Supplement to
Warm conveyor belt characteristics and impacts along the life cycle of extratropical cyclones: Case studies and climatological analysis based on ERA5

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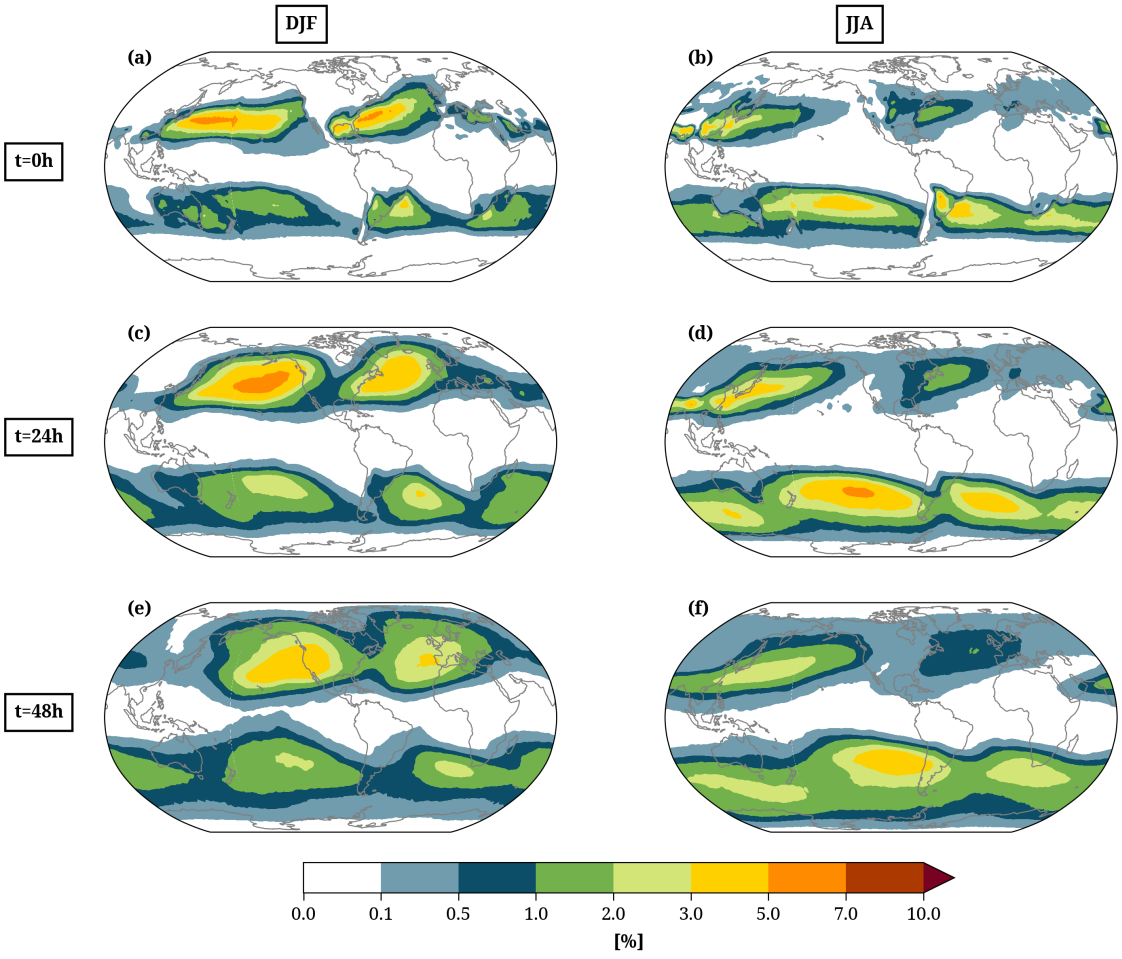

Figure S1. 42-year (1980–2022) climatology of the frequency (%) of WCB trajectories in (left column) DJF and (right column) JJA, at (a, b) $t = 1$ h, (c, d) $t = 24$ h and (e, f) $t = 48$ h.

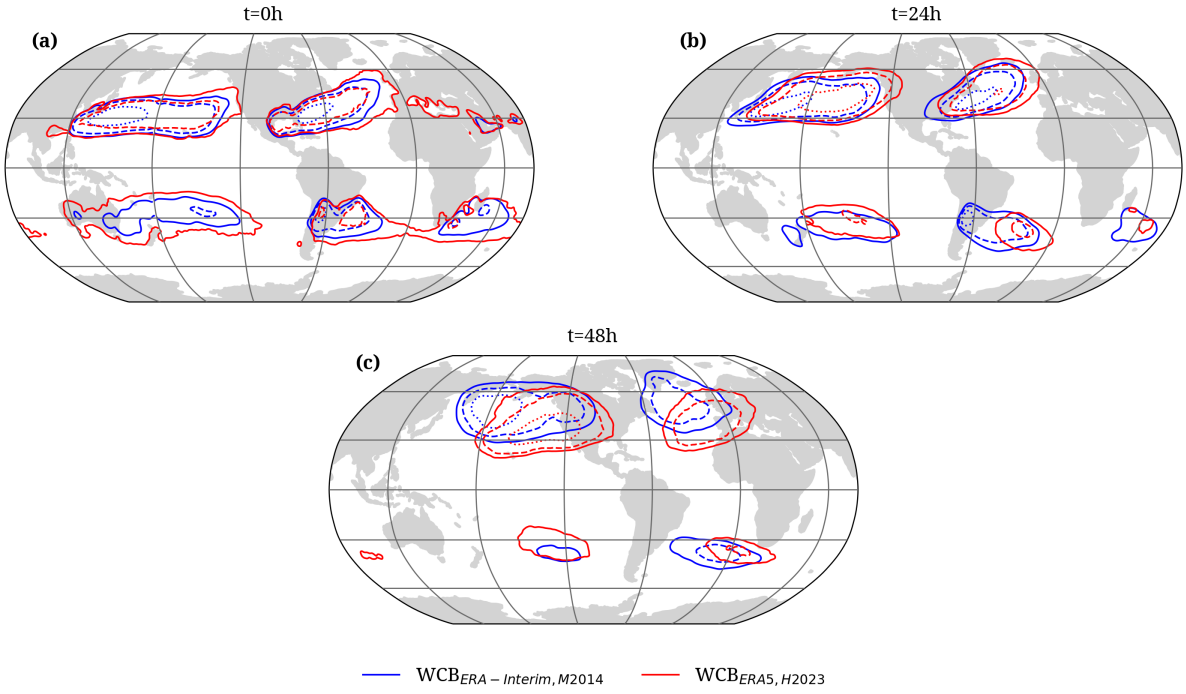

Figure S2. Regions of frequent WCB at (a) $t = 0$ h, (b) $t = 24$ h and (c) $t = 48$ h in winter (December–February). The blue contours correspond to WCB trajectories calculated in ERA-Interim and the WCB definition used by Madonna et al. (2014) for the time period 1980–2015, while the red contours correspond to WCB trajectories calculated in ERA5 and the adapted WCB definition described by Heitmann et al. (2023) for the time period 1980–2022. Due to the different numbers of trajectories and different absolute frequency values, the contours denote the 90^{th} (solid), 95^{th} (dashed) and 99^{th} (dotted) percentile of the ERA-Interim and ERA5 field.

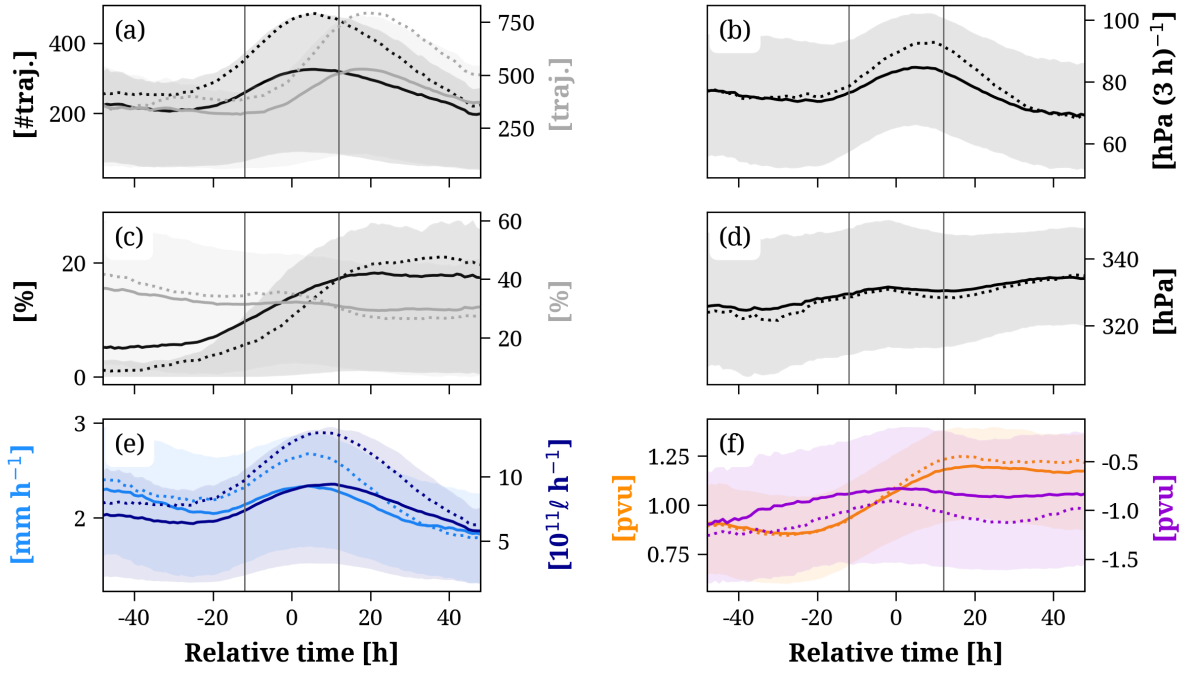

Figure S3. Mean (solid and dotted line) and 50% confidence interval (shading) of the cyclone and WCB metrics centered around the time of maximum cyclone intensification ($t_{rel} = 0$ h). The solid and dashed line correspond to the mean value of WCB associated with cyclones with a maximum $\Delta\text{SLP}_B > 0$ and $\Delta\text{SLP}_B > 1$, respectively. (a) Cyclone's central pressure (hPa), (b) WCB intensity of the ascent (black) and outflow mask (number of trajectories, grey), (c) WCB ascent rate (hPa (3 h)$^{-1}$), (d) percentage of cyclonic (black) and anticyclonically ascending trajectories (%, grey), (e) total precipitation rate (mm h^{-1}, light-blue) and total precipitation volume ($10^{12}\ell$ h^{-1}, dark-blue), and (f) low-level PV (pvu, orange) and upper-level PV anomaly (pvu, violet) for all WCBs ascending in the NA in DJF between 1980–2022. Vertical lines denote the 24-hour period of strongest cyclone intensification.

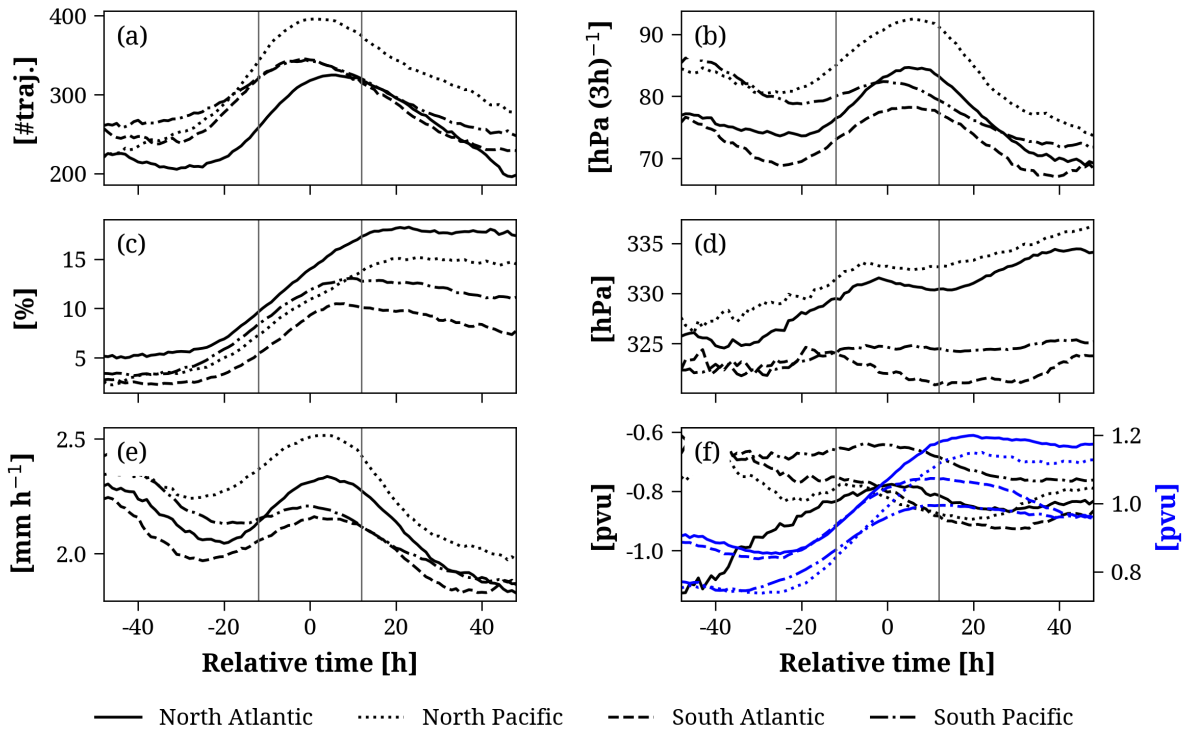

Figure S4. Similar to Fig. 14 and Fig. S3 but for the mean evolution of WCBs ascending in the North Atlantic (solid), North Pacific (dotted), South Atlantic (dashed) and South Pacific (dash-dotted) in the respective winter season of (a) cyclone's central pressure (hPa), (b) WCB intensity of the ascent (number of trajectories), (c) WCB ascent rate (hPa (3 h)$^{-1}$), (d) percentage of cyclonically ascending trajectories (%), (e) total precipitation rate (mm h^{-1}) and (f) low-level PV (pvu) and upper-level PV anomaly (pvu, blue). All WCBs associated with cyclones with a maximum $\Delta\mathrm{SLP}_B > 0$ were taken into account.