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Supplement of

Future changes in the extratropical storm tracks and cyclone intensity, wind speed, and structure

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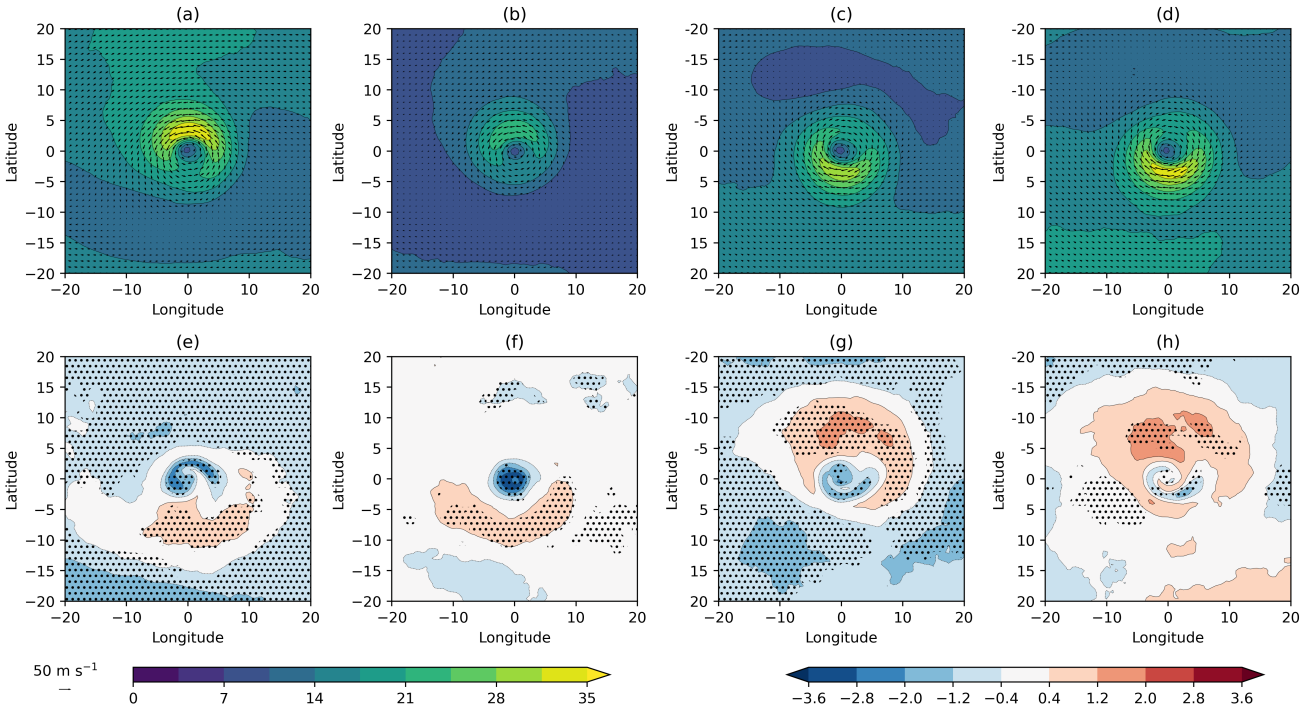

Figure S1. Composites of cyclone system relative wind speed at 850 hPa for extreme cyclones in (a–d) ERA5 and (e–h) biases of CMIP6 relative to ERA5. Composites are shown for (a,e) NH DJF, (b,f) NH JJA, (c,g) SH DJF, and (d,h) SH JJA. Units are m s^{-1}. Stippling indicates where 80% of models agree on the sign of the bias.

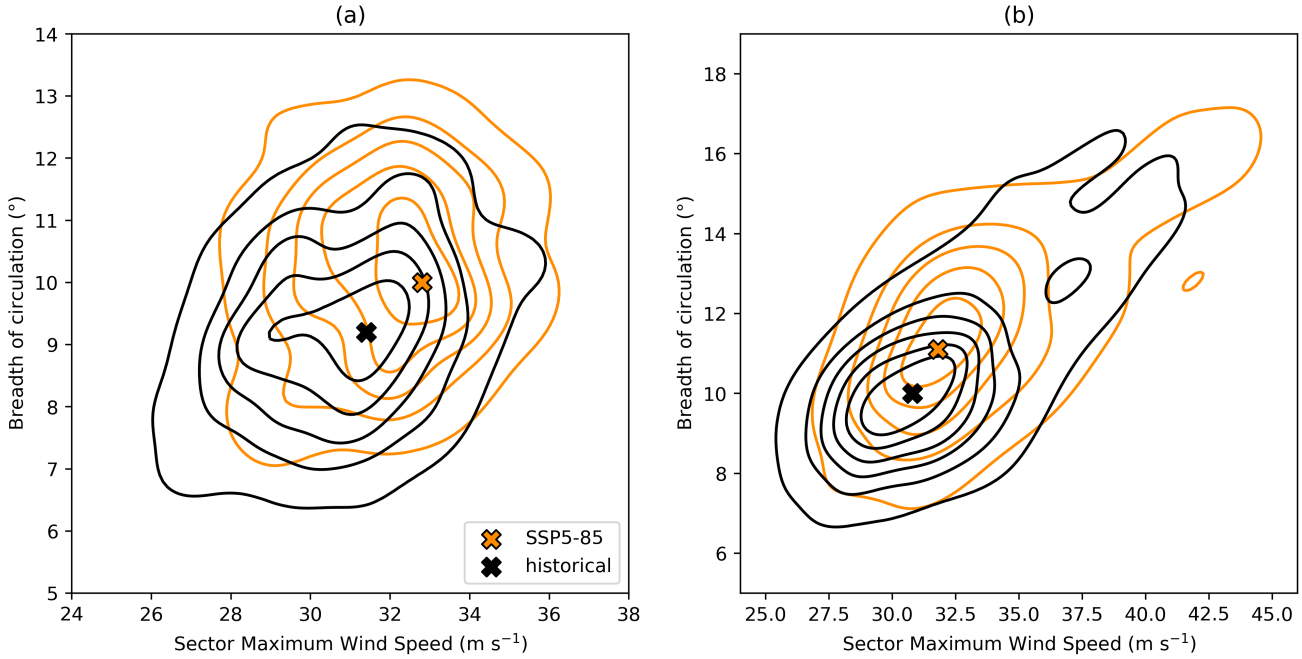

Figure S2. Scatter plot of maximum wind speed along the cyclone transect (dashed white line Fig. 6f) against the broadness of wind speeds above a fixed threshold along the same transect plotted via a gaussian kernel density estimator (KDE). KDEs are plotted for the historical (black, 1979-2014) and SSP5-85 experiments (orange, 2080-2100) for the SH in (a) DJF and (b) JJA at 850 hPa. Crosses indicate the highest frequency of the KDE. Thresholds for the broadness of the circulation are 20 m s^{-1}.

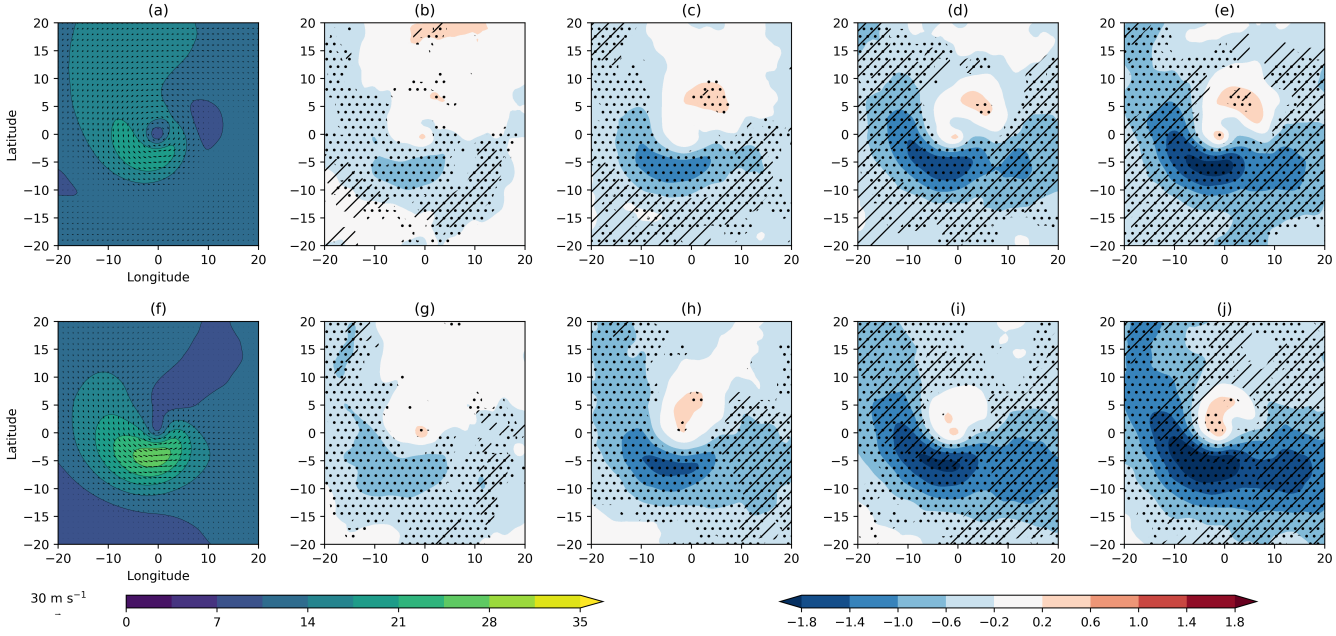

Figure S3. Composites of cyclone wind speeds at 500 hPa in a system relative (a–e) and earth relative (f–j) perspective for NH JJA. Composites are shown for the CMIP6 historical average (a,f) and changes for the SSP1-26 (b,g), SSP2-45 (c,h), SSP3-70 (d,i), and SSP5-85 (e,j) scenarios for the 2080-2099 period. Stippling indicates 80% model consensus on the sign of the bias and hatching shows where the model mean is larger than the model variance. Units are m s^{-1}.

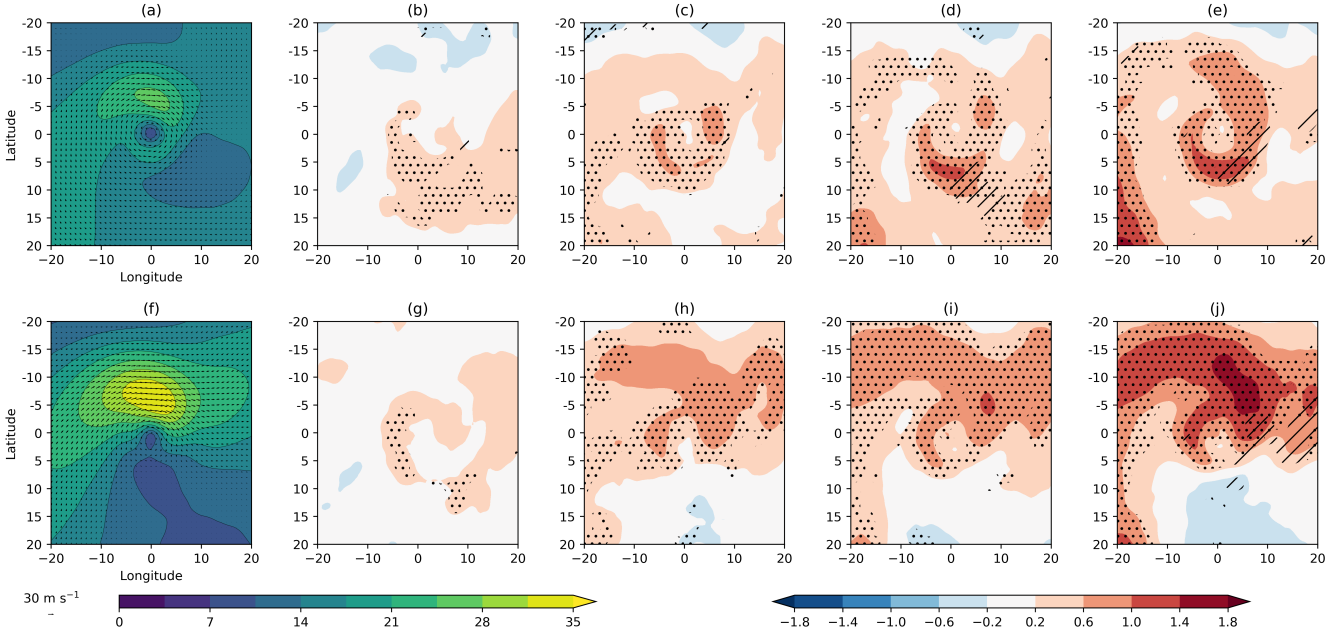

Figure S4. As Figure S3 but for SH DJF.

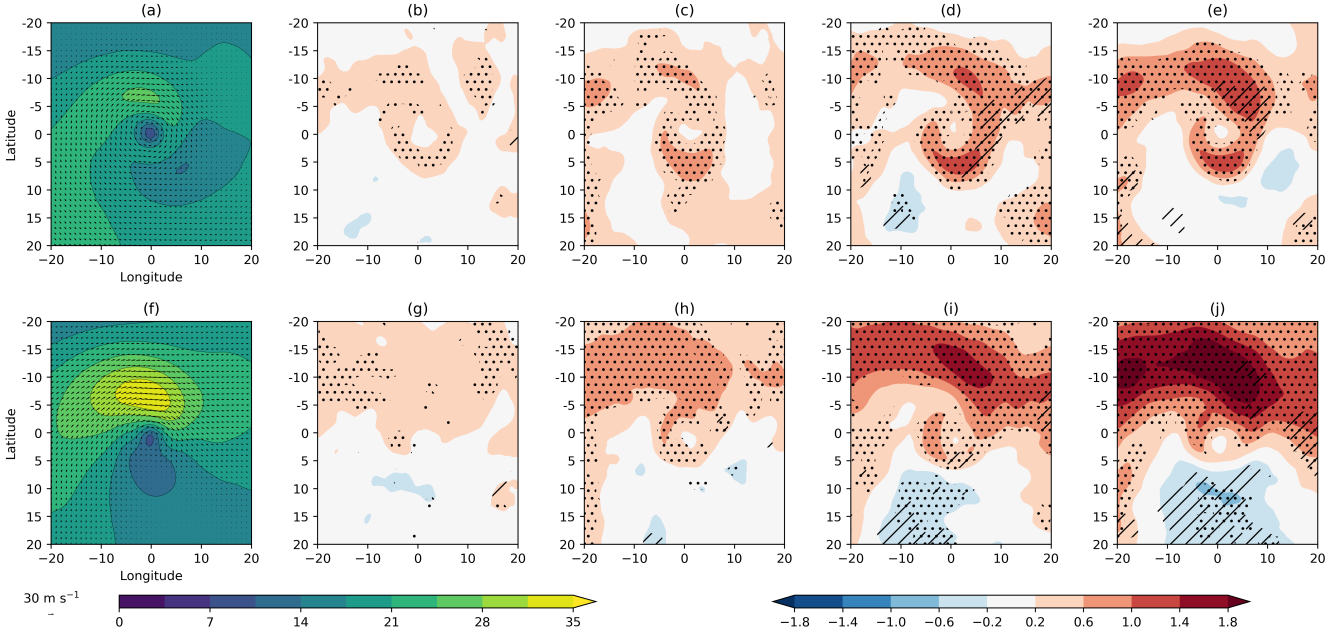

Figure S5. As Figure S3 but for SH JJA.

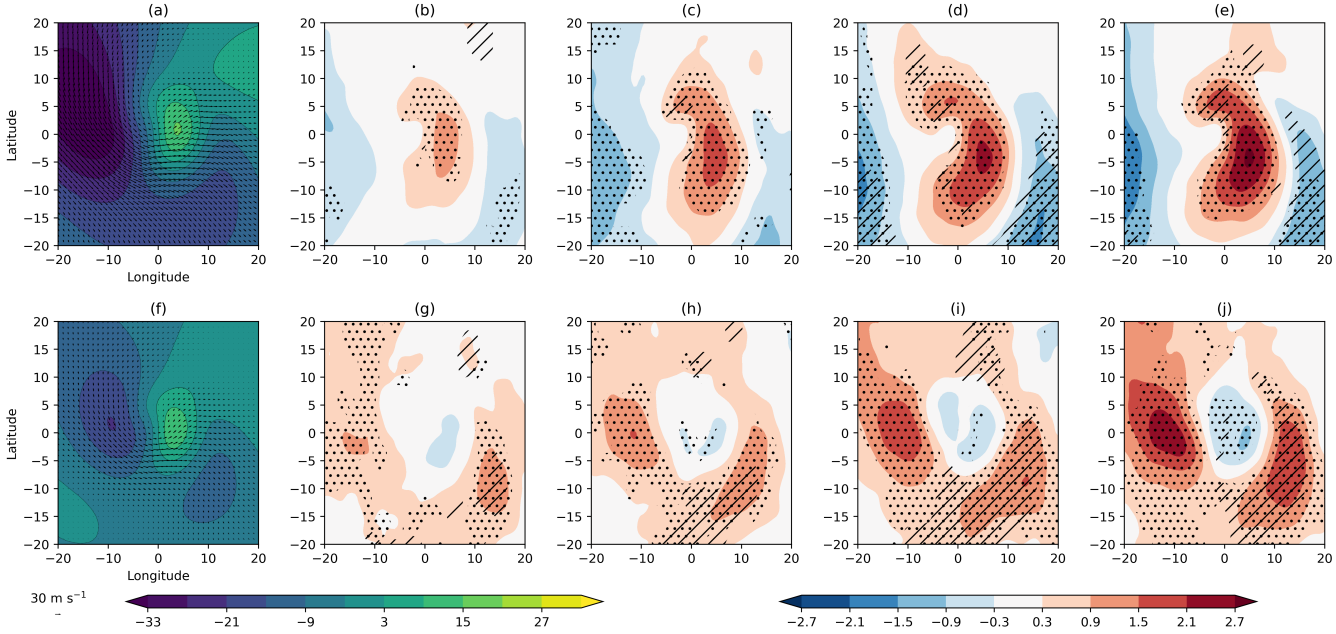

Figure S6. Composites of meridional wind speeds (v) at 850 hPa associated with extreme cyclones in (a–e) DJF and (f–j) JJA in the NH. Composites are shown for the CMIP6 historical average (a,f) and biases for the SSP1-26 (b,g), SSP2-45 (c,h), SSP3-70 (d,i), and SSP5-85 (e,j) scenarios for the 2080-2100 period. Stippling indicates 80% model consensus on the sign of the bias and hatching shows where the model mean is larger than the model variance. Changes at 500 hPa are consistent albeit with smaller magnitudes. Units are m s^{-1}.

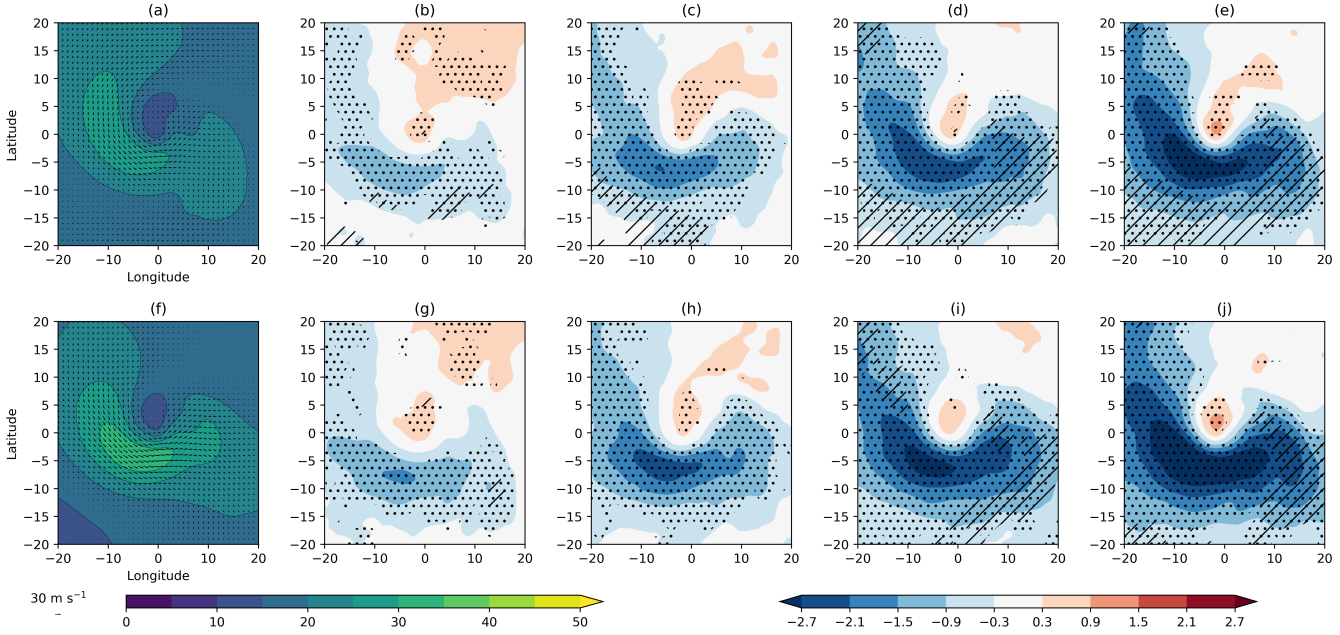

Figure S7. As Figure S3 but for wind speeds at 250 hPa.

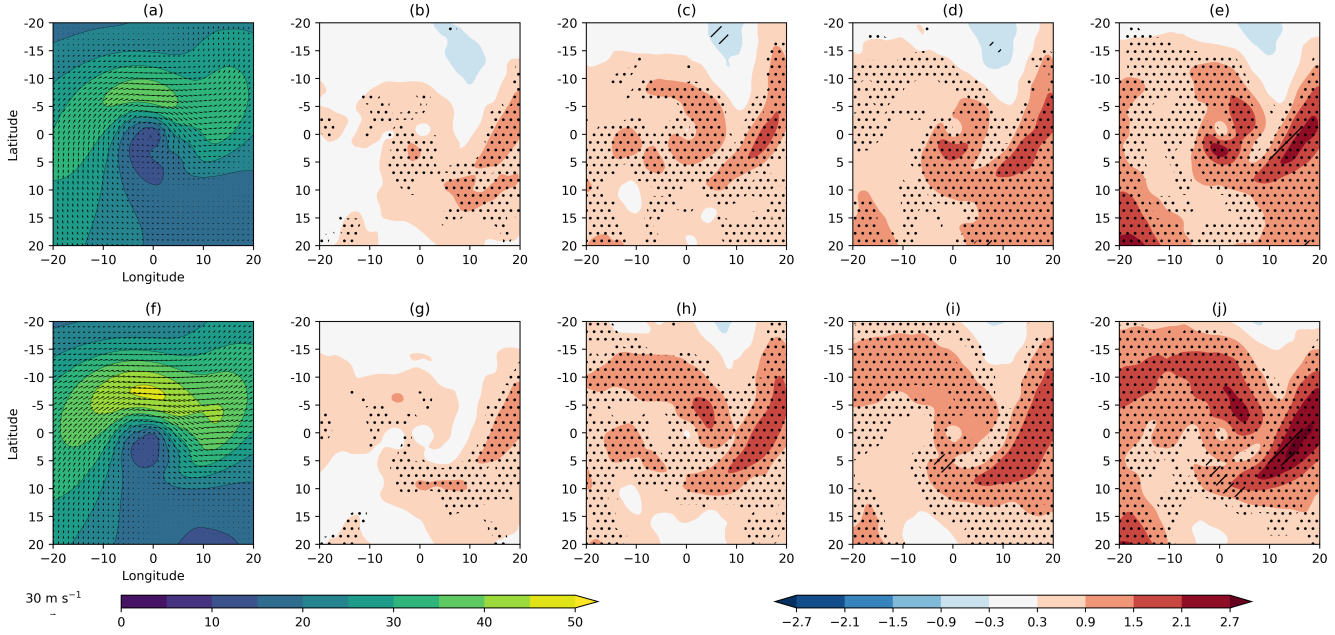

Figure S8. As Figure S6 but for SH DJF.

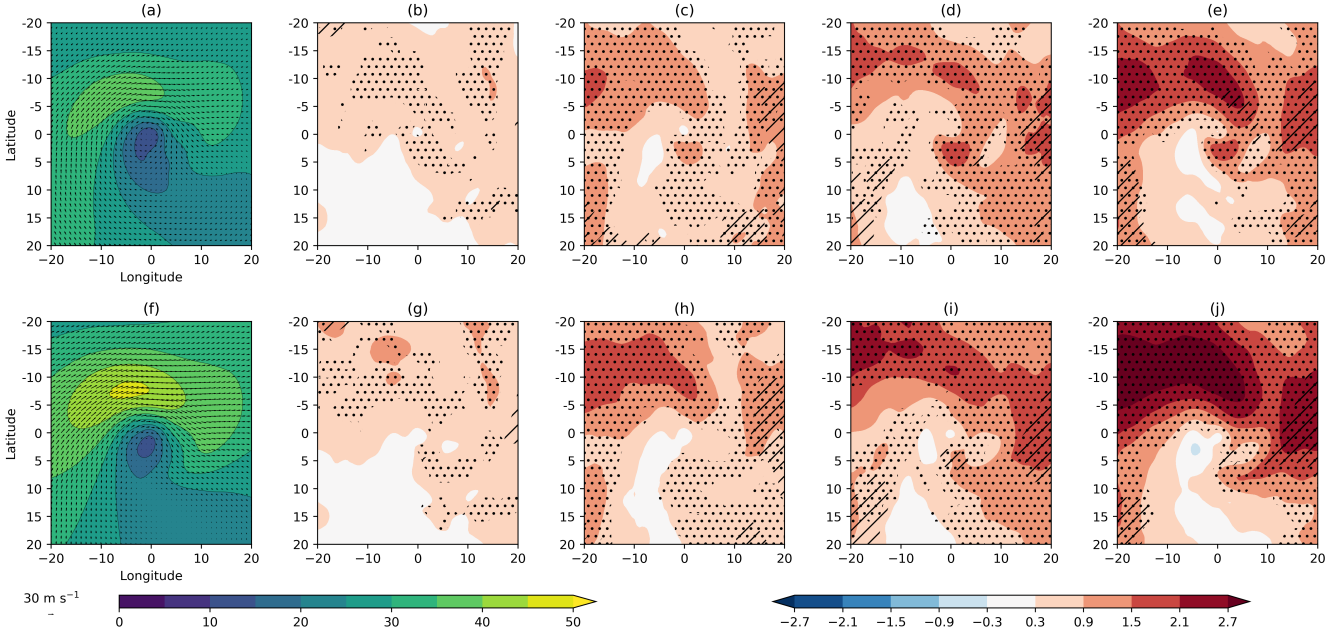

Figure S9. As Figure S6 but for SH JJA.

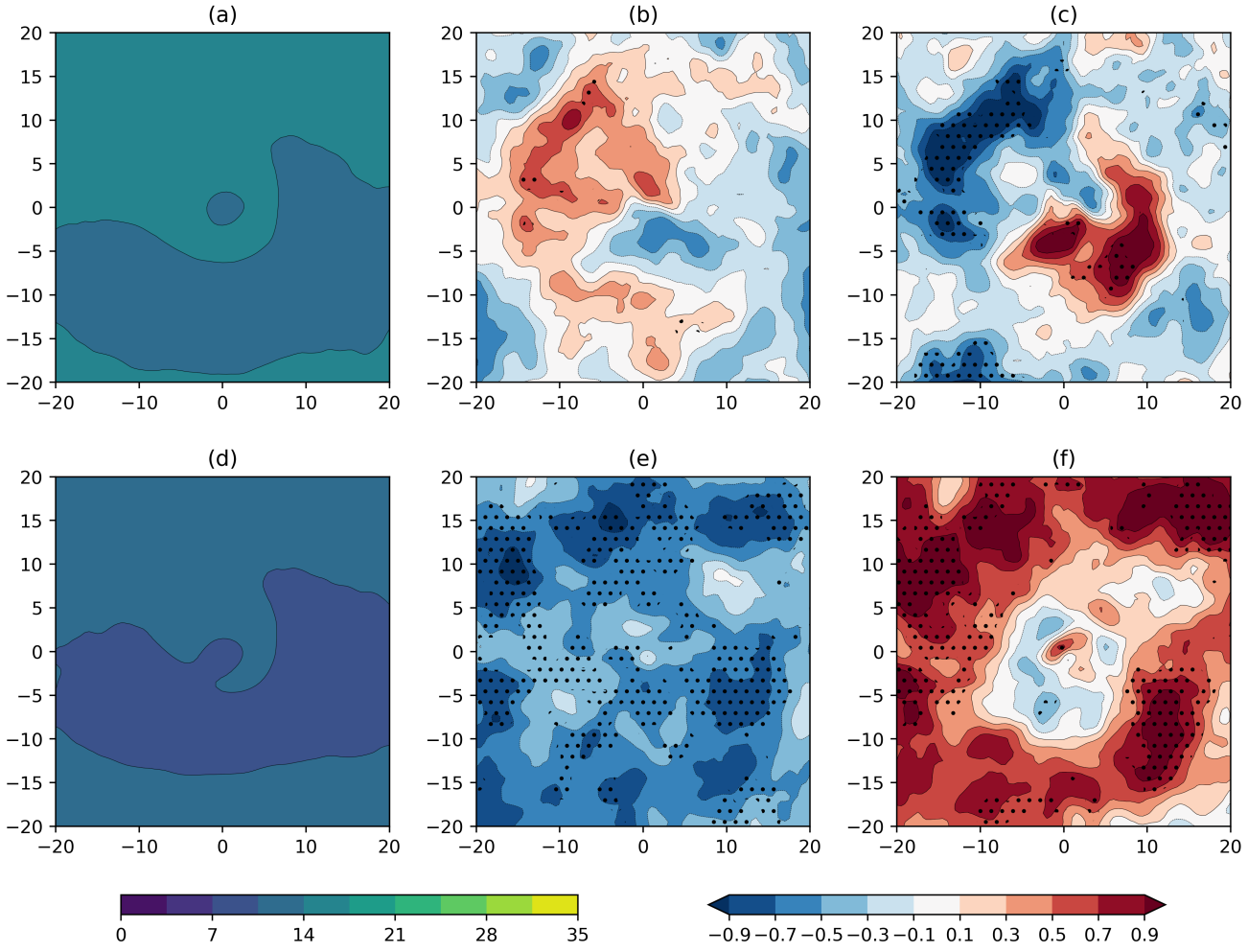

Figure S10. Comparison of composite system relative wind speed for cyclones over the North Atlantic (30°N-70°N, 280°E-360°E) for (a–c) DJF and (d–f) JJA. (a,d) Composites of the AVG cyclones in the 1979-2014 historical period in ERA5. (b,e) Change in the AVG cyclones in the SSP5-85 scenario for the 2080-2100 period. (c,f) Difference between the changes in the EXT and AVG cyclones for the 2080-2099 period. Stippling indicates where 80% of the models agree on the sign of the change. Units are m s^{-1}.