Climate change of precipitation extremes in the Iberian Peninsula: CLIPE project results

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CLIPE objectives

(i) To diagnose the climate change signal in the precipitation extremes over the Iberian Peninsula (IP).

(ii) To identify the underlying physical mechanisms.

NOTE: Only the first aim is addressed in this presentation; other works performed under the CLIPE project are presented by other colleagues.
- Original data
- Derived data
- Methodology
- Results
- Concluding remarks
Precipitation daily-total data obtained from the Multi-Model Ensemble (MME) of Regional Climate Model (RCM) simulations provided by the ENSEMBLES project (spatial resolution of ~25km).

MME: 15 GCM-driven RCM simulations from 1961 to 2098 (9 RCMs forced by 11 GCMs).
Original data: RCM grids
### Original data: GCM x RCM matrix

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<th>BCM</th>
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Annual and seasonal indices of precipitation extremes, proposed by the CCI/CLIVAR/JCOMM Expert Team on Climate Change Detection and Indices (ETCCDI), derived from the daily precipitation MME. Each index was computed for each member of the MME (ETCCDI-MME) and for the MME Median (ETCCDI-MMEM).

**ETCCDI**:  

**PRCTOT**: Total amount of precipitation.  
**CDD**: Consecutive dry days (PRP < 1.0 mm).  
**Rx5day**: Maximum total precipitation over five consecutive wet days.  
**R95T**: % of PRCTOT due to days with daily-total amount ≥95th percentile of wet days of the reference climate (1961-1990).
**Methodology: non-parametric approach**

**TREND**
Theil-Sen linear trend, from 1961 to 2098, tested by the Mann-Kendall test.

**CD**
Differences between the climatologies, estimated by the time Median, of a **near-future (2021-2050)** and a **distant-future (2071-2098)** climates from the climatology of a recent-past reference climate (1961-1990), tested by the Mann-Whitney test.

Climate change projections are evaluated from the statistics obtained from the ETCCDI-MMEM, while the uncertainties of those projections are evaluated by a rank-based measure of the spread of these statistics across the ETCCDI-MME: modified version of MAD (Median Absolute Deviation) statistic.
Results: PRCTOT

MMEM PRCTOT

1951-2098 TREND

2021/50 vs 20C: CD

2059/98 vs 20C: CD

ANNUAL

WINTER

SPRING

SUMMER

AUTUMN
Results: PRCTOT (MME SPREAD < 50%)
Results: CDD
Results: CDD (MME SPREAD < 50%)
Results: Rx5day

MMEM Rx5day

1961-2090 TEND

2021/50 vs 20C CD

2069/98 vs 20C CD
Results: Rx5day (MME SPREAD < 50%)
Results: R95T
Results: R95T (MME SPREAD < 50%)
Concluding remarks

RCM simulations differ between RCMs. Note that the physics of the RCMs are different and the driver GCMs are also different.

Climate change projections are highly depend on the chosen GCM/RCM simulation, specially for extreme indices or high-moment statistics.

Climate change detection methods should take into account the variability across the RCM ensemble.

Robust regional climate change projections based on ensembles of RCM simulations can be achieved by considering only the regions where the RCM projections agree.
Thank you for your time