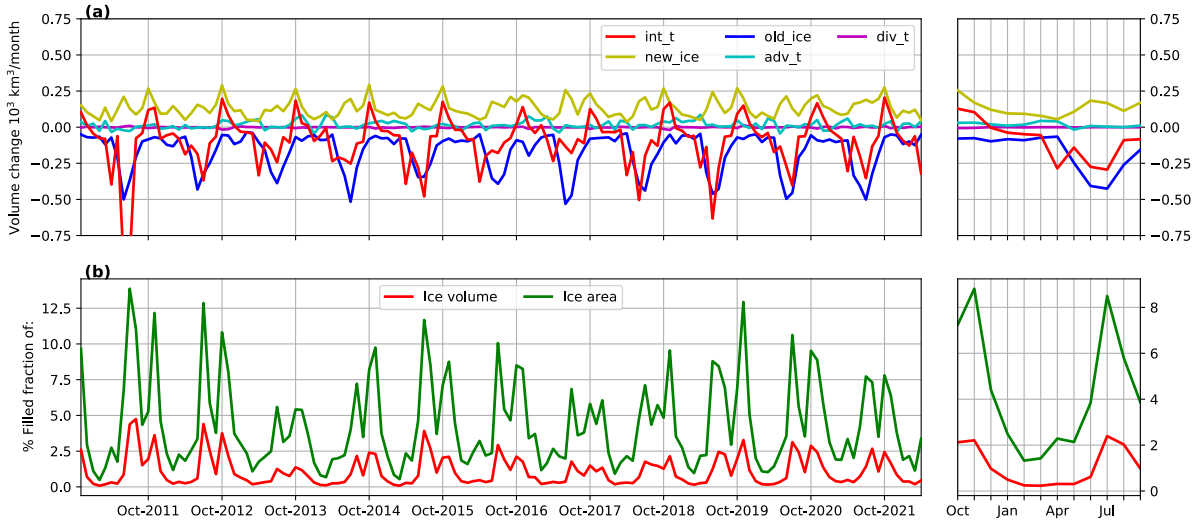
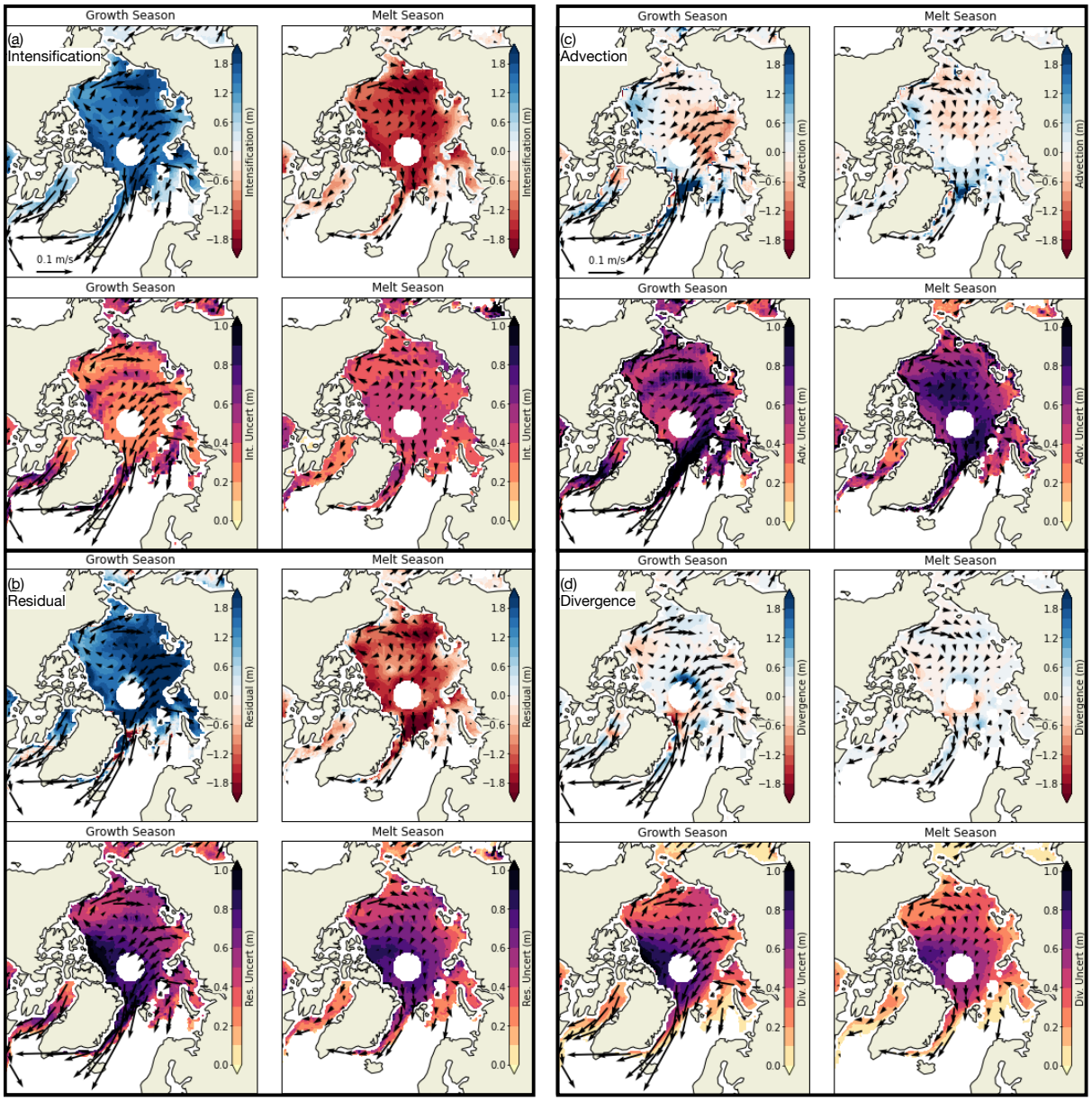
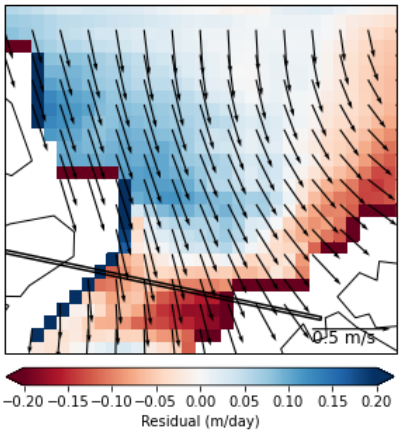


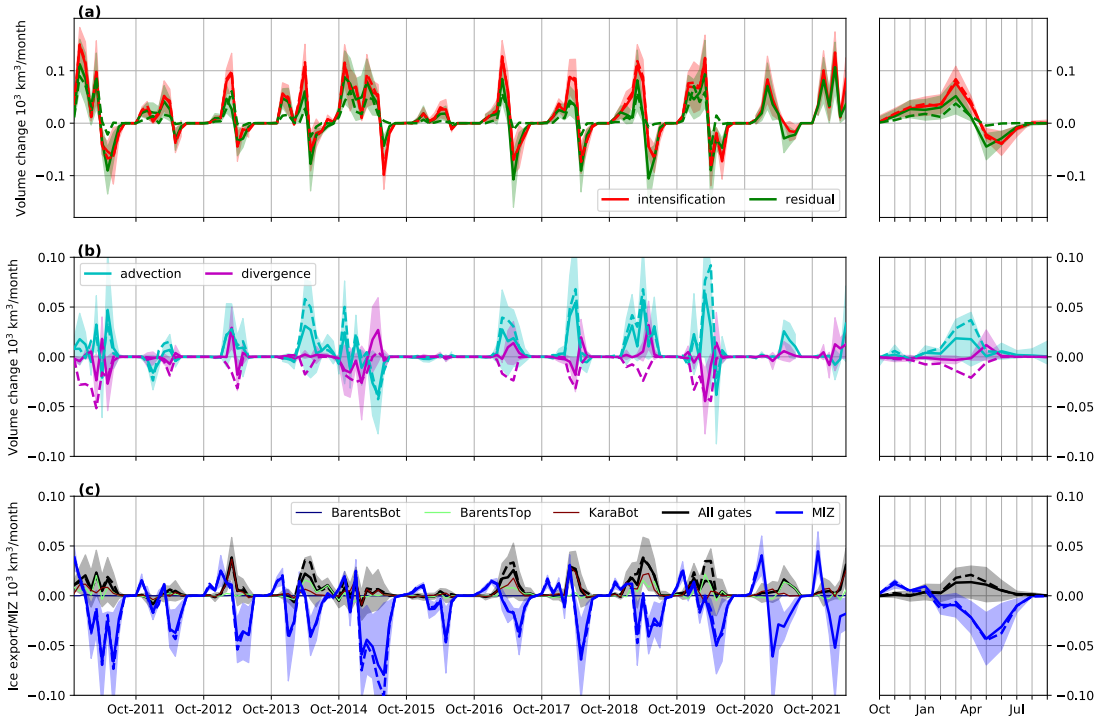
S 1 The components of the MIZ and filled thickness data in detail for the Basin region. Plot (a) shows the time series of summed filled intensification (int_t) and calculated advection over the filled grid cells (adv_t, div_t) for the full Arctic Basin plus the summed volumes of first occurring or last disappearing sea ice data cells (new_ice, old_ice). Plot (b) shows the % fraction of the total basin ice area and volume that is within the filled cells. Note that data is filled on a daily time scale, though this data is a monthly average of this filled fraction.



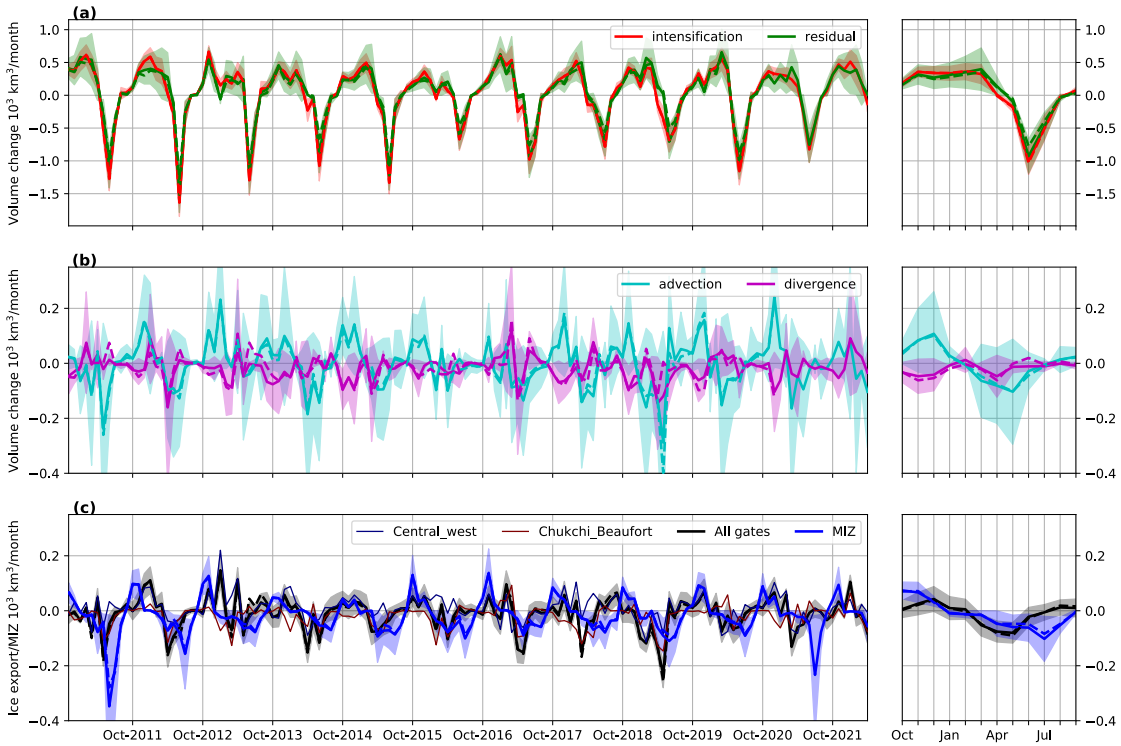
S 2 Similar to figure 2 in main text, but for Pathfinder data 2010-10-15 to 2022-04-15, for intensification (a), advection (b), divergence (c) and the residual (d), for growth seasons (Oct. 16th to Apr. 15) and melt seasons (Apr. 15th to Oct. 16). Each budget component is given as the total volume change per unit area in meters, along with its propagated uncertainty. The budget components and uncertainties are calculated daily and summed to a seasonal value. The average of all seasonal values are presented here. The arrows indicate the average ice drift speed for the season shown.



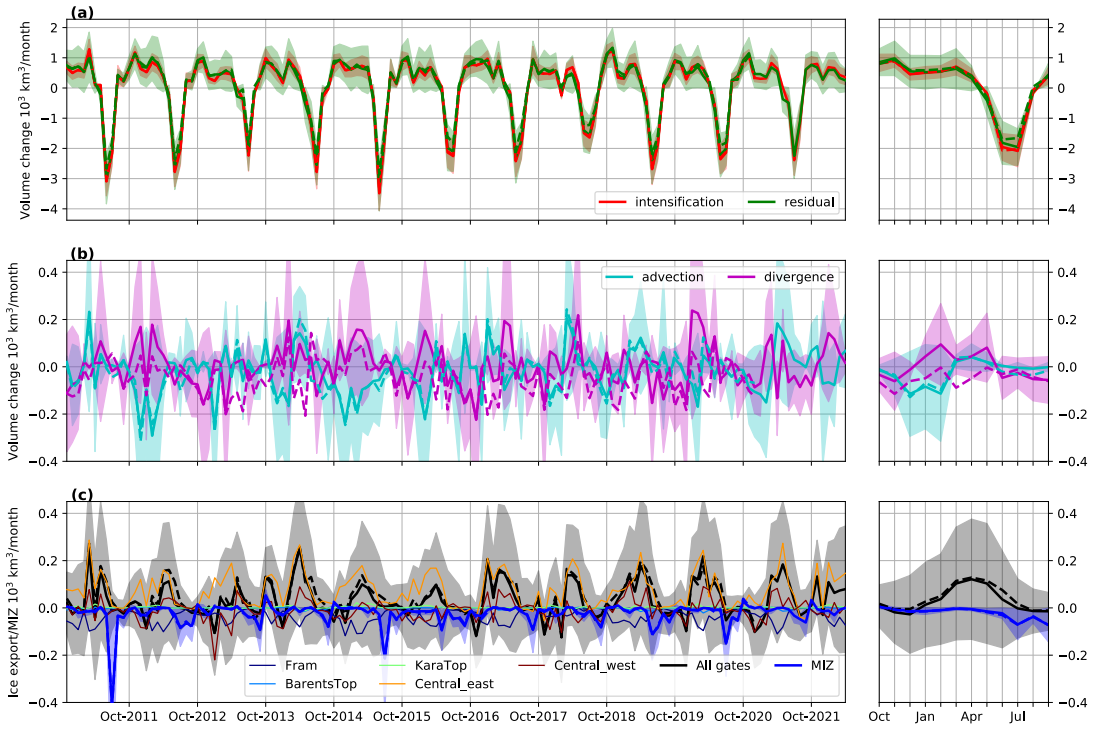
S 3 As for figure 3 in the main text, showing the residual component of the volume budget, Pathfinder drift data 19-02-2015.



S 4 Similar to figure 4: Full time series of budget components and ice export for the Barents Sea. The units are the total volume change per month, with the average seasonal cycle shown on the far right. Plot (a) is for the intensification and residual, plot (b) for dynamical terms and plot (c) for the ice transport and ice change within the MIZ. The shaded areas represent the propagated uncertainty from the original data. Dashed lines are for terms using OSISAF data, solid for Pathfinder.

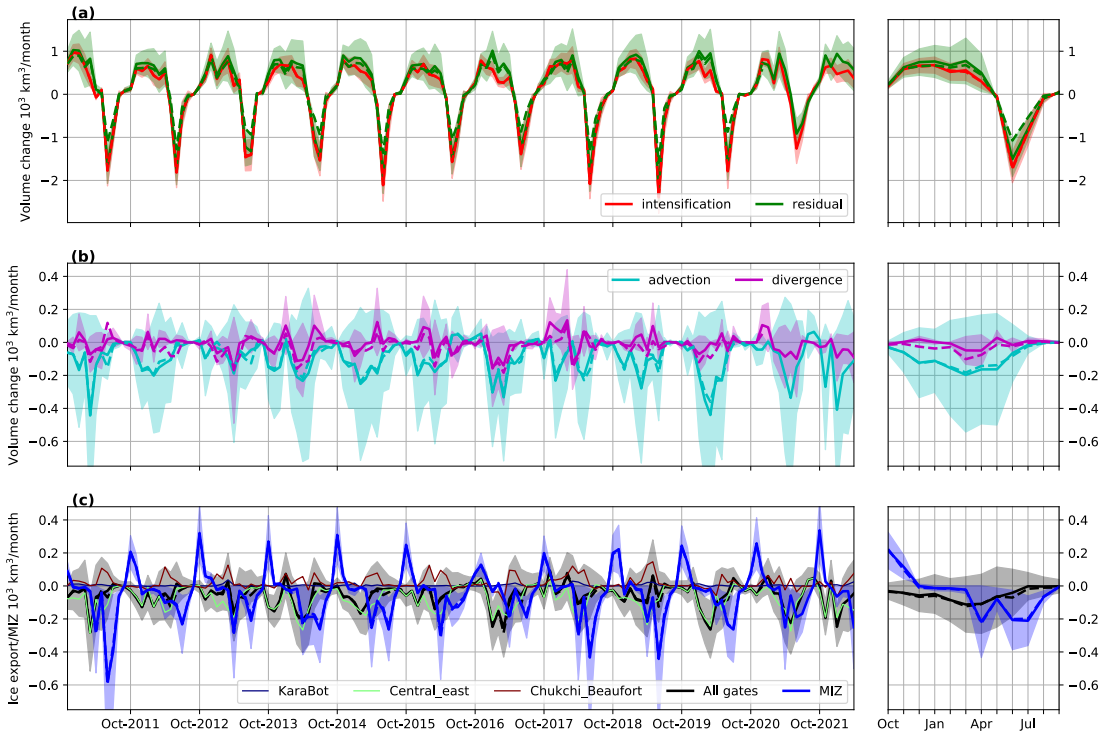


S 5 Similar to figure 4: Full time series of budget components and ice export for the Beaufort/Chukchi Seas. The units are the total volume change per month, with the average seasonal cycle shown on the far right. Plot (a) is for the intensification and residual, plot (b) for dynamical terms and plot (c) for the ice transport and ice change within the MIZ. The shaded areas represent the propagated uncertainty from the original data. Dashed lines are for terms using OSISAF data, solid for Pathfinder.

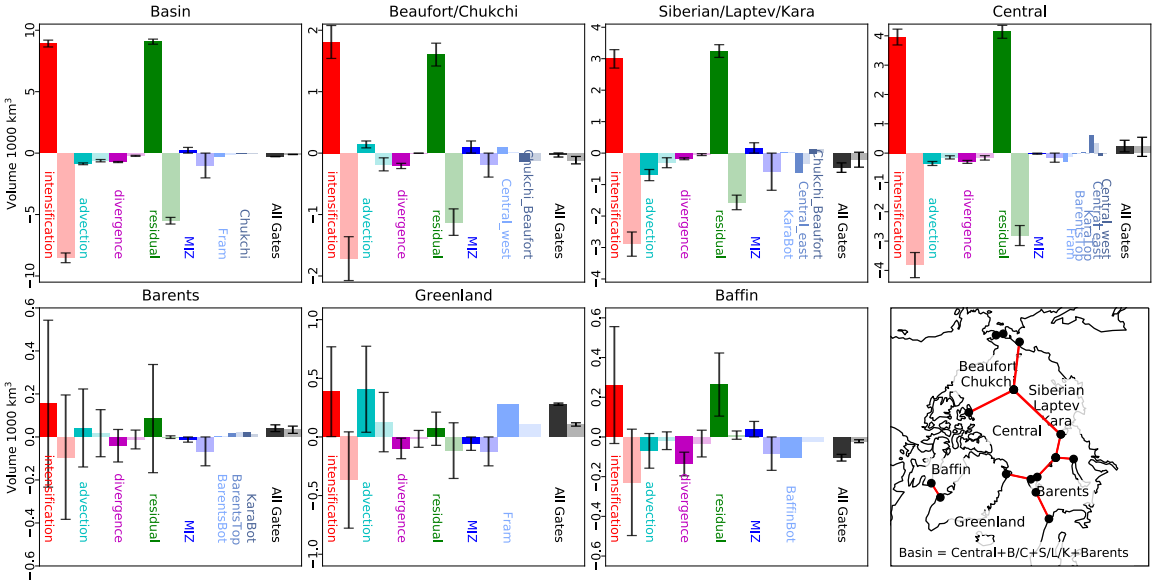


S 6 Similar to figure 4: Full time series of budget components and ice export for the Central Arctic. The units are the total volume change per month, with the average seasonal cycle shown on the far right. Plot (a) is for the intensification and residual, plot (b) for dynamical terms and plot (c) for the ice transport and ice change within the MIZ. The shaded areas

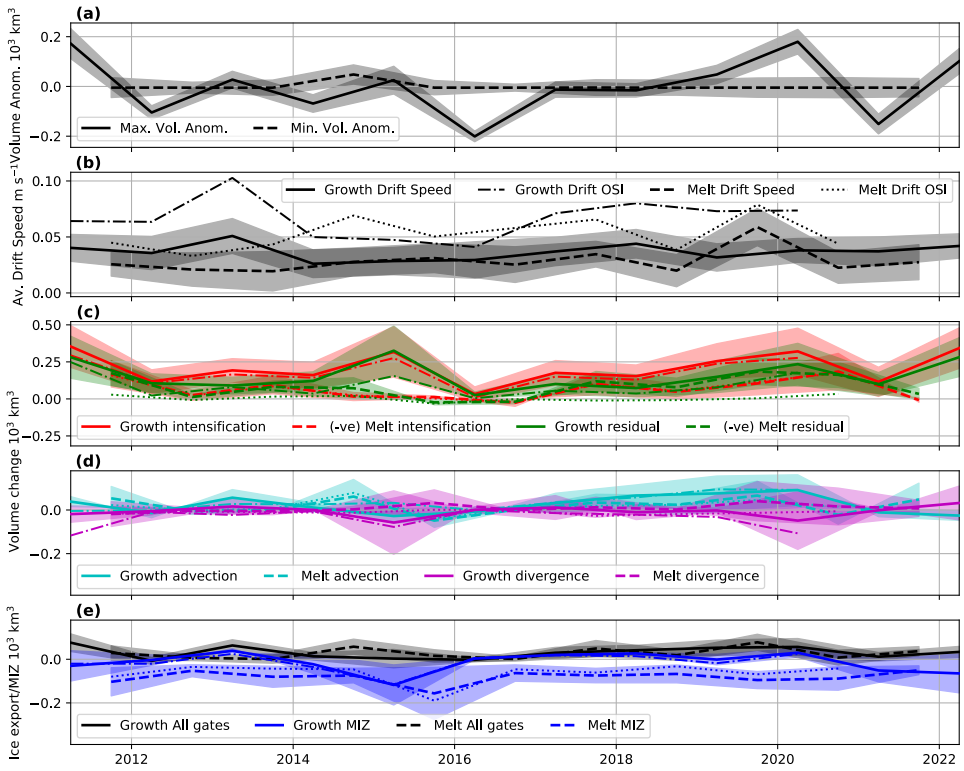
represent the propagated uncertainty from the original data. Dashed lines are for terms using OSISAF data, solid for Pathfinder.



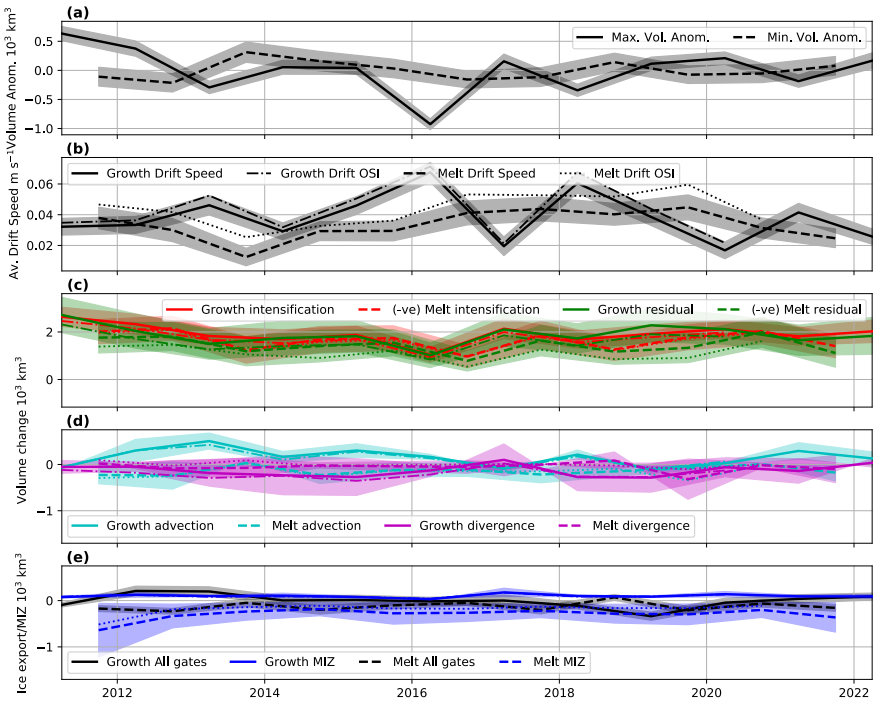
S 7 Similar to figure 4: Full time series of budget components and ice export for the Siberian/Laptev/Kara Seas. The units are the total volume change per month, with the average seasonal cycle shown on the far right. Plot (a) is for the intensification and residual, plot (b) for dynamical terms and plot (c) for the ice transport and ice change within the MIZ. The shaded areas represent the propagated uncertainty from the original data. Dashed lines are for terms using OSISAF data, solid for Pathfinder.



S 8 As figure 5 in the main text, but for OSISAF data 2010-10-15 to 2020-10-15. Units represent the volume change due to the listed components per growth season (bold colours) and melt season (pale colours). Note the different scales on the y axes. For the ice transport each gate is shown along with the total ice transport. The regions are shown in the bottom right. The Arctic Basin region is equivalent to all regions except for the Baffin Bay and the Greenland Sea.

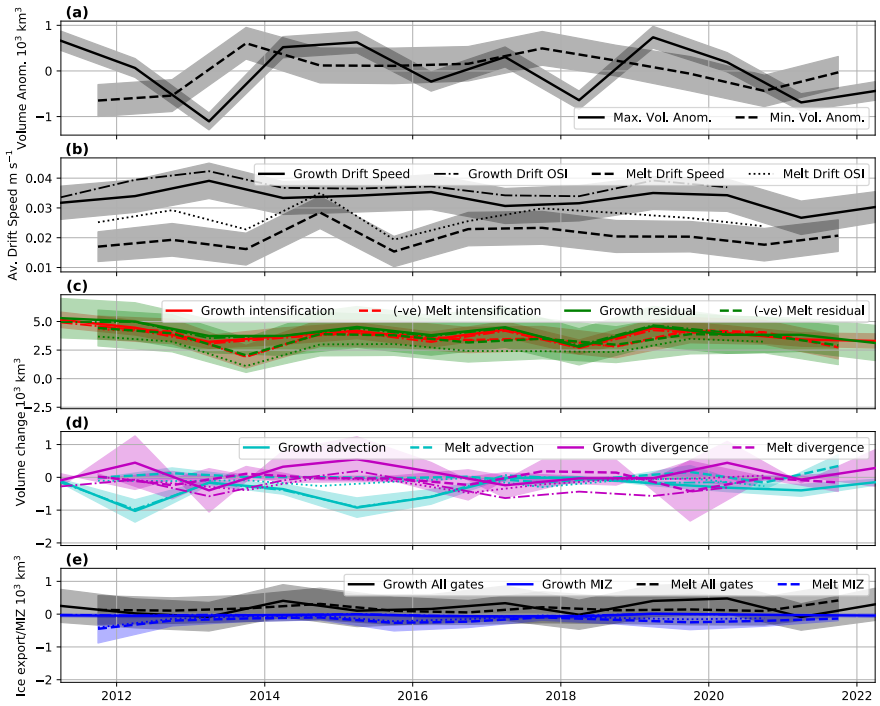


S 9 Similar to figure 6 in the main text but for the Barents sea. The units are the total volume change per growth season (solid lines Pathfinder, dot-dashed OSISAF) and melt season (dashed lines Pathfinder, dotted OSISAF). Plot (a) and (b) are the input ice thickness and ice drift speed data plot (c) is the intensification and residual with melt season having the opposite sign to ease comparison, plot (d) is dynamical terms and plot (e) for the ice transport and ice change within the MIZ. Plot (d) and (e) have the signs conserved for both seasons. The shaded areas represent the propagated uncertainty from the original data.

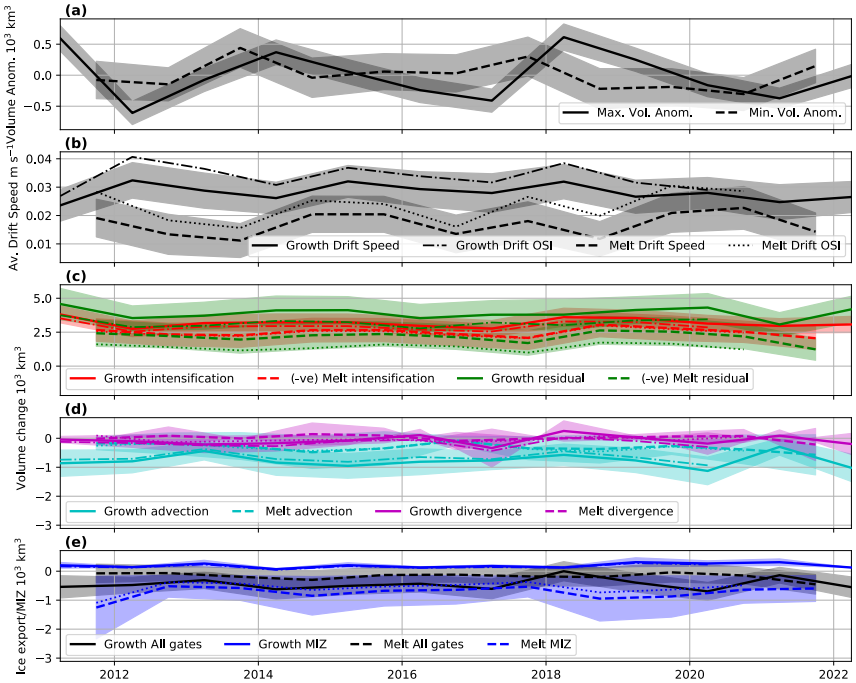


S 10 Similar to figure 6 in the main text but for the Beaufort/Chuckchi seas. The units are the total volume change per growth season (solid lines Pathfinder, dot-dashed OSISAF) and melt season (dashed lines Pathfinder, dotted OSISAF). Plot (a) and (b) are the input ice thickness and ice drift speed data plot (c) is the intensification and residual with melt season having the opposite sign to ease comparison, plot (d) is dynamical terms and plot (e) for the ice transport and ice change

within the MIZ. Plot (d) and (e) have the signs conserved for both seasons. The shaded areas represent the propagated uncertainty from the original data.

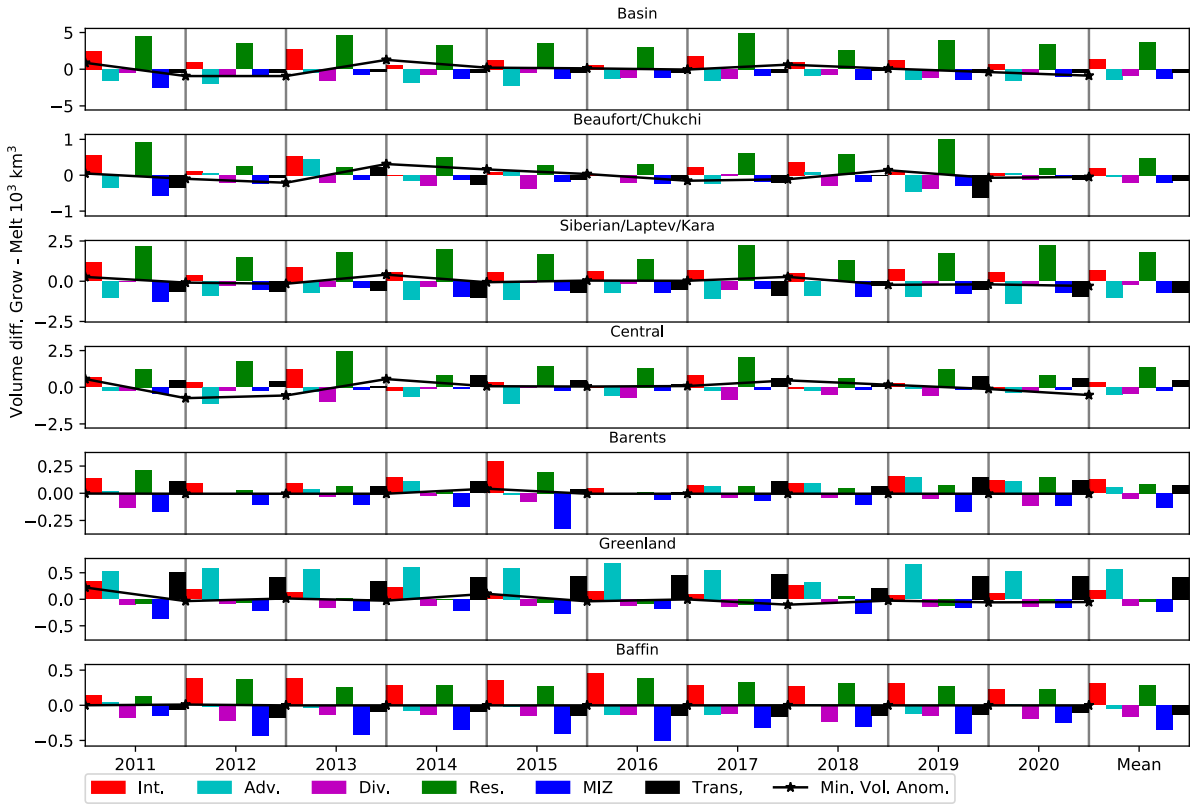


S 11 Similar to figure 6 in the main text but for the Central Arctic. The units are the total volume change per growth season (solid lines Pathfinder, dot-dashed OSISAF) and melt season (dashed lines Pathfinder, dotted OSISAF). Plot (a) and (b) are the input ice thickness and ice drift speed data plot (c) is the intensification and residual with melt season having the opposite sign to ease comparison, plot (d) is dynamical terms and plot (e) for the ice transport and ice change within the MIZ. Plot (d) and (e) have the signs conserved for both seasons. The shaded areas represent the propagated uncertainty from the original data.

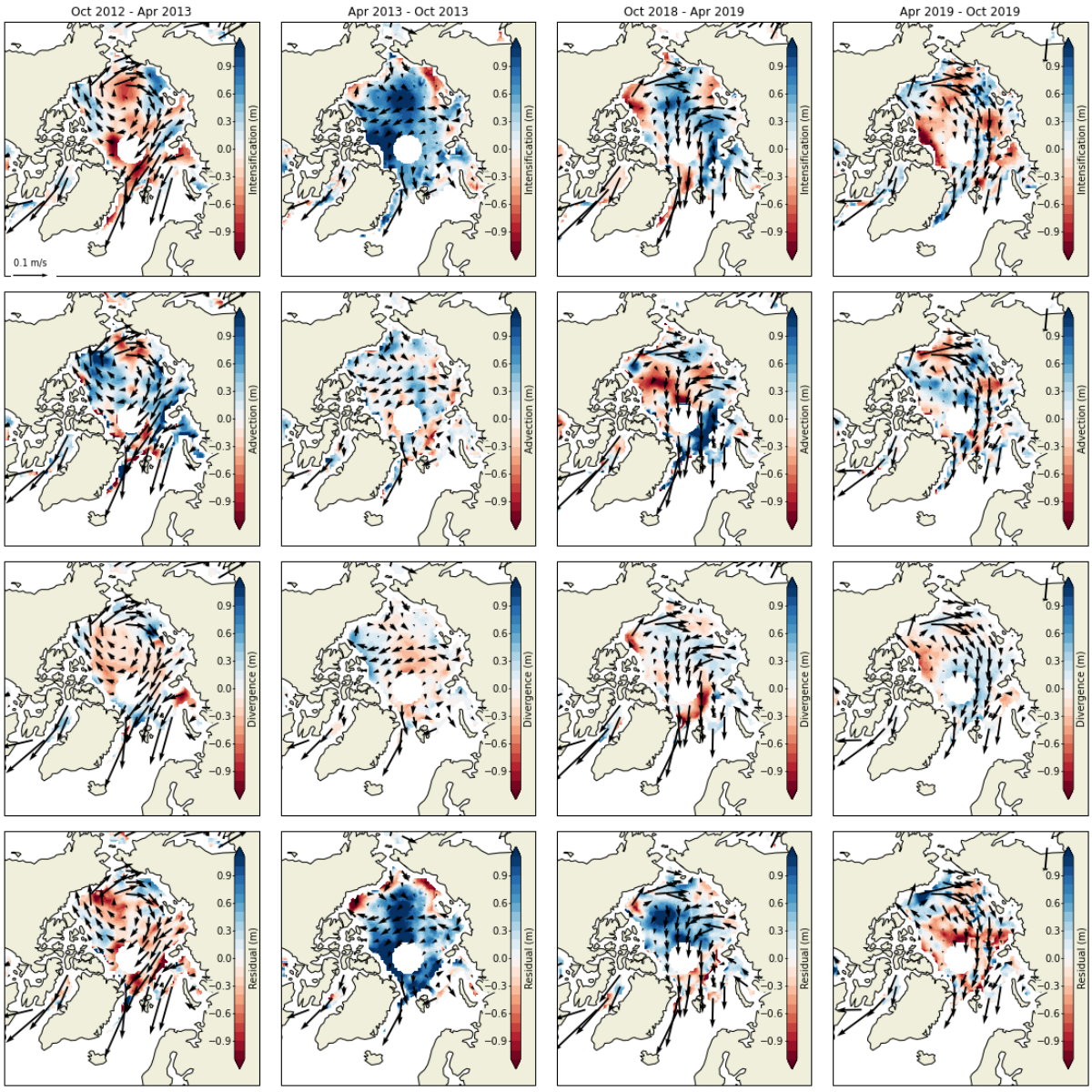


S 12 Similar to figure 6 in the main text but for the Siberian/Laptev/Kara seas. The units are the total volume change per growth season (solid lines Pathfinder, dot-dashed OSISAF) and melt season (dashed lines Pathfinder, dotted OSISAF). Plot (a) and (b) are the input ice thickness and ice drift speed data plot (c) is the intensification and residual with melt season having the opposite sign to ease comparison, plot (d) is dynamical terms and plot (e) for the ice transport and ice change

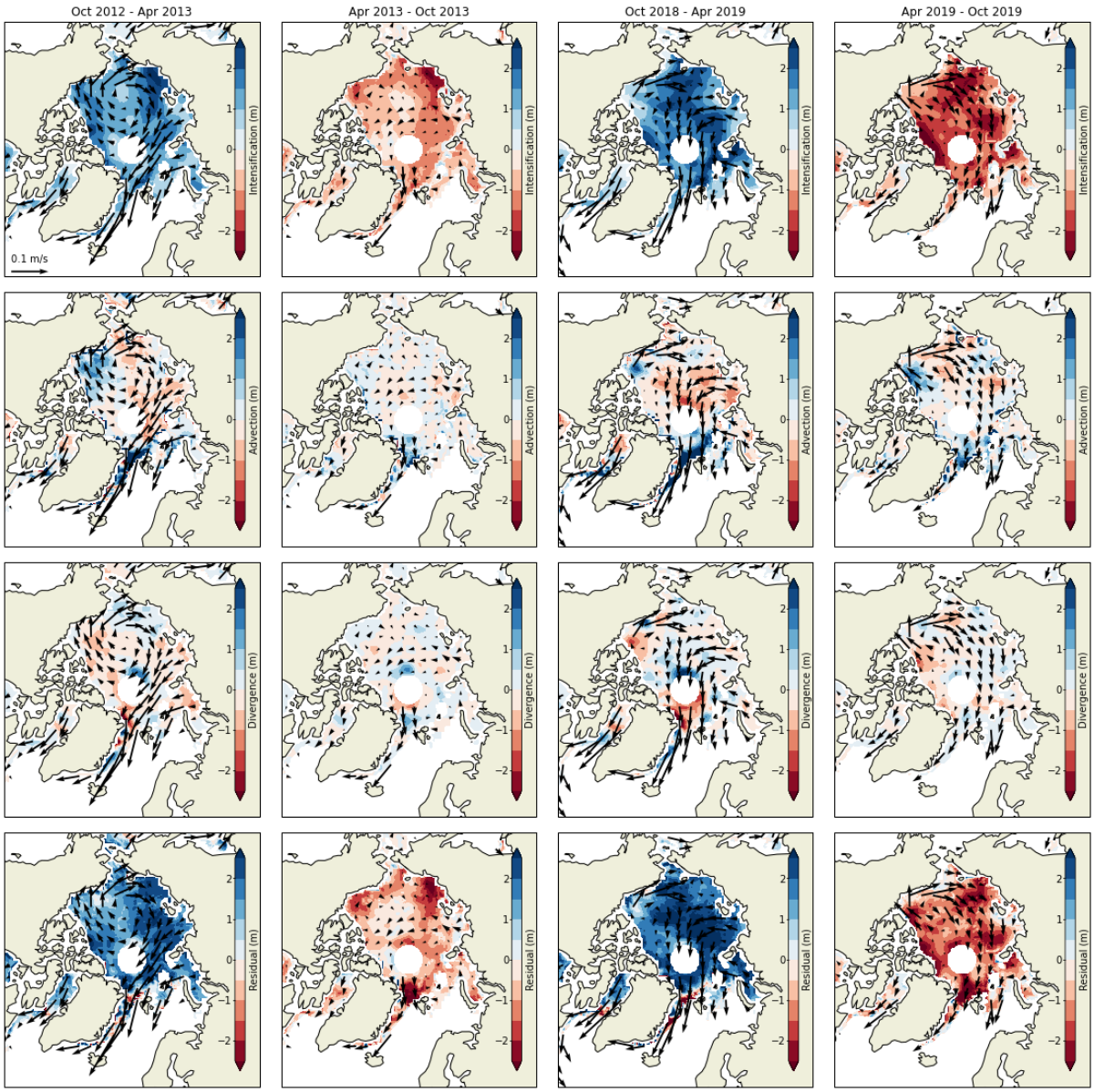
within the MIZ. Plot (d) and (e) have the signs conserved for both seasons. The shaded areas represent the propagated uncertainty from the original data.



S 13 As figure 7 in the main text, but for OSISAF data 2010-10-15 to 2020-10-15. Each bar for each is the sum from the previous year Oct. 16th through to the listed year's Oct 15th, with the average cycle shown on the far right. Each bar is for a budget component and the lines indicate the change to the minimum volume anomaly.



S 14 As figure 8 in the main text, but anomalies to the mean. Here red indicates volume change less than the mean state, blue is greater than the mean state. The growth (previous Oct. 16 to Apr. 15) and melt (Apr. 16 to Oct. 15) are displayed separately. The budget component maps are best compared to the mean sate shown in figure 2.



S 15 As figure 8 in the main text, but for Pathfinder drift data. The growth (previous Oct. 16 to Apr. 15) and melt (Apr. 16 to Oct. 15) are displayed separately. The budget component maps are best compared to the mean sate shown in figure S2.