

Precipitation extremes in the Iberian Peninsula: an overview of the CLIFE project

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Project CLIFE (PTDC/AAC-CLI/111733/2009)

Main aims of the CLIFE project

Climate change of precipitation extreme episodes in the Iberian Peninsula and its forcing mechanisms

1) To diagnose the climate change signal in the precipitation extremes over the Iberian Peninsula (IP);

2) To identify the underlying physical mechanisms.

Datasets: multi-model ensemble

25 RCM simulations from the ENSEMBLES project, generated by 15 RCMs driven by 5 GCMs, under both historic conditions (1951-2000) and SRES A1B scenario (2001-2100).

Daily precipitation and mean sea level pressure for the periods 1961-1990 (recent past) and 2021-2100 (future) are used.

Using the Standardised Precipitation Index (SPI) on a daily basis, a precipitation extreme is defined by the pair of threshold values (Dmin, Imin), where Dmin is the minimum number of consecutive days with daily SPI above the Imin value.

For both past and future climates, a precipitation extreme of a specific type is then characterised by two variables: number of episodes with a given duration in days and number of episodes with a given mean intensity (SPI/duration).

Analyses

Climate change is assessed by changes in the PDFs of the extreme indices, estimated at sectors with different precipitation regimes (cf. Figs. 1 & 2 for an illustration of changes in PDFs and extreme indices in Portugal).

Links between precipitation and Circulation Weather Regimes (CWRs) are explored for both past and future climates (cf. Fig. 3 for an illustration of the main CWRs in the Iberian Peninsula).



Fig. 1 – Ensemble mean PDFs of area-mean precipitation (over Portugal) in 1961–2000 (blue curves) and 2041–2070 (red curves) for: (a) winter (DJF) and (b) summer (JJA). The corresponding PDFs estimated from E-OBS in 1961–2000 (black curves) are also plotted.

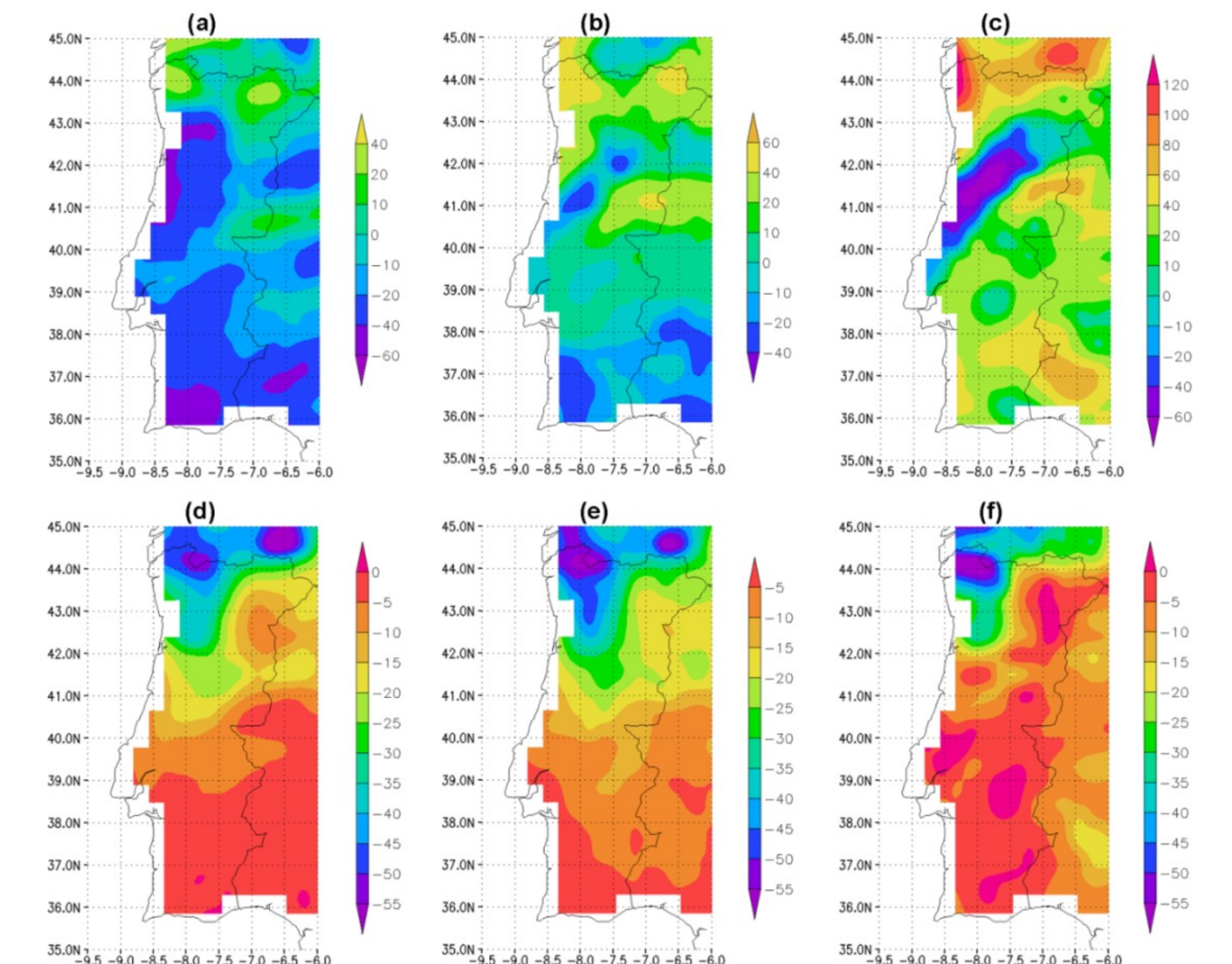


Fig. 2 – Differences between the future (2041-2070) and the recent-past (1961-2000) ensemble means of R5p (left panels), R50p (central panels) and R95p (right panels) in mm season-1 for (a, b, c) DJF and (c, d, f) JJA.

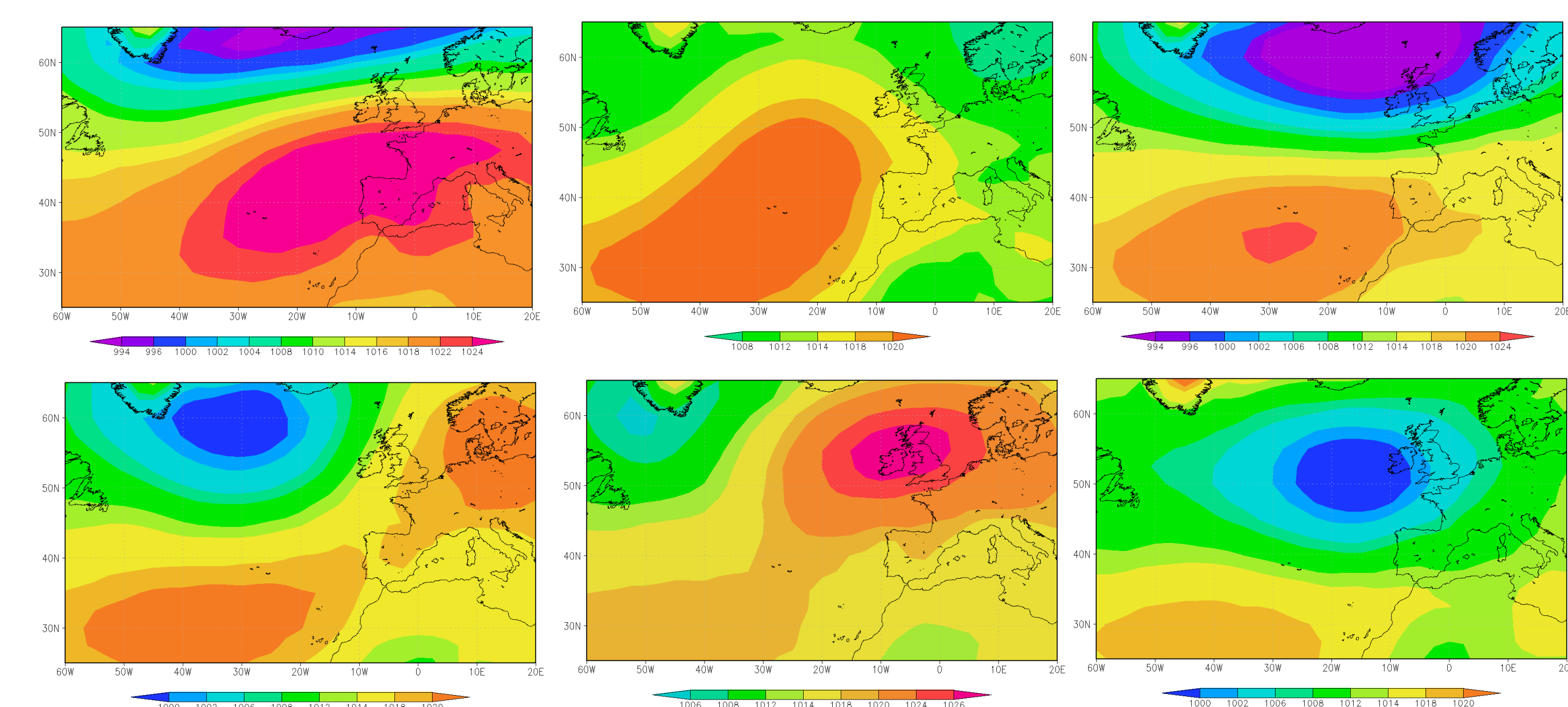


Fig. 3 – The six most relevant weather regimes for the Iberian Peninsula (mean sea level pressure composites in hPa). These regimes are obtained by applying a K-means clustering on the leading principal components of the daily mean sea level pressure fields (NCEP reanalysis) within the Euro-Atlantic sector and for the period 1950-2012. Seasonality is previously removed on a daily basis after spline smoothing at each grid point.