

Extended data 'Dynamical proxies of North Atlantic predictability and extremes'

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A Additional Figures

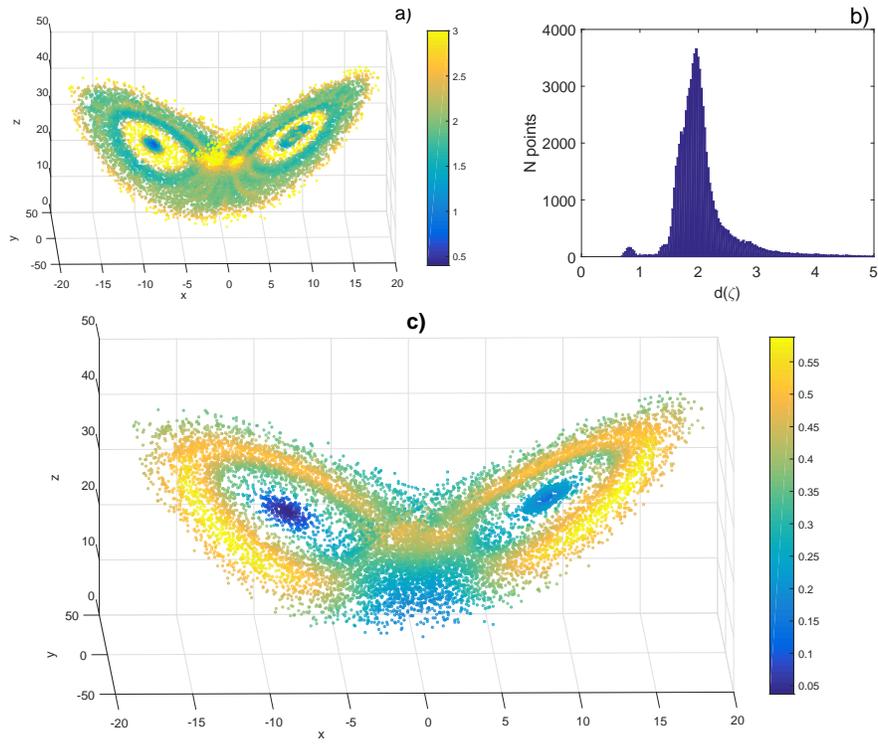


Figure A.1: Test of the algorithm for the Lorenz 1963 attractor. a) Local dimensions $d(\zeta)$ and b) their histogram, c) Stickiness $\theta(\zeta)$. All the quantities have been computed at 75,000 ζ points on the Lorenz attractor.

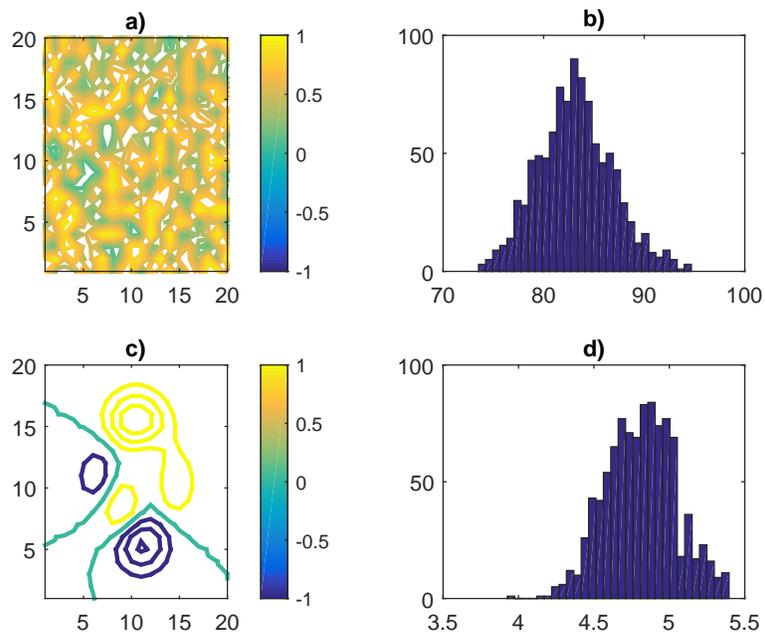


Figure A.2: Test of the algorithm on synthetic fields of size 20×20 . The fields have been randomly iterated 50000 times to mimic chaotic dynamics. a) Random field example. b) histogram of the local dimensions: $D = 83.12$. c) Field with coherent structures resembling pressure fields. d) Histogram of the local dimension: $D = 4.8$.

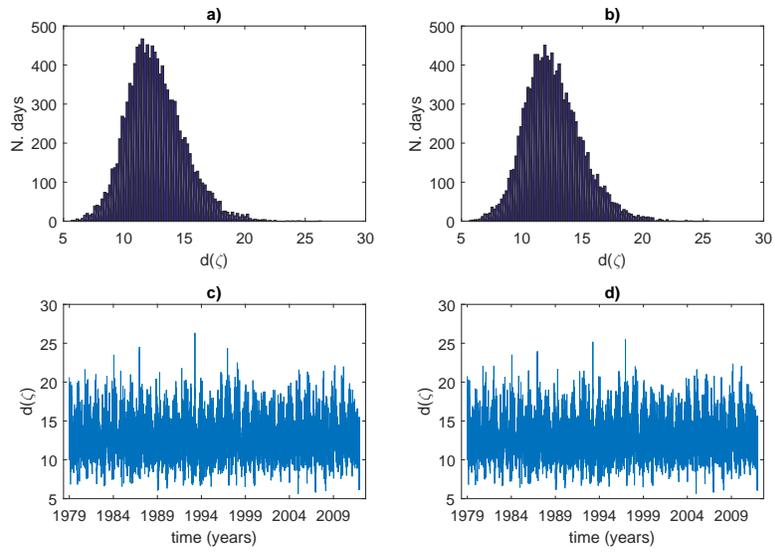


Figure A.3: Histograms of the daily local dimension d for the ERA-Interim data 0.75 (a) and the ERA 1.5 5 (b) reanalyses. c) Time series of the local dimensions for the ERA-Interim data 0.75 (c) and the ERA 1.5 5 (d) reanalyses.

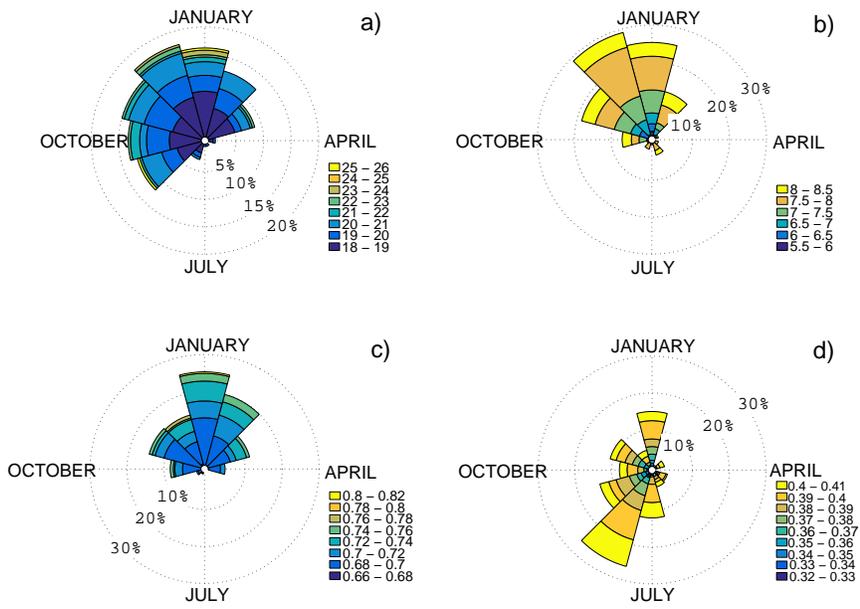


Figure A.4: Monthly distribution of the instantaneous properties exceeding the 0.02 and 0.98 quantiles of their respective distributions. Maxima of a) d and (b) θ and minima of (c) d and θ (d) for the ERA-Interim data for the period 1979-2015. The percentage values indicate the occurrences in each month. The colourscale refers to the values of the quantities.

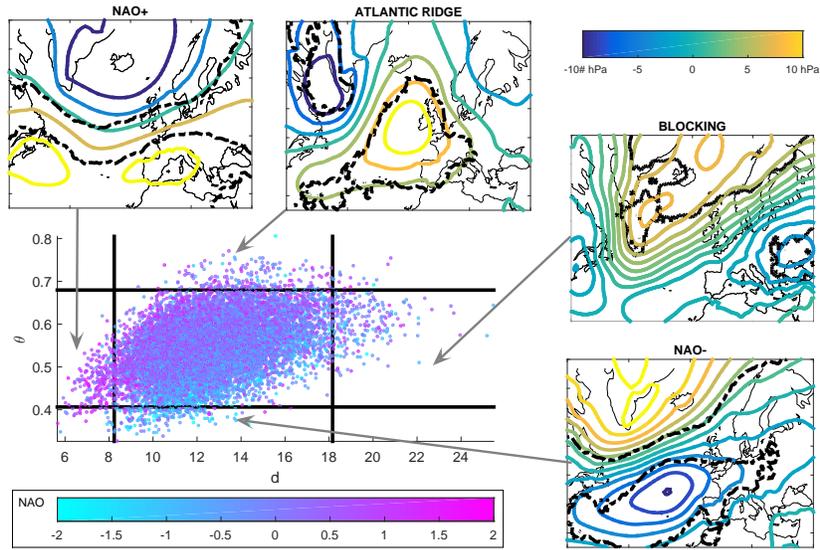


Figure A.5: Dynamical systems analysis for the ERA-Interim data for the period 1979-2015. The scatter plot represents the daily value of the local dimension d and the persistence θ of the field, with the NCEP-NAO value for that day in colourscale. The black solid lines indicate the 0.02 and 0.98 quantiles for d and θ . The conditional sea level pressure fields with respect to the seasonal anomalies for the four regions delimited by the black lines are plotted in the side panels and could be associated with known weather regimes: NAO+ (minima of $d(t)$), NAO- (minima of θ), Atlantic Ridge (maxima of d), Blocking (maxima of θ). The black line indicates the region where at least the 2/3 of extreme pressure anomalies have the same sign.

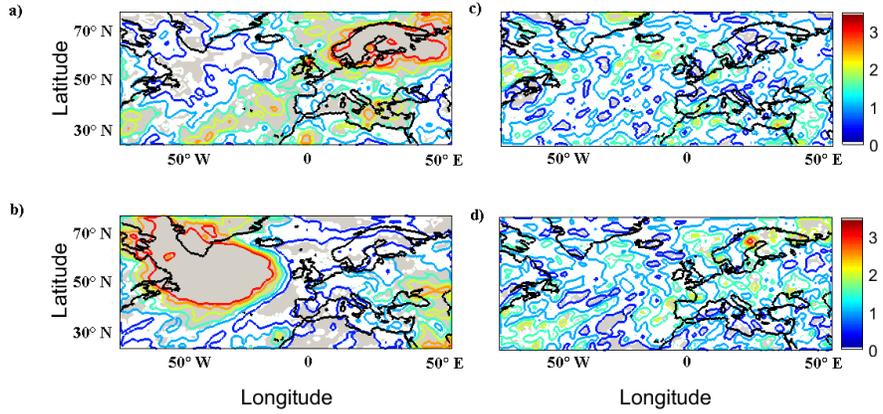


Figure A.6: Relative changes in the frequency of (a), (b) extreme cold and (c), (d) extreme wet events for days with local dimension beyond the (a), (c) 0.98 and (b), (d) 0.02 quantiles of d in the ERA-Interim data. Contours start at 0, with an interval of 0.5; the grey shading shows statistically significant changes.

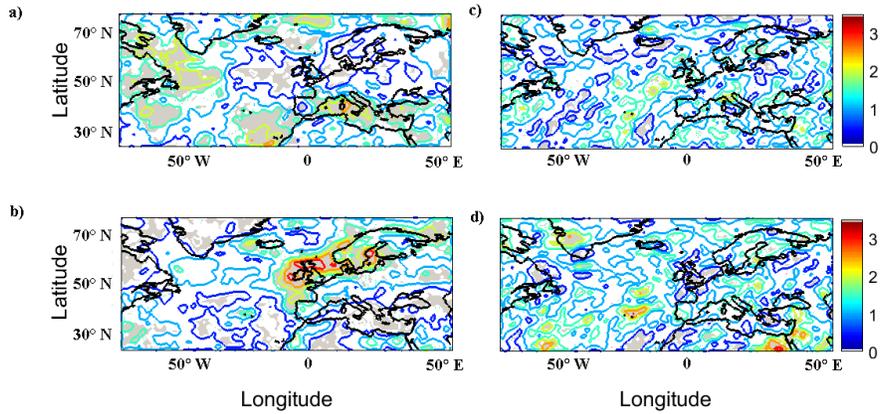


Figure A.7: Relative changes in the frequency of (a), (b) extreme cold and (c), (d) extreme wet events for days with stickiness beyond the (a), (c) 0.98 and (b), (d) 0.02 quantiles of θ in the ERA-Interim data. Contours start at 0, with an interval of 0.5; the grey shading shows statistically significant changes.

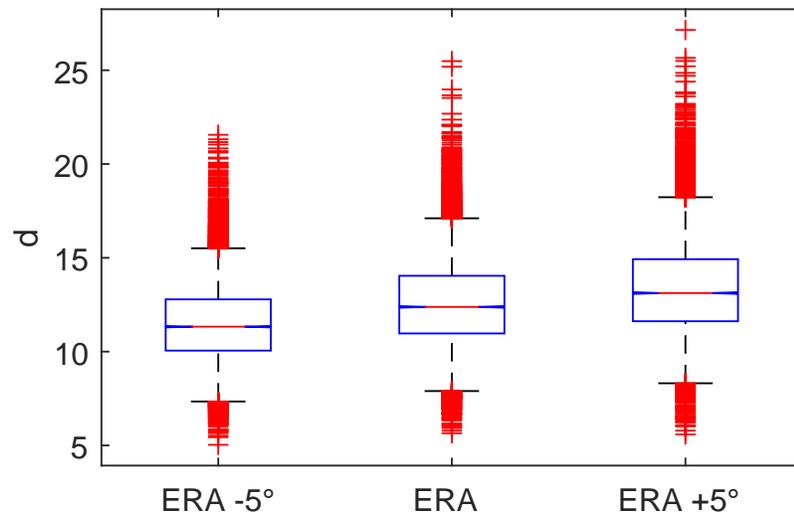


Figure A.8: Box-plots of d for different domain sizes. The region has been shrunk or extended by 5° in longitude and latitude. In each box, the central mark is the median, the edges of the box are the 25th and 75th percentiles, the whiskers extend to the most extreme data points not considered outliers, and outliers are plotted individually.

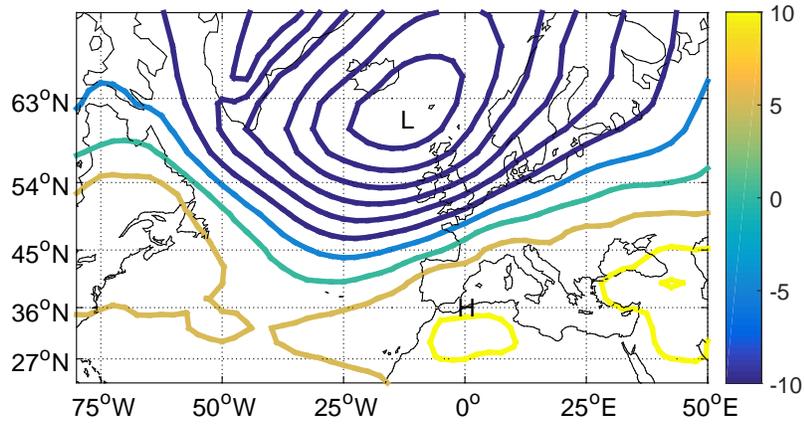


Figure A.9: Sea-level pressure anomaly (in hPa) for days corresponding to both a historical storm and a minimum in local dimension. The anomalous field resembles very closely those obtained for the minima of the local dimension (Fig. 5 b-d in the manuscript).

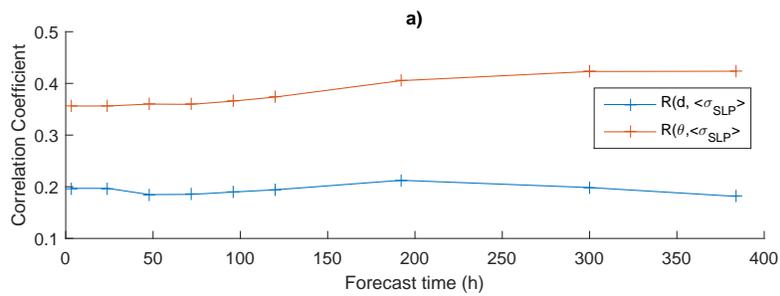


Figure A.10: Correlation coefficient R between the ensemble spread $\langle \sigma_{SLP} \rangle$ and θ (red) and d (blue) at different forecast times.