Supplementary Information

North Atlantic seasonal climate variability significantly modulates extreme winter Euro-Atlantic extratropical cyclone hazards

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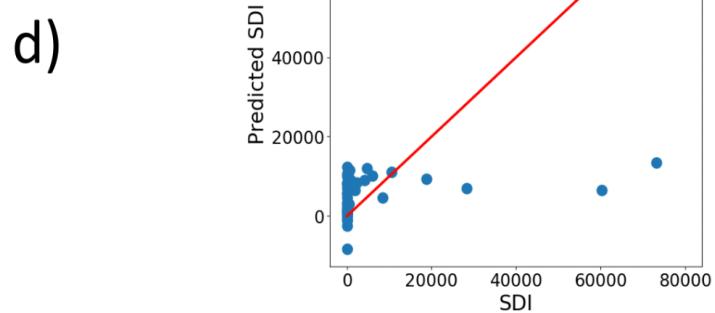
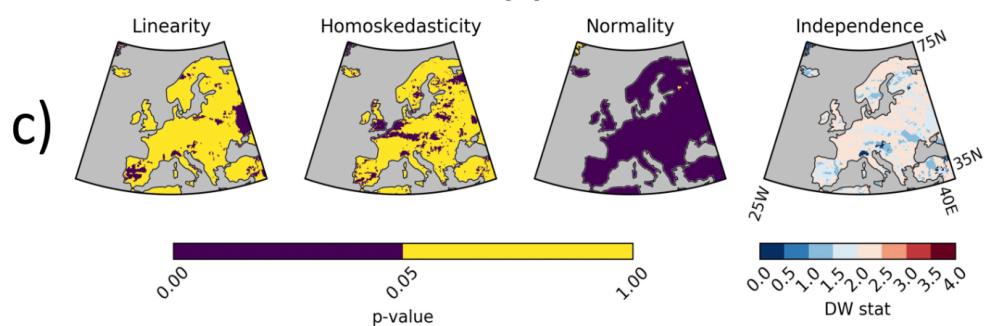
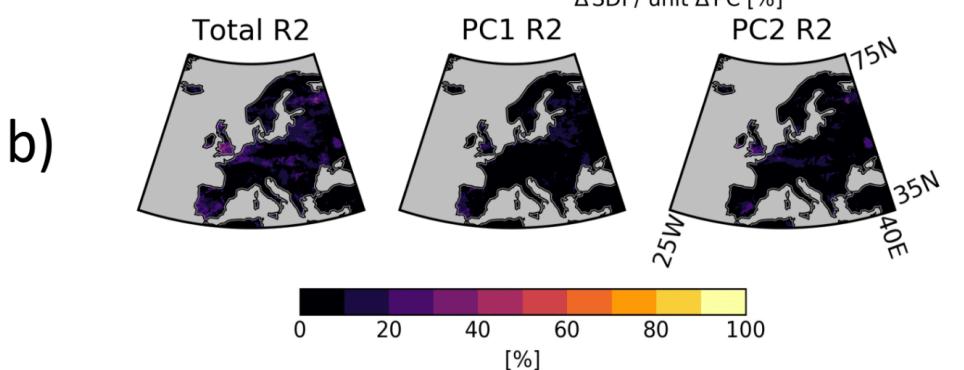
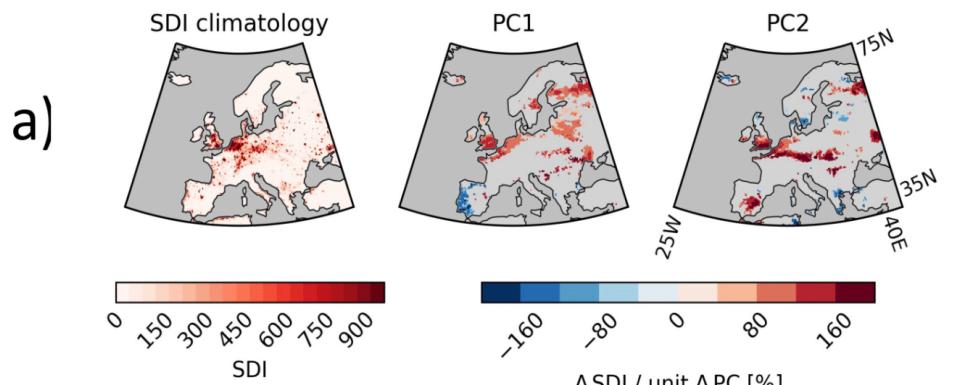

35 **Figure S1:** Performance of the linear regression model for the winter Storm Damage Index (SDI). (a) Climatology and regression coefficients onto PC1/PC2. (b) Total R^2 and PC1/PC2 R^2. (c) Linearity, homoskedasticity, normality and Independence measures for goodness of fit. Yellow is non-significant p-value at the 95% level, indicating the residuals satisfy the assumptions of the regression model. Purple means significant deviations in the residuals from the underlying assumption of the regression model, indicating a poorer fit. DW = 2 means zero autocorrelation in the residuals, DW<2 means positive

40 autocorrelation and DW>2 means negative autocorrelation. (d) Example regression performance at a typical gridbox (1.875°E, 52.125°N).

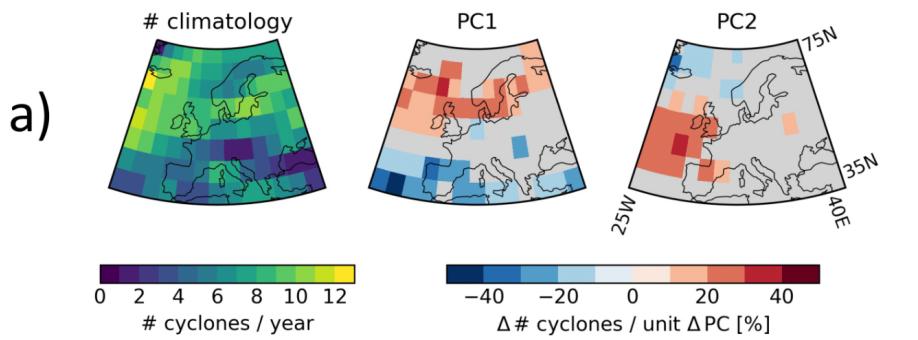
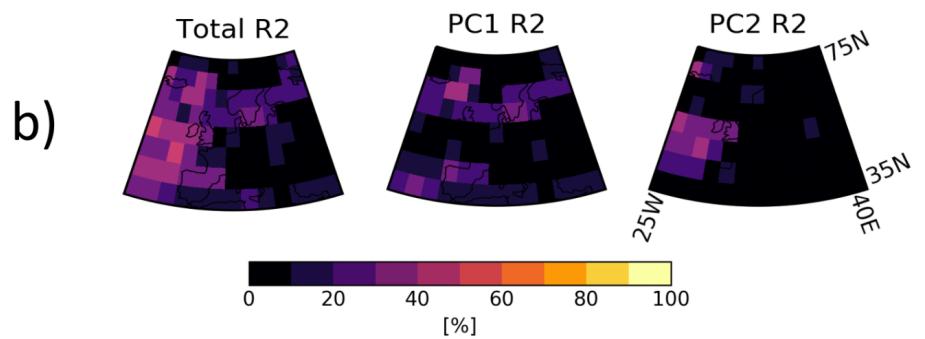
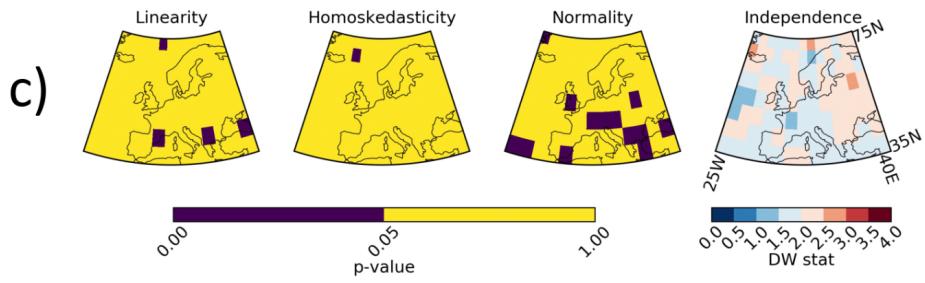
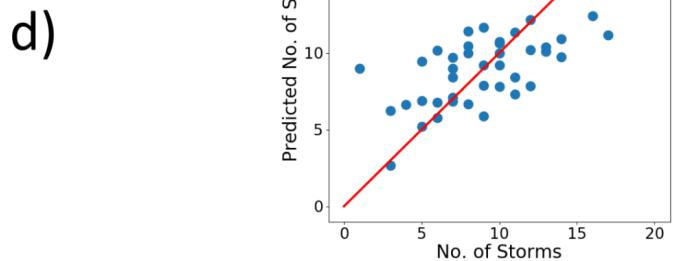
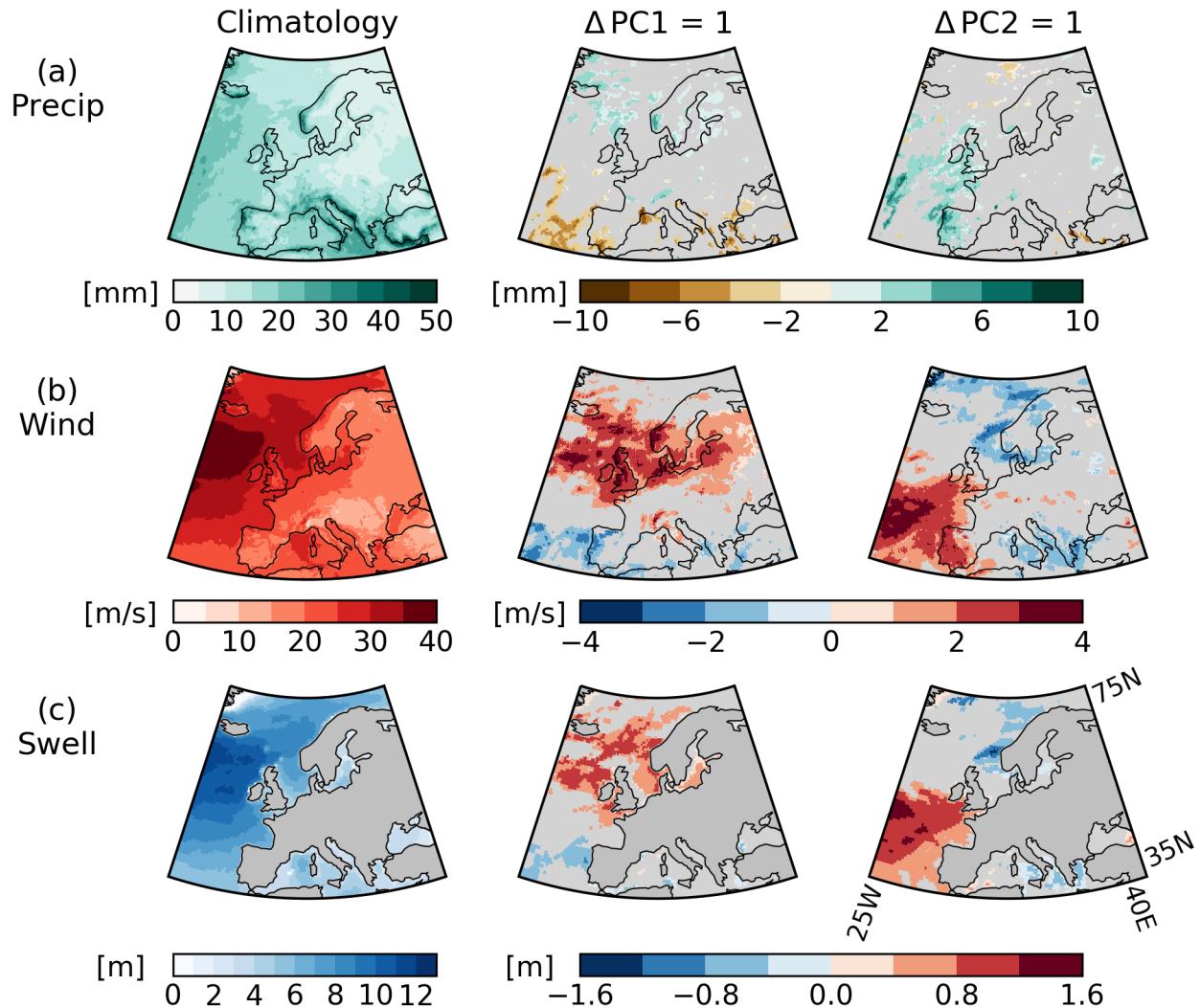



Figure S2: As in Figure S1 but for the winter storm count. (d) shows gridbox (5°E, 55°N).

Maximum for all cyclones in a winter, ERA5 1981-2020

70 **Figure S3:** Maximum winter ETC hazards for (a) daily total precipitation [mm], (b) 10m wind gust [m/s] and (c) maximum wave swell height [m] for (left column) climatology, (middle column) regression onto PC1 and (right column) regression onto

PC2. Note wave swell height is only defined over ocean points. Grey areas in middle and right columns denote regions where the regression slope is not significantly different from zero at the 95% confidence level.

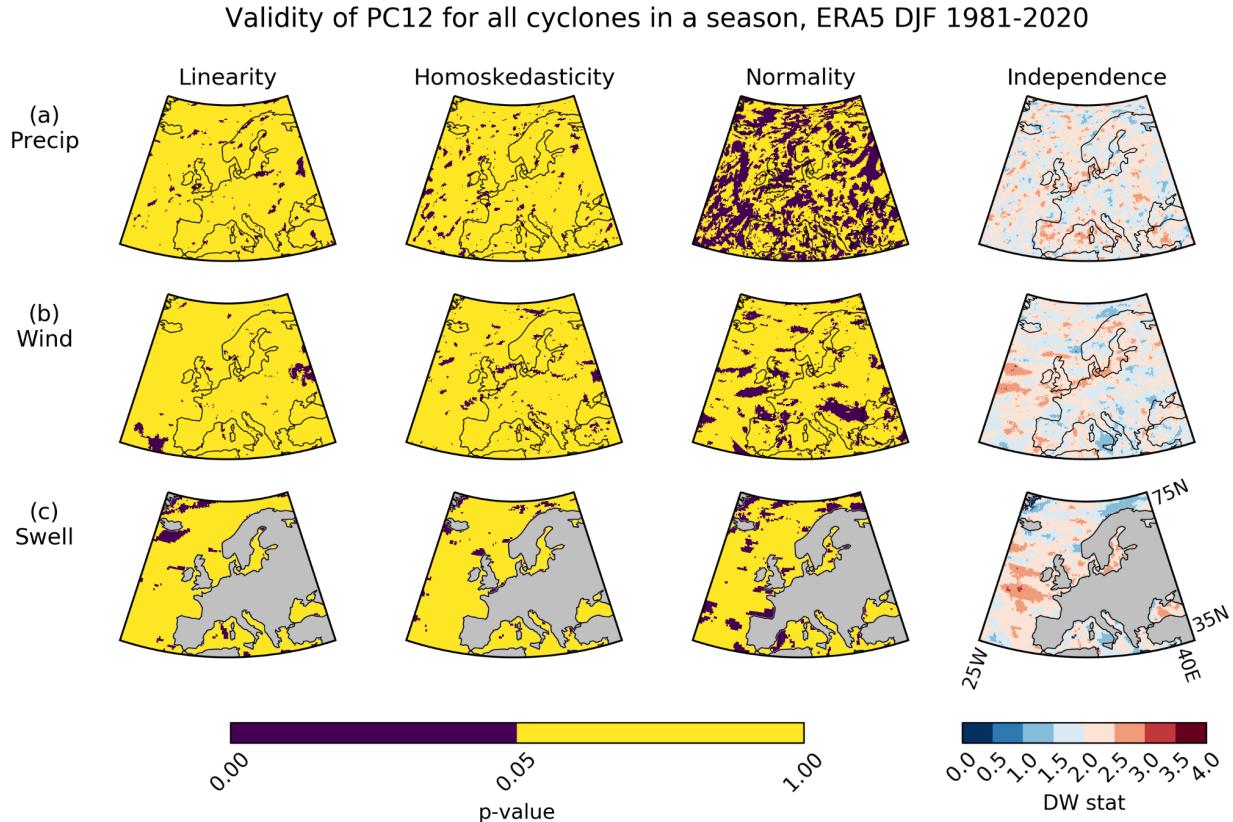



Figure S4: Measures of performance of the linear regression model for ETC hazards regressed onto PC1+PC2 for (a) maximum daily precipitation, (b) maximum 10m wind gust and (c) maximum wave swell height. Measures are (left) linearity, (second left) homoskedasticity, (second right) normality and (right) Durban Watson independence statistic. Yellow means a non-significant p-value at the 95% confidence level, indicating the residuals satisfy the underlying assumptions of the regression model. Purple means there are significant deviations in the residuals from the underlying assumption of the regression model, indicating a poorer fit. For the DW statistic a value of 2 means zero autocorrelation in the residuals, DW<2 means positive autocorrelation and DW>2 means negative autocorrelation.