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Supplement of

Life cycle dynamics of Greenland blocking from a potential vorticity perspective

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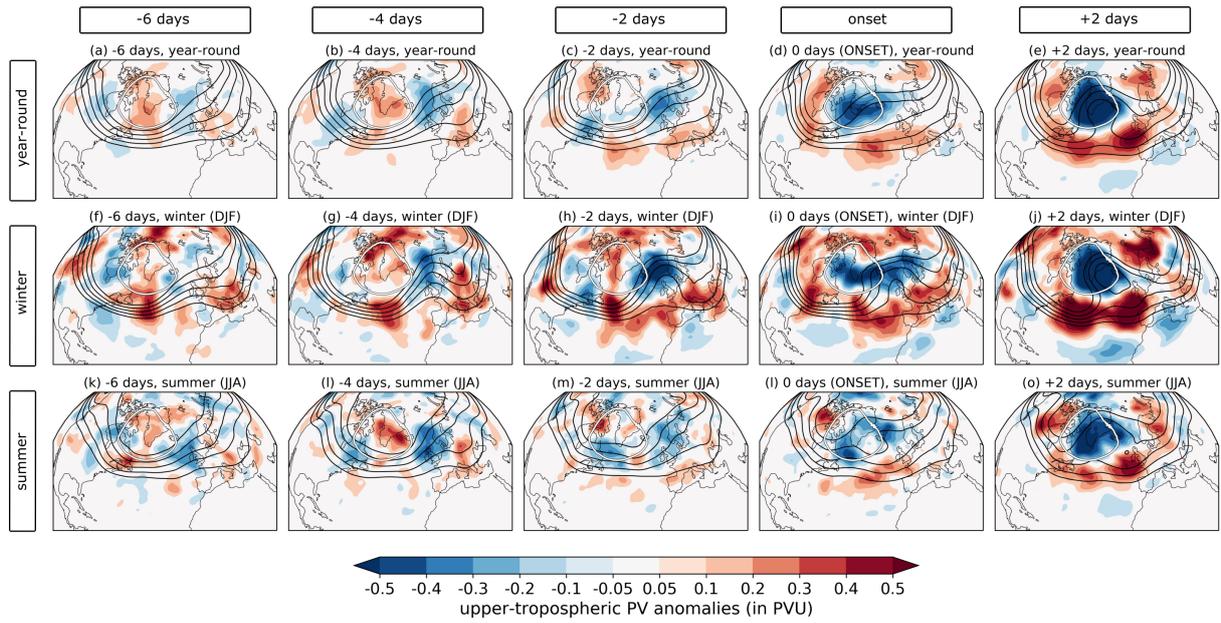


Figure S1: Seasonal stratification of the large-scale development of vertically averaged PV anomalies (500–150hPa, shading, in PVU), Z_{500} (black contours, in gpm), and anomalies of mean sea level pressure (red and blue contour lines, in hPa): (a-e) year-round, (f-j) winter (DJF), (k-o) summer (JJA). Anomalies are calculated relative to a 30-day running mean climatology spanning the period 1979–2019. Z_{500} contour intervals for first row (a-e): 5350, 5400, 5450, 5500, 5550 gpm, second row (f-j): 5250, 5300, 5350, 5400, 5450 gpm, and third row (k-o): 5450, 5500, 5550, 5600, 5650 gpm. Contour intervals for mean sea level pressure anomalies (positive: red, negative: blue): $\pm 2, 3, 4, 5$ hPa for year-round, $\pm 4, 5, 6, 7$ hPa for winter, and $\pm 1, 2, 3, 4$ hPa for summer.

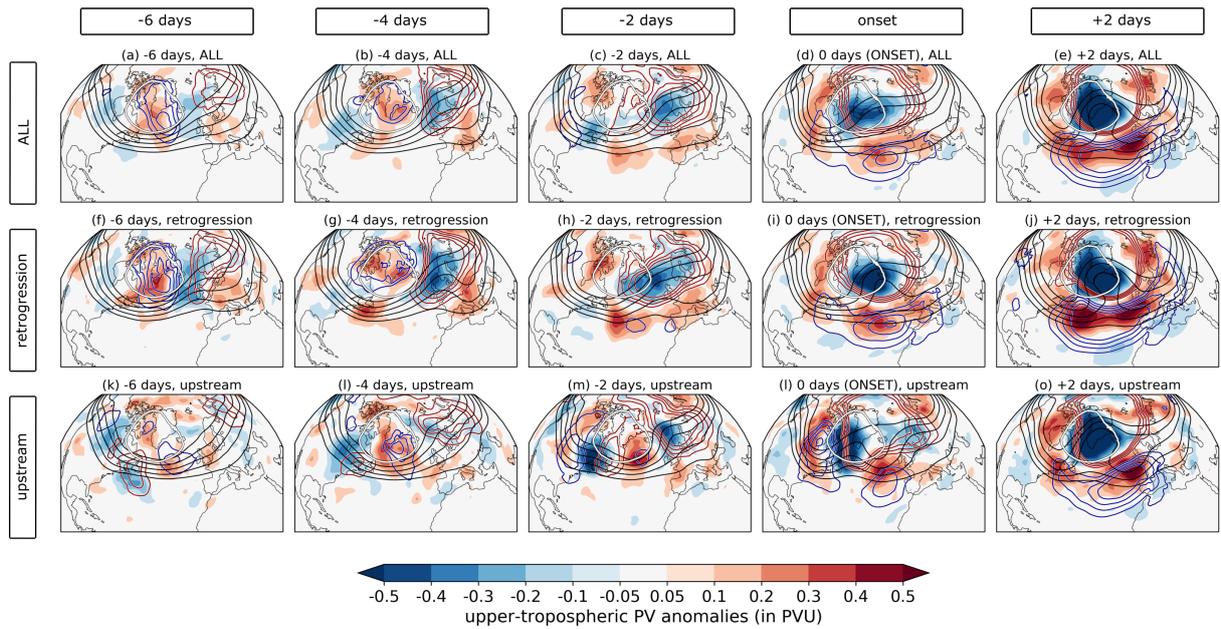


Figure S2: Pathway-specific development of upper-tropospheric PV anomalies (shading, in PVU), Z_{500} (black contours; contour levels: 5350, 5400, 5450, 5500, 5550 gpm), and positive (red) and negative (blue) anomalies of mean sea level pressure (in contour lines: $\pm 2, 3, 4, 5$ hPa) for (a-e) both pathways together, (f-j) retrogression pathway, and (k-o) upstream pathway. Anomalies are calculated relative to a 30-day running mean climatology spanning the period 1979–2019.

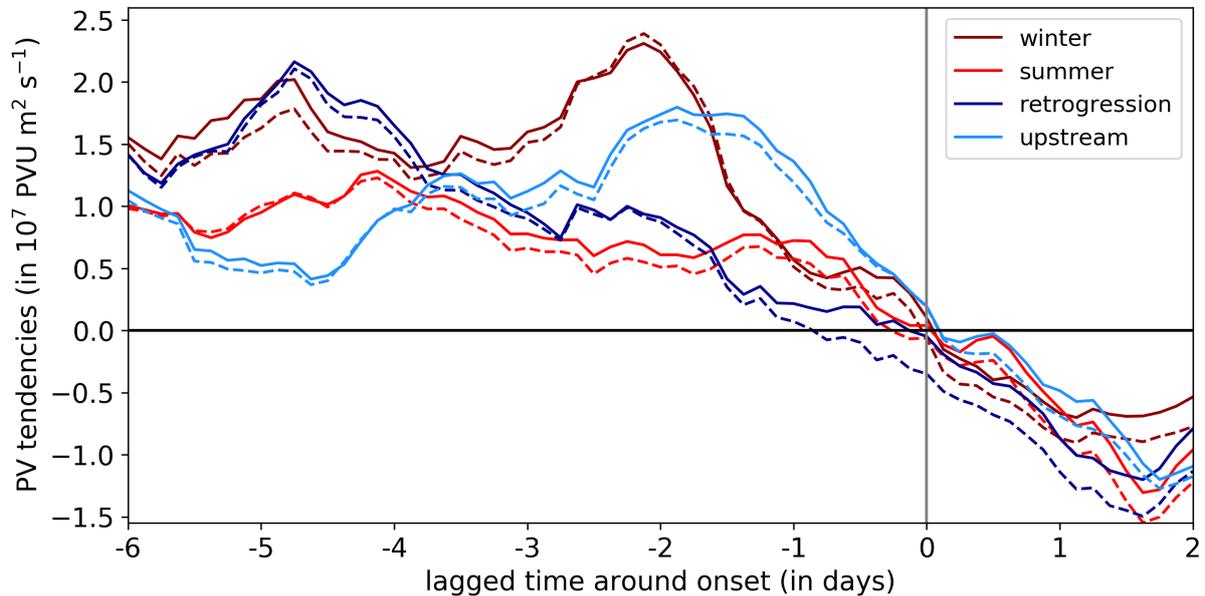


Figure S3: Amplitude evolution of $PVAs^-$ split up into different seasons and pathways of $PVAs^-$: (i) extended winter (November–March, dark red line), (ii) extended summer (May–September, red line), (iii) retrogression pathway (dark blue line), and (iv) upstream pathway (light blue line). Solid lines represent the diagnosed amplitude change (referred to as DIAG in the manuscript) and dashed lines represent the observed amplitude change (referred to as OBS). Note that the 2.5×10^7 PVU $m^2 s^{-1}$ criterion has been applied. Note again that positive values point to a strengthening of the PVA^- amplitude and that values are slightly smoothed with at ± 12 hours running mean.

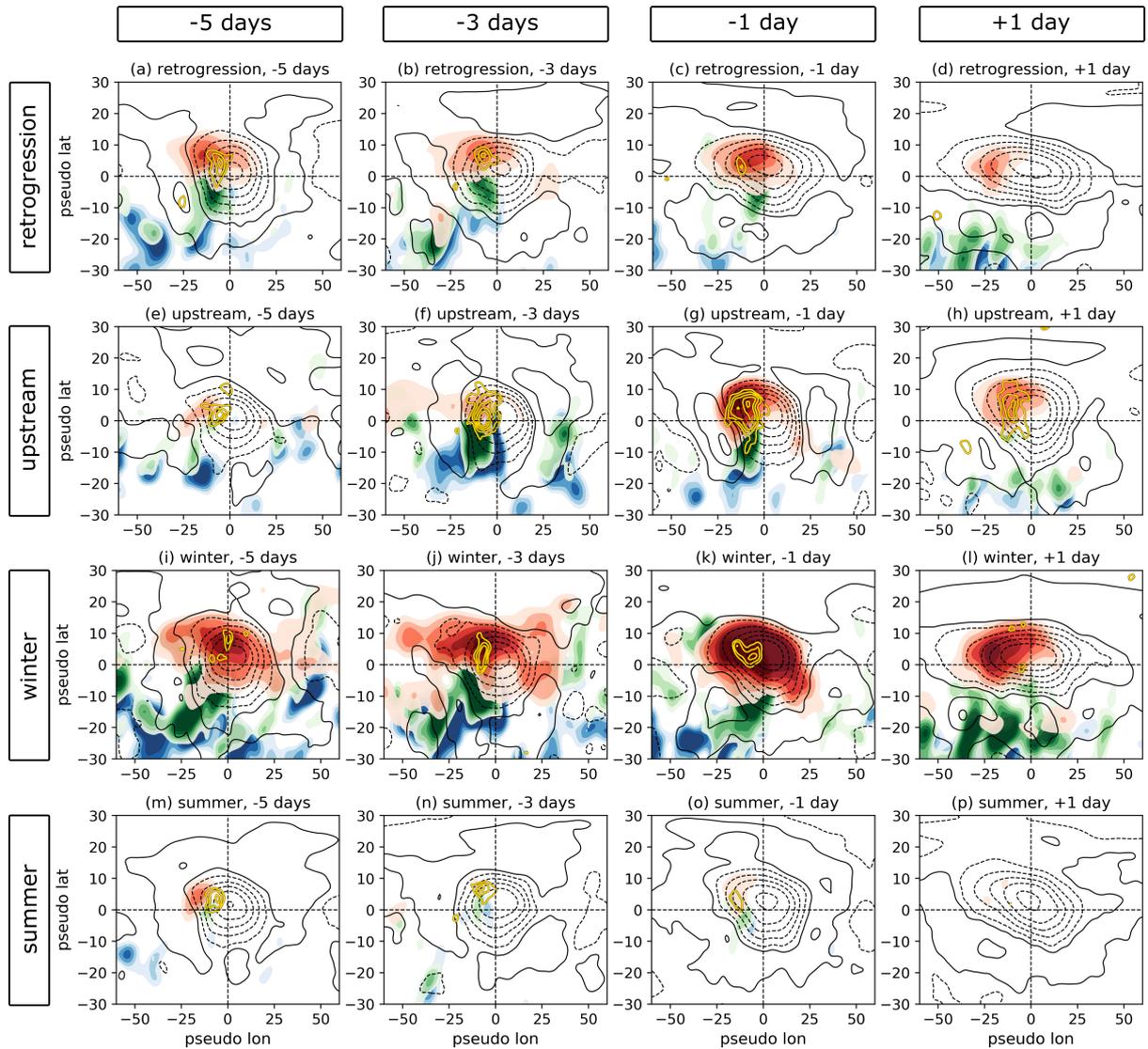


Figure S4: Composites of WCB activity centered on the position (center of mass) of onset PVAs⁻ for selected times relative to GL onset (columns). The two upper rows represent the two pathways (retrogression and upstream) and the last two rows represent the division into seasons (winter and summer). All centered composites show the occurrence of different WCB stages (shading) and anomalies of vertically averaged PV anomalies (500–150 hPa, black contours). Colored shading indicates the frequency of WCB inflow in the lower troposphere in blue (from 0.02 to 0.04 in steps of 0.005), WCB ascent in the mid-troposphere in green (from 0.02 to 0.045 in steps of 0.005), and WCB outflow in the upper troposphere in red (0.06 to 0.16 in steps of 0.02). Black contours in solid and dashed illustrate the positive and negative anomalies of vertically averaged PV anomalies, respectively with contour levels of [-1.3, -1.0, -0.7, -0.4, -0.1, 0.1, 0.4, 0.7] PVU. Negative PV tendencies of DIV_{div} are shown in gold with contour levels of $[-6, -8, -10, -12, -14] \times 10^6$ PVU $m^2 s^{-1}$. All fields are smoothed by a Gaussian filter with $\sigma = 2$.