Supplementary material of "Identifying controls of extratropical cyclone intensity at genesis time and during intensification in the North Atlantic and Europe"

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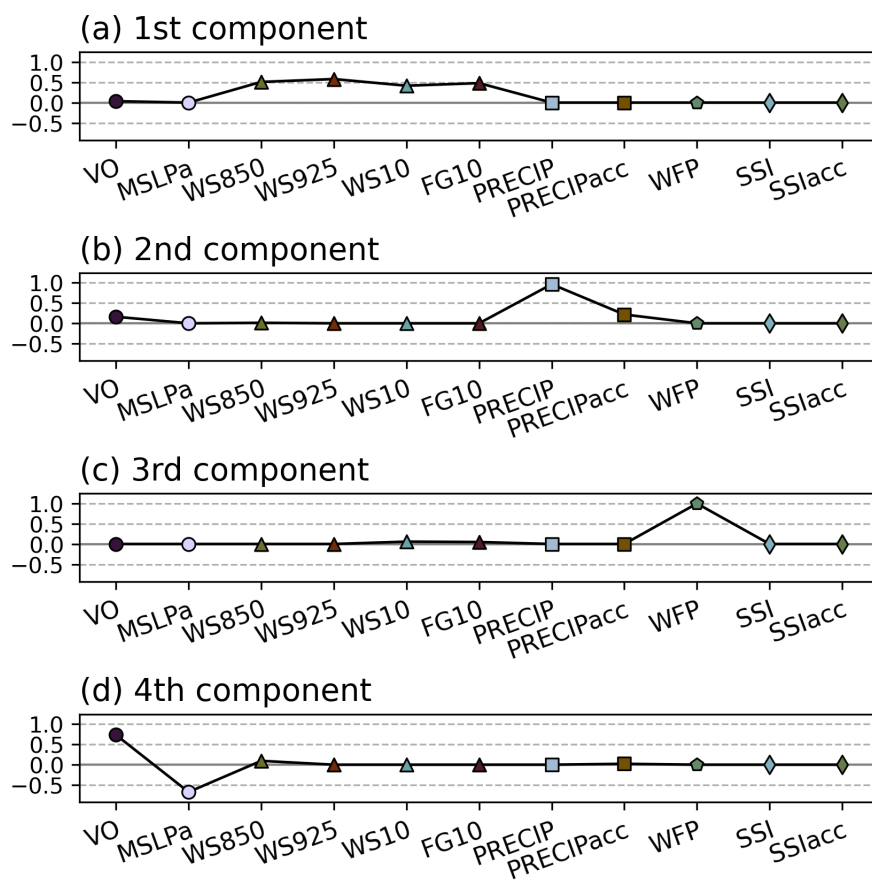
Figure S1: Weights of the 11 intensity measures in the four components of the sparse principal component analysis (sPCA) from Cornér et al. (2025)
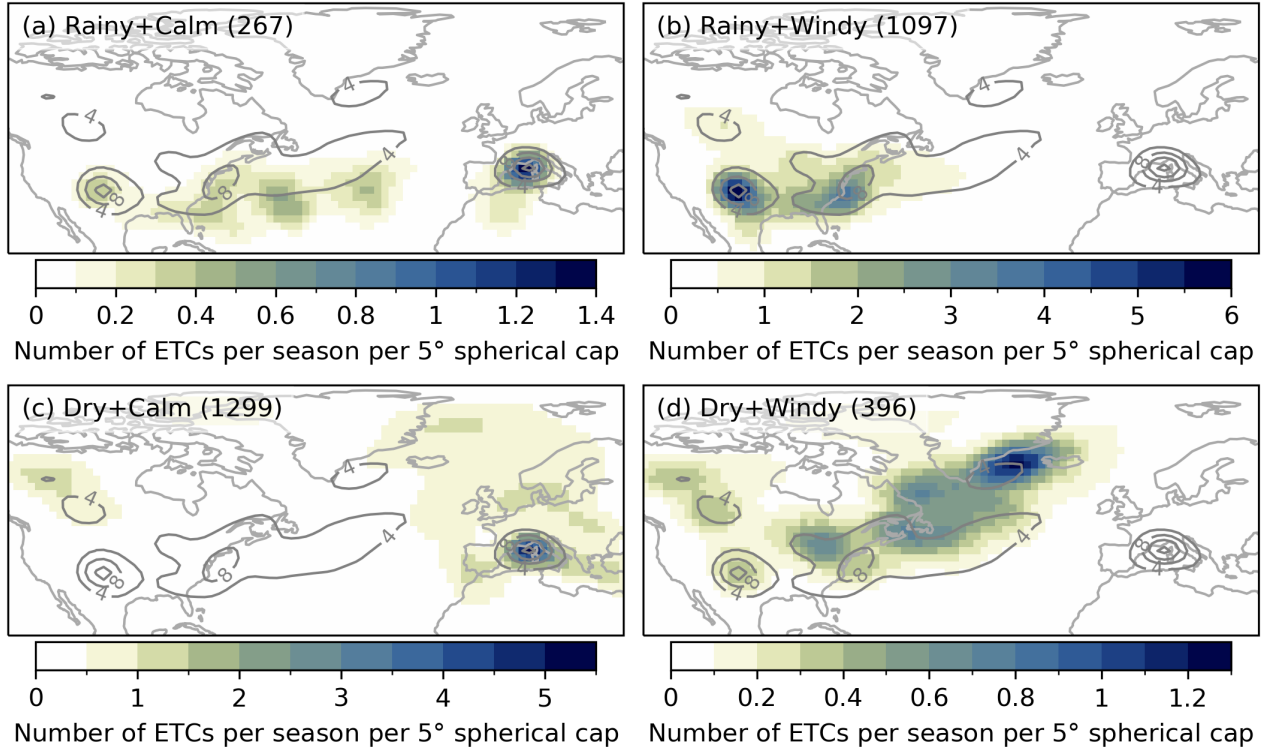
Figure S2: Genesis densities of the four intensity groups. The value indicates the number of ETCs originating from an area within a spherical cap with a radius of 5° geodesic per season (six months). The contours show the genesis density distribution of the full dataset (7361 ETCs) in the same unit. Total number of ETC tracks in each group is shown in the parentheses. Note the different values in the colourbars.
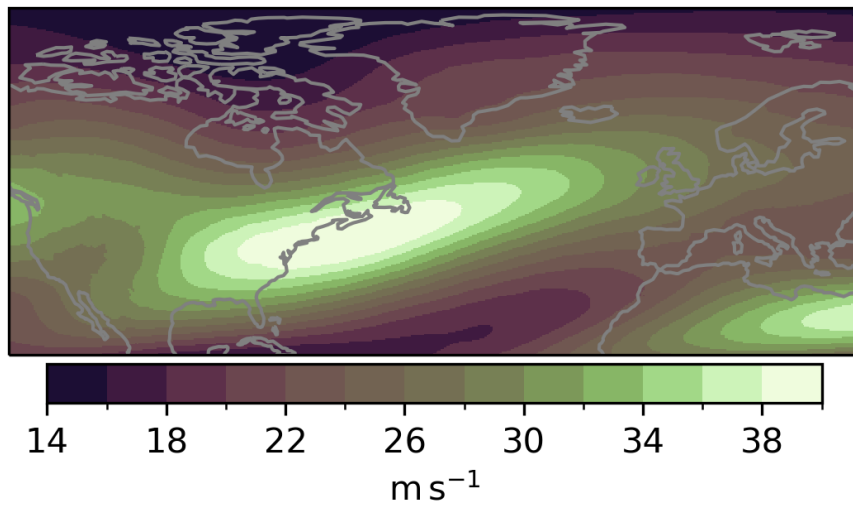
Figure S3: Climatological mean values of WS300 during ONDJFM 1979–2022.
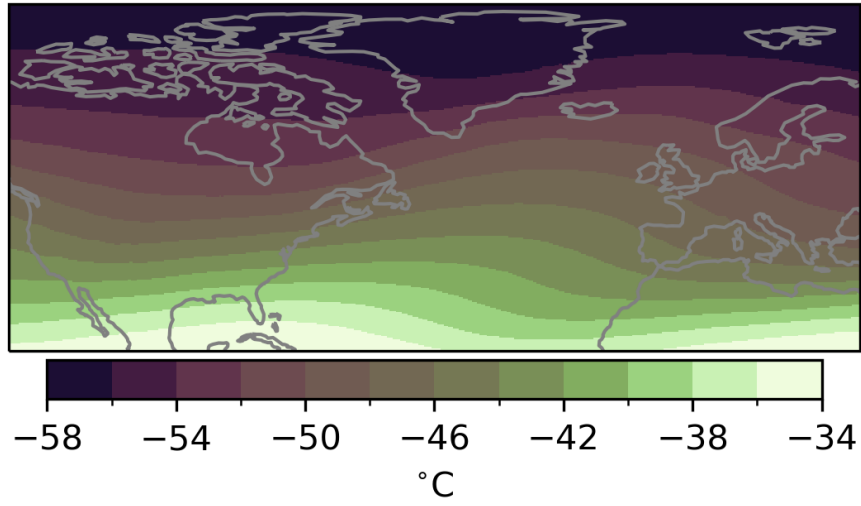
Figure S4: Climatological mean values of T300 during ONDJFM 1979–2022.
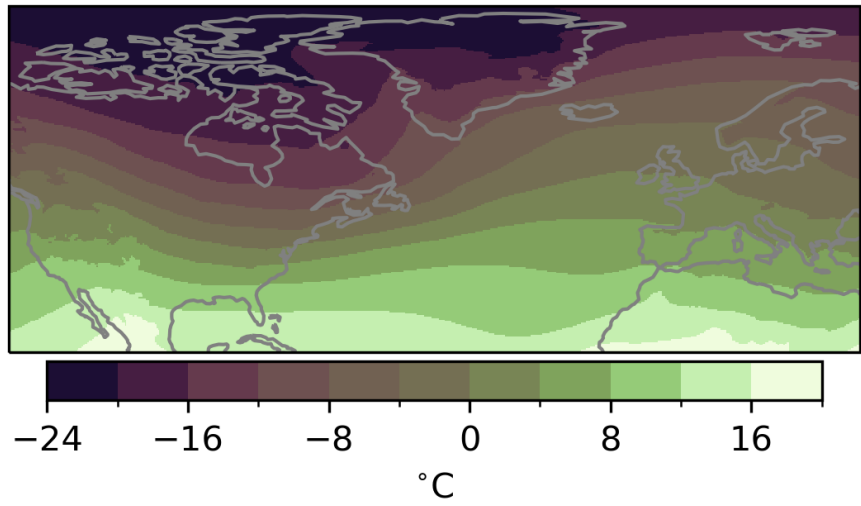
Figure S5: Climatological mean values of T850 during ONDJFM 1979–2022.
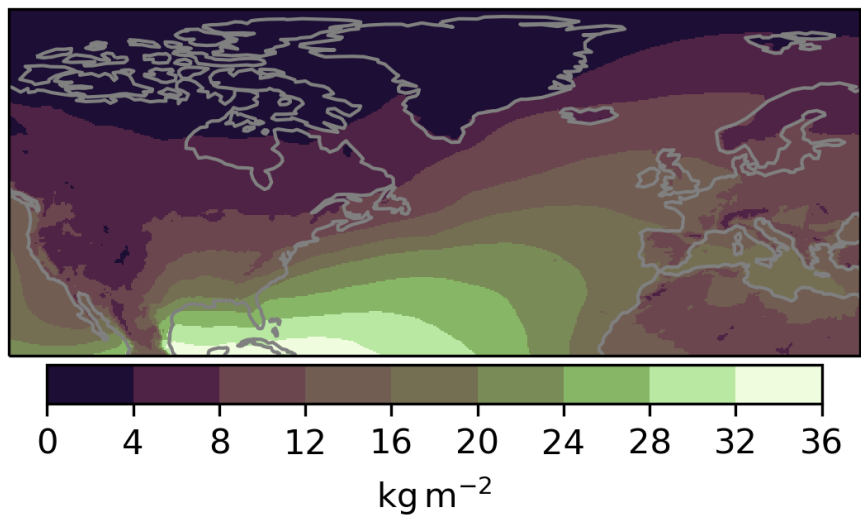
Figure S6: Climatological mean values of TCWV during ONDJFM 1979–2022.
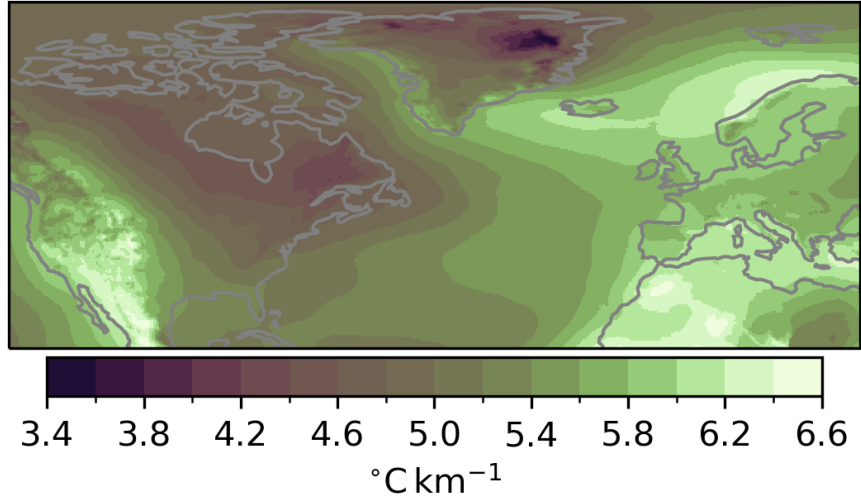
Figure S7: Climatological mean values of GAMMA during ONDJFM 1979–2022.
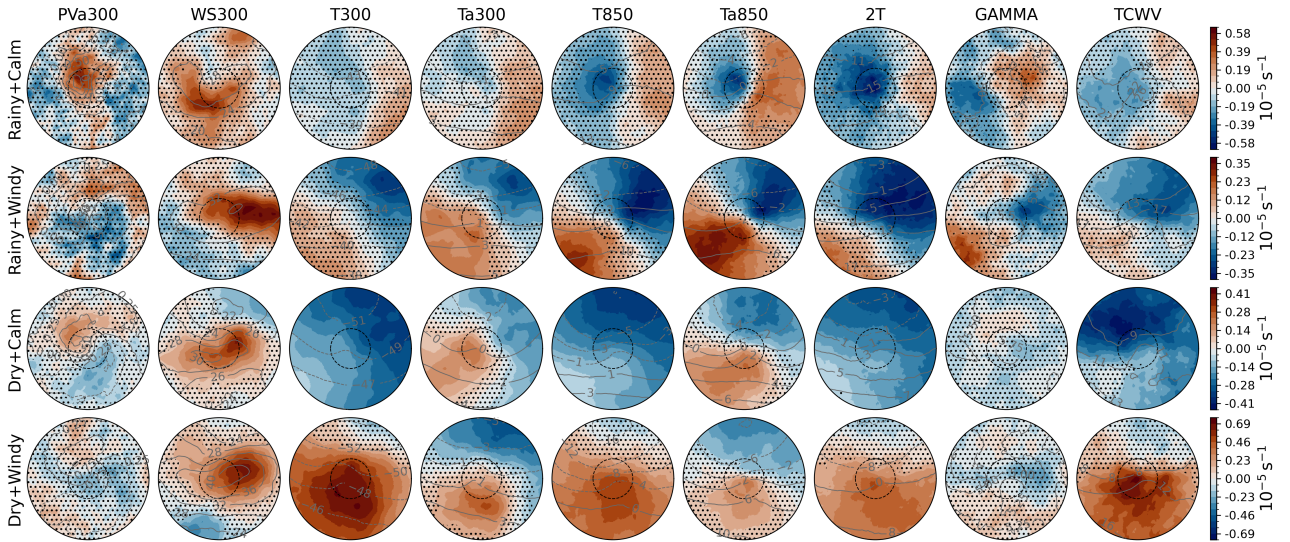
Figure S8: Sensitivity signals of VO (shading) for each intensity group and the composite field of precursors at genesis (contours). Intensity groups stay constant along rows and precursors stay constant along columns. There is one colourbar per intensity group, i.e. per row. The hatched areas indicate statistically nonsignificant values and the dashed black circle denotes a radius of 6° geodesic. The radius of the whole circle is 18° geodesic. Units of precursors are PVU ($10^{-6}\,\mathrm{K\,m^2\,kg^{-1}\,s^{-1}}$) for PVa300, $\mathrm{m\,s^{-1}}$ for WS300, °C for T300, Ta300, T850, Ta850, and 2T, $\mathrm{^\circ C\,km^{-1}}$ for GAMMA, and $\mathrm{kg\,m^{-2}}$ for TCWV.
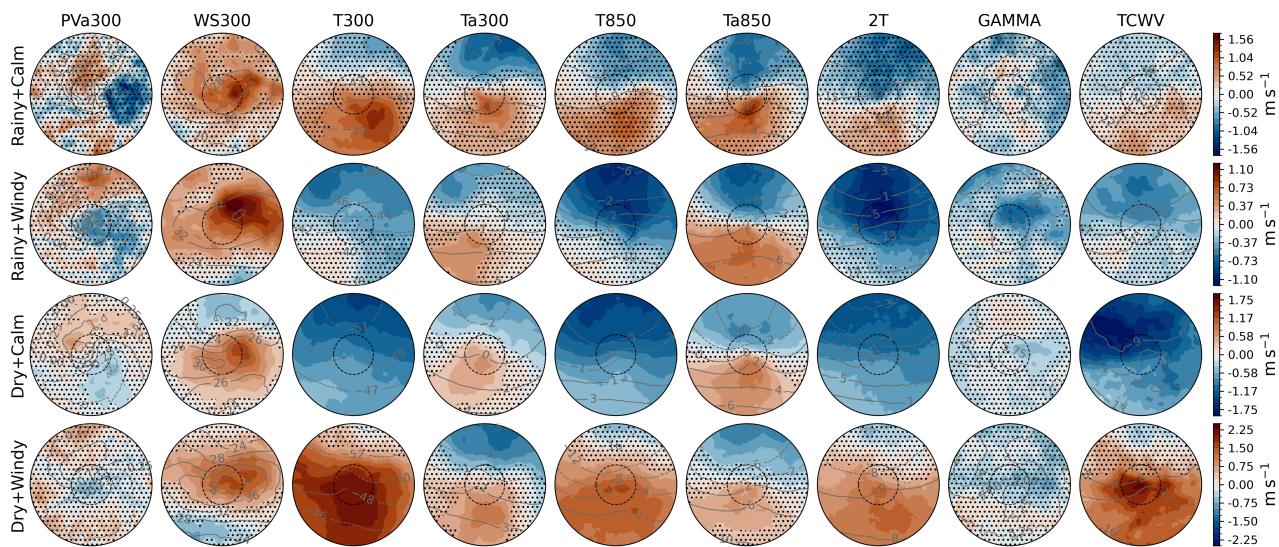
Figure S9: As in Fig. S8 for WS850.
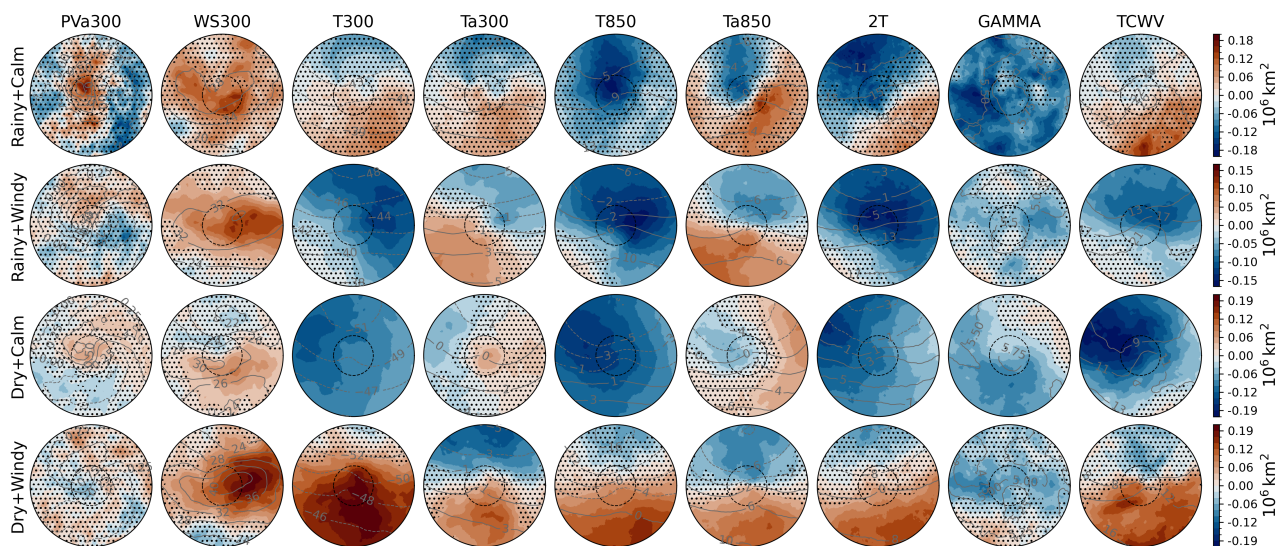
Figure S10: As in Fig. S8 for WFP.
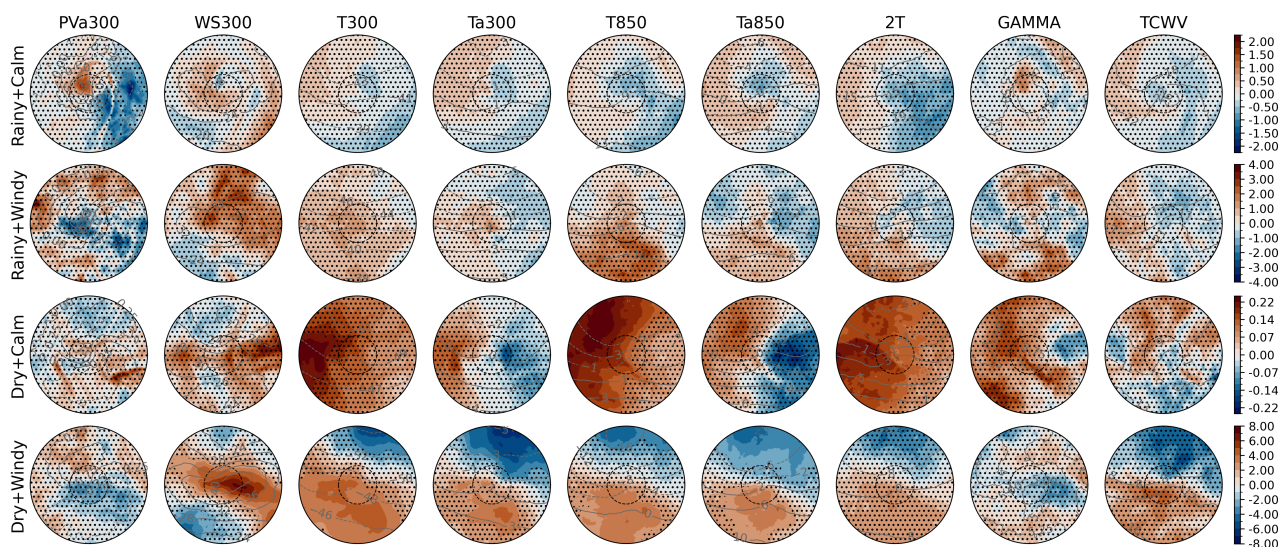
Figure S11: As in Fig. S8 for SSI.
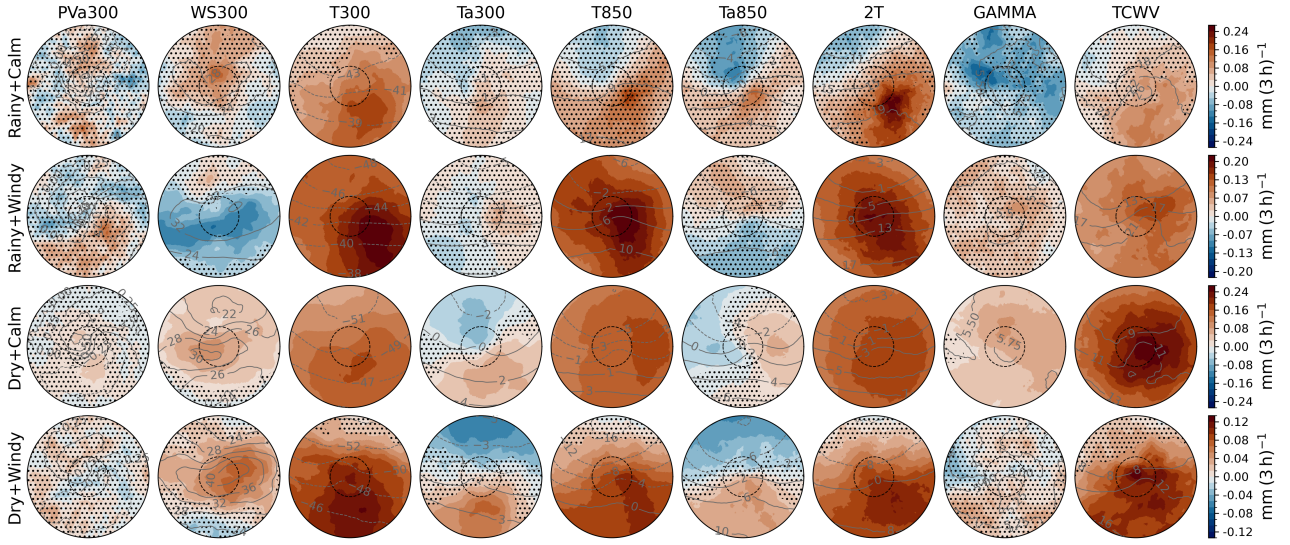
Figure S12: As in Fig. S8 for PRECIP.
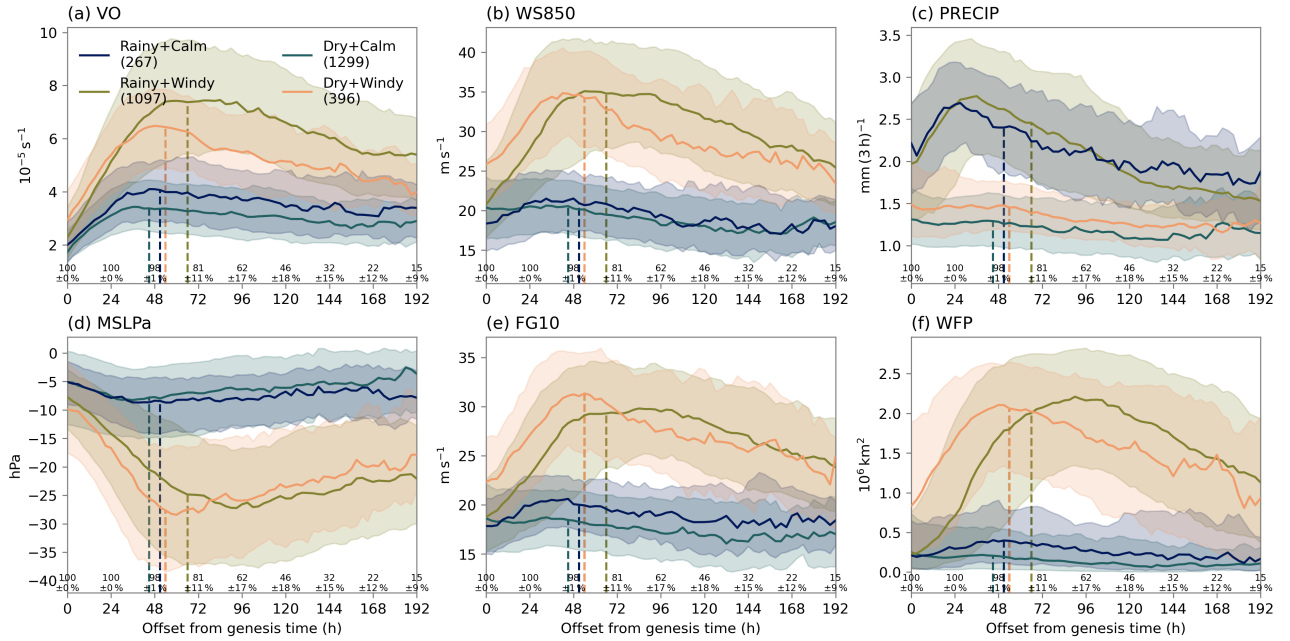
Figure S13: Average evolution of six selected intensity measures in the four intensity groups relative to the time of genesis. The solid line shows the median value and the shading contains values in the two middle quartiles. Percentages on the x-axis show the mean and standard deviation of proportion of tracks sampled in the groups for a given time step. The complete group sizes are shown in parentheses in the legend in panel **(a)**. The dashed vertical lines indicate median times of maximum VO in the four groups.

References

Cornér, J., Bouvier, C., Doiteau, B., Pantillon, F., and Sinclair, V. A.: Classification of North Atlantic and European extratropical cyclones using multiple measures of intensity, Nat. Hazards Earth Syst. Sci., 25, 207–229, https://doi.org/10.5194/nhess-25-207-2025, 2025.