, alongside the trendline for the dynamic component (dashed-purple). The detrended dynamic component is shown (orange) with error bars.

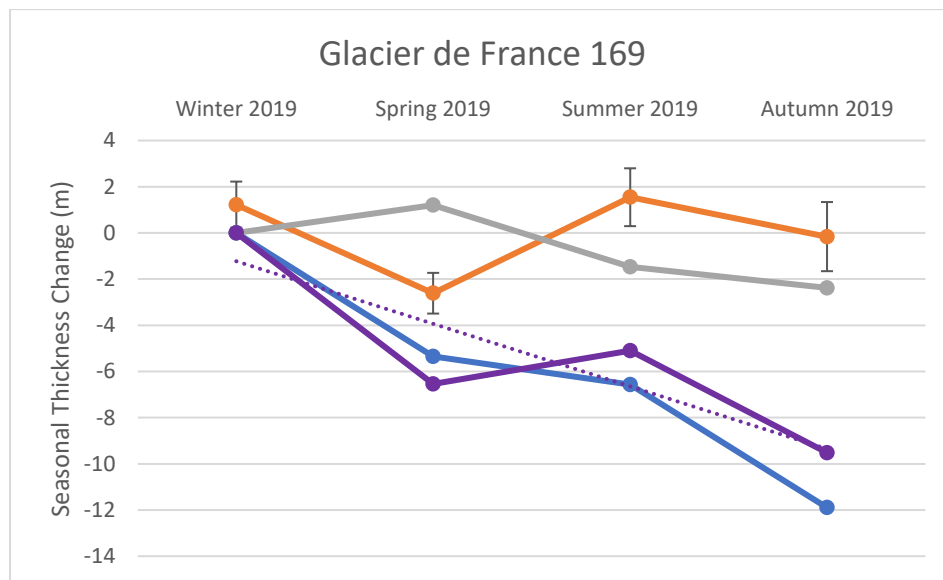


Figure S31: Seasonal thickness change of Glacier de France. Total thickness change (blue), SMB (grey), and dynamic (purple) are displayed with their annual trend retained, alongside the trendline for the dynamic component (dashed-purple). The detrended dynamic component is shown (orange) with error bars.

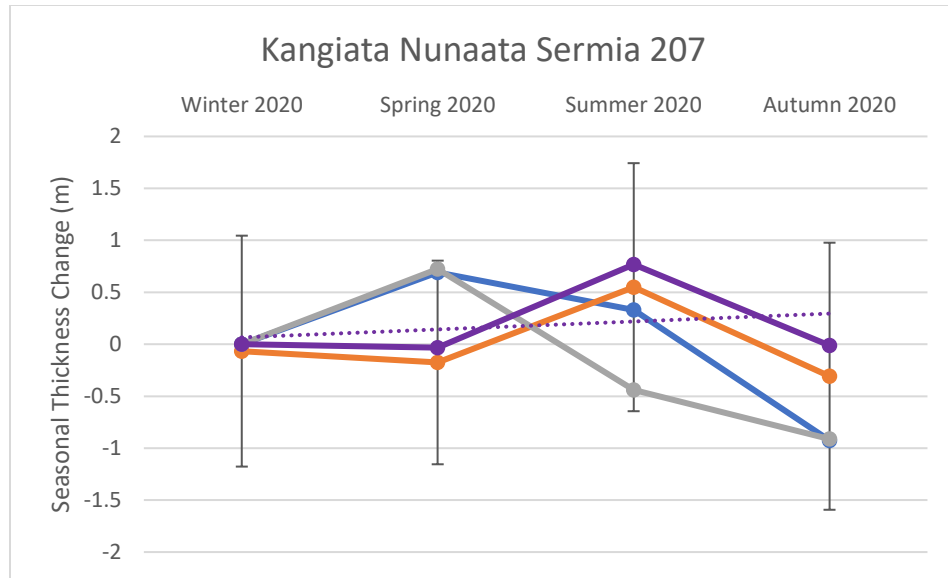


Figure S32: Seasonal thickness change of Kangiata Nunaata Sermia. Total thickness change (blue), SMB (grey), and dynamic (purple) are displayed with their annual trend retained, alongside the trendline for the dynamic component (dashed-purple). The detrended dynamic component is shown (orange) with error bars.

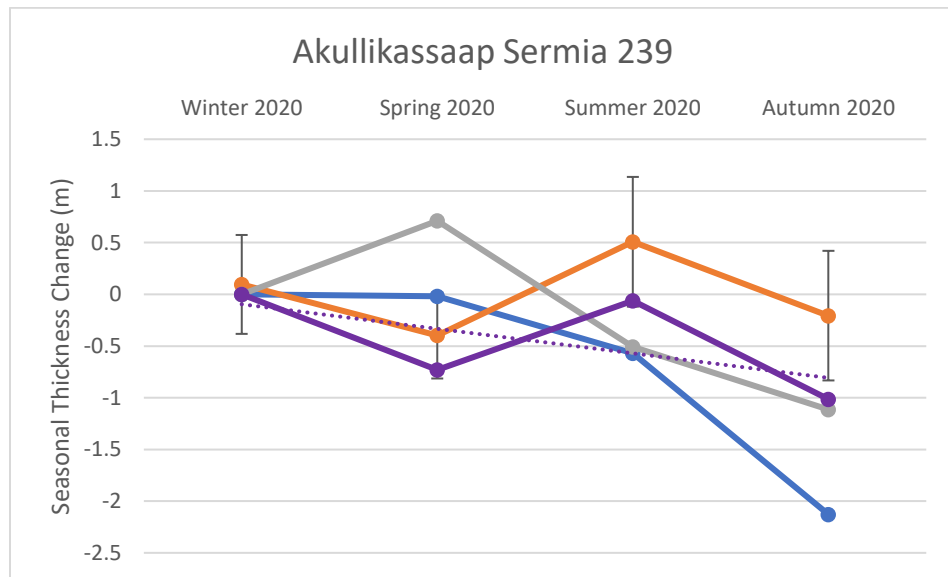


Figure S33: Seasonal thickness change of Akullikassaap Sermia. Total thickness change (blue), SMB (grey), and dynamic (purple) are displayed with their annual trend retained, alongside the trendline for the dynamic component (dashed-purple). The detrended dynamic component is shown (orange) with error bars.

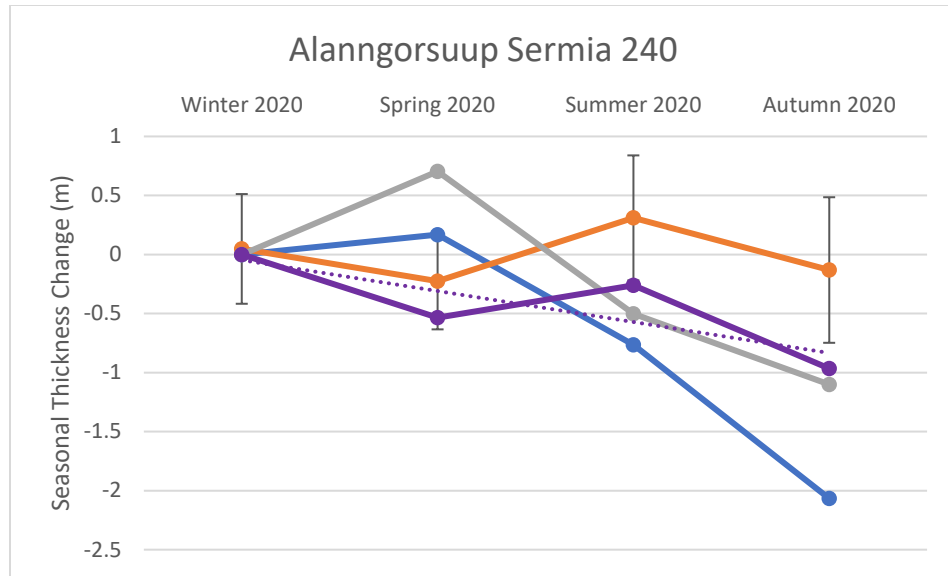


Figure S34: Seasonal thickness change of Alanngorsuup Sermia. Total thickness change (blue), SMB (grey), and dynamic (purple) are displayed with their annual trend retained, alongside the trendline for the dynamic component (dashed-purple). The detrended dynamic component is shown (orange) with error bars.