

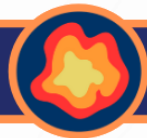
Ensemble weather forecast of precipitation with a stochastic weather generator based on analogues of circulation

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Objectives

1. Ensemble forecast of precipitation in western Europe with a stochastic weather generator (SWG)
2. Assess the skills of the stochastic weather generator to forecast precipitation for lead times of days to weeks

Concept

Random analogue
sampling of atmospheric
circulation :

- **Z 500**
- **SLP**



Stochastic
weather generator



**Precipitation of Orly
(France, near Paris)**



Different timescales (1 day to a month)

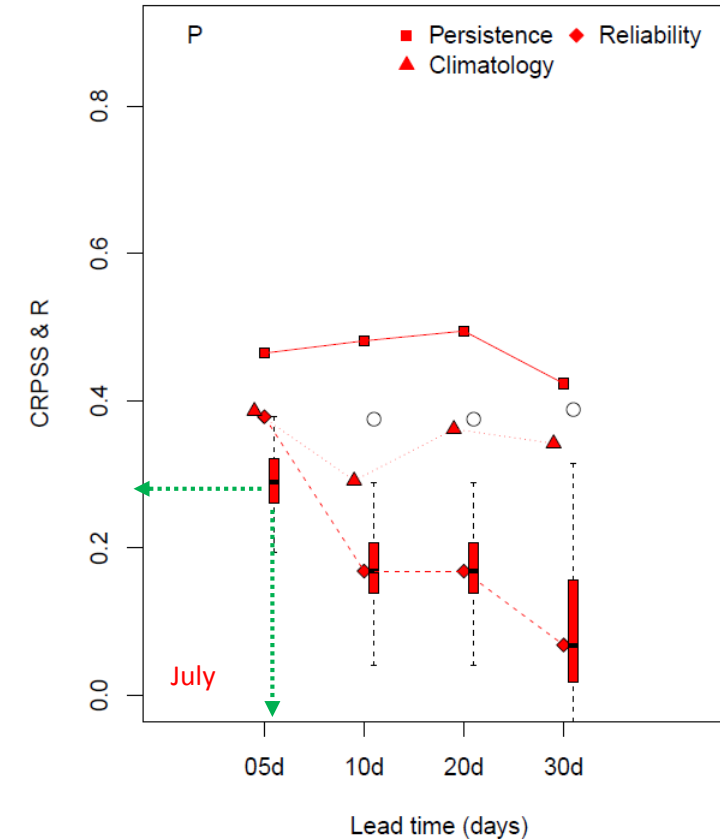
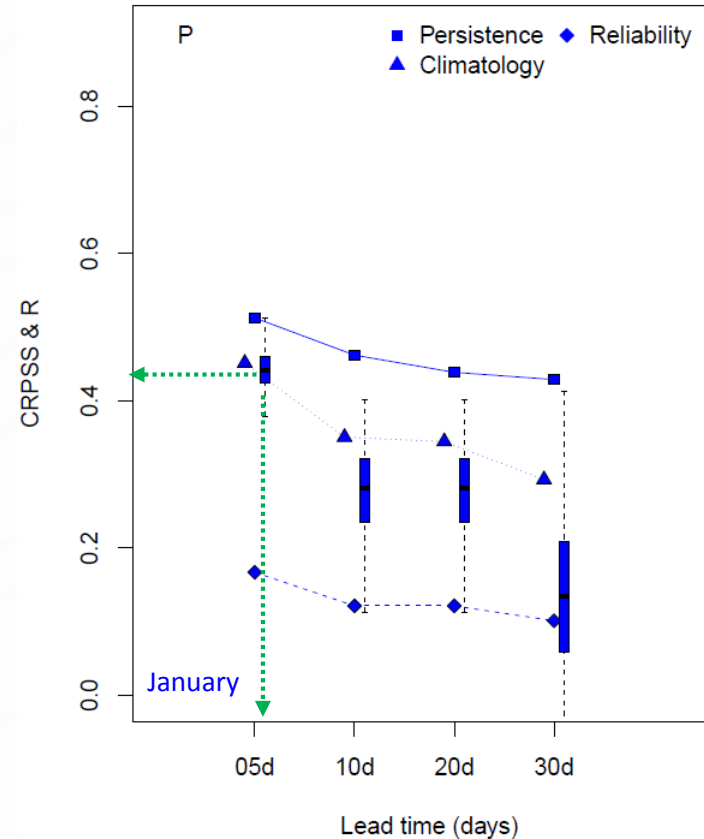
Protocol

- Analogues computed from Z500 over region 30°W - 20°E ; 40° - 60°N (NCEP) from 1948 to 2019.
- We simulate $N=100$ trajectories of lead times $T= 5$ to 30 days for a given date and average each trajectory over T .
- Skill scores: Correlation, CRPS and CRPSS are computed for each value of lead times T .
- Hindcast mode.

Results

The correlations indicate the spread across the 100-member ensemble forecasts:

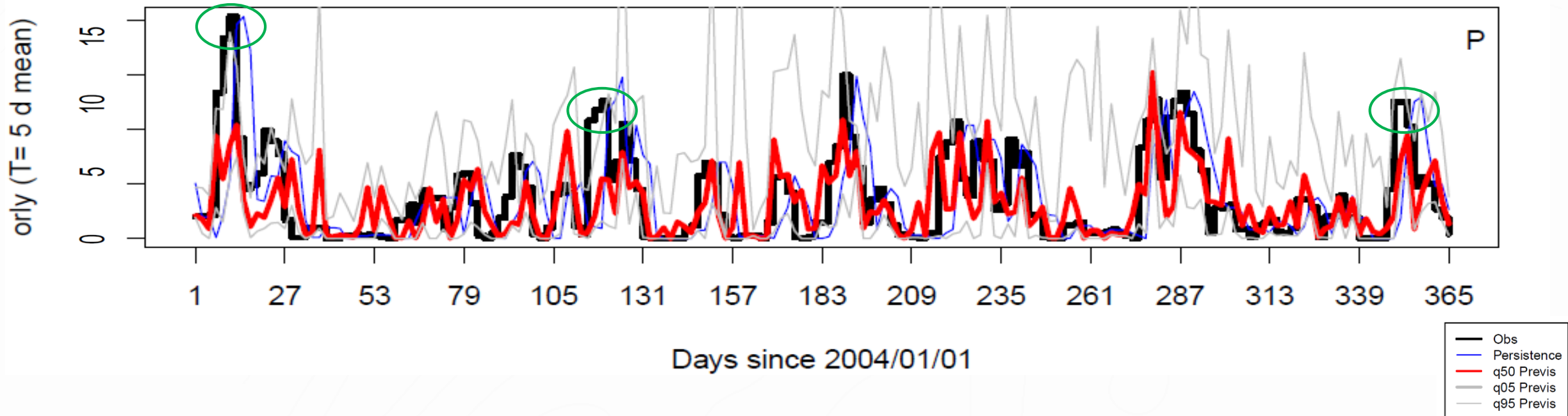
- For lead time $T = 5$ days $r = 0.43$
- For lead times $T = 10, 20$ days $r = 0.3$



Skill scores for the precipitation for lead times T of 5, 10, 20, 30 days for January (a: blue) and July (b: red)

Results

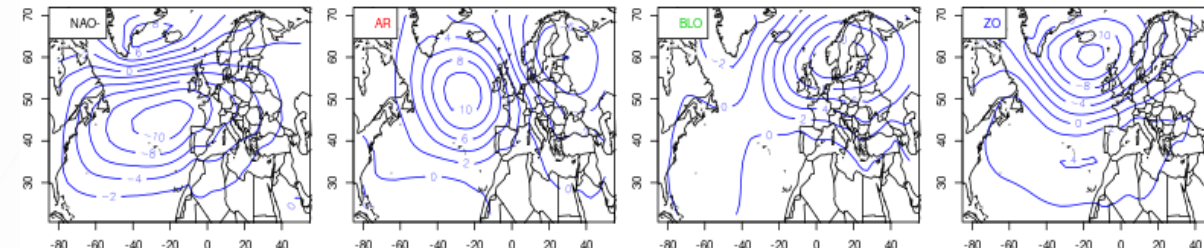
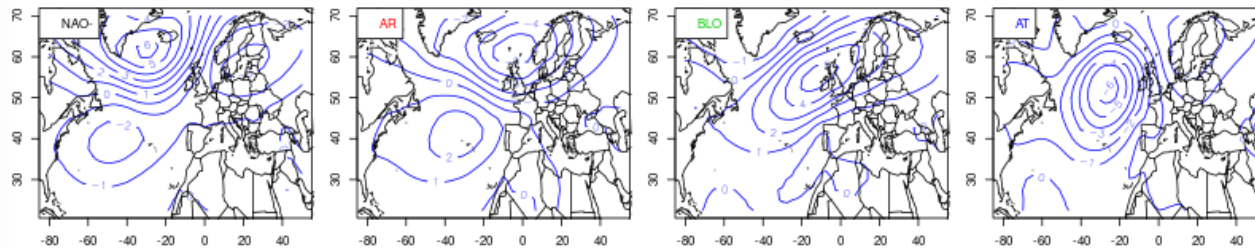
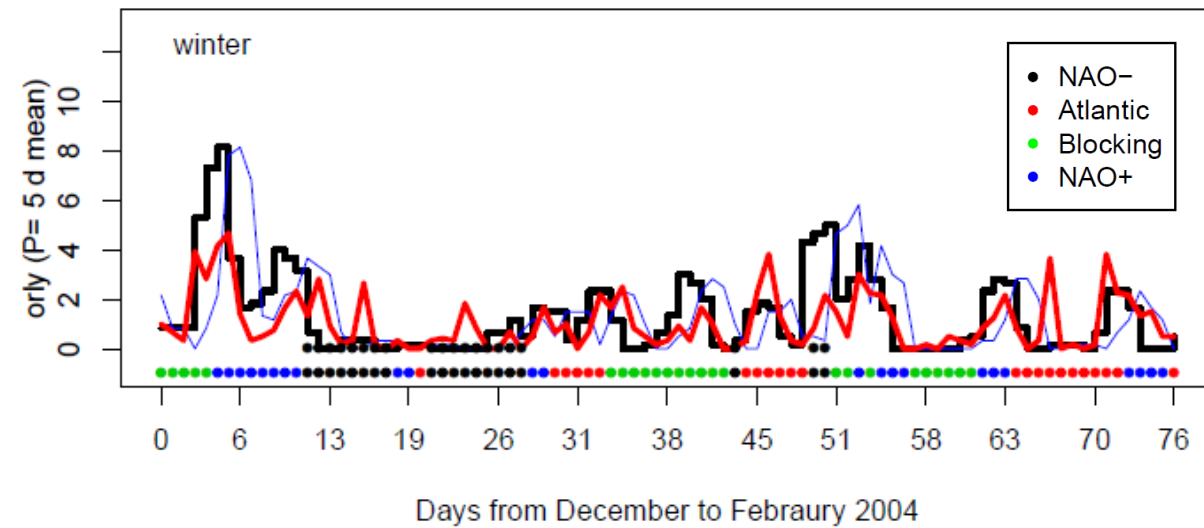
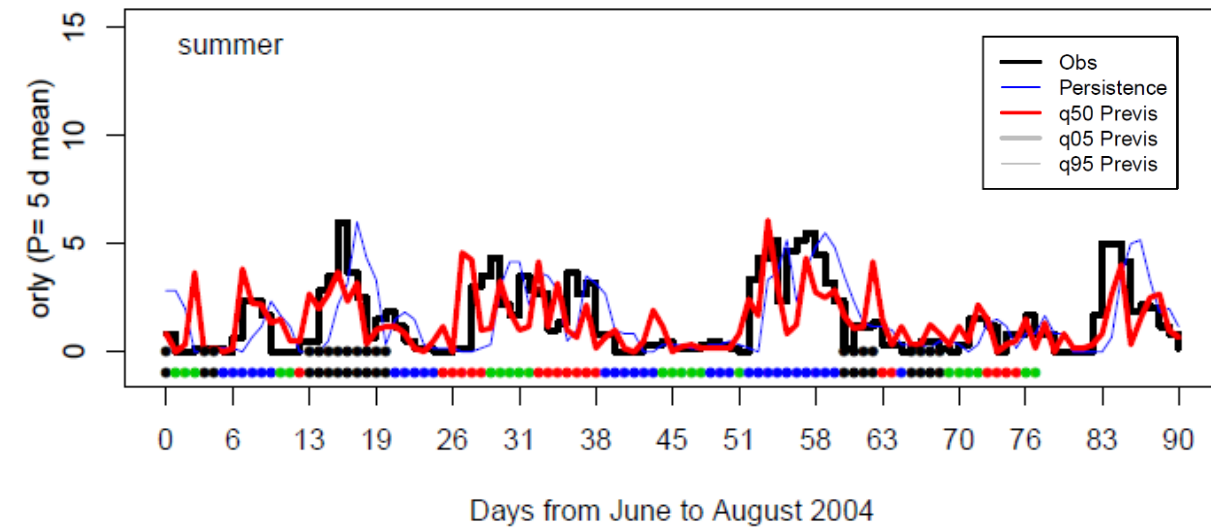
- Simulated and observed precipitations



Time series of analogue ensemble forecasts for 2004 for lead times $T = 5$ days

Results

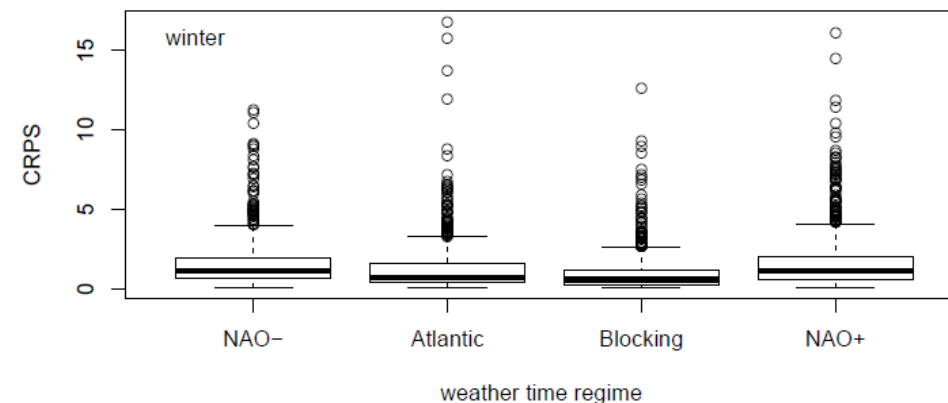
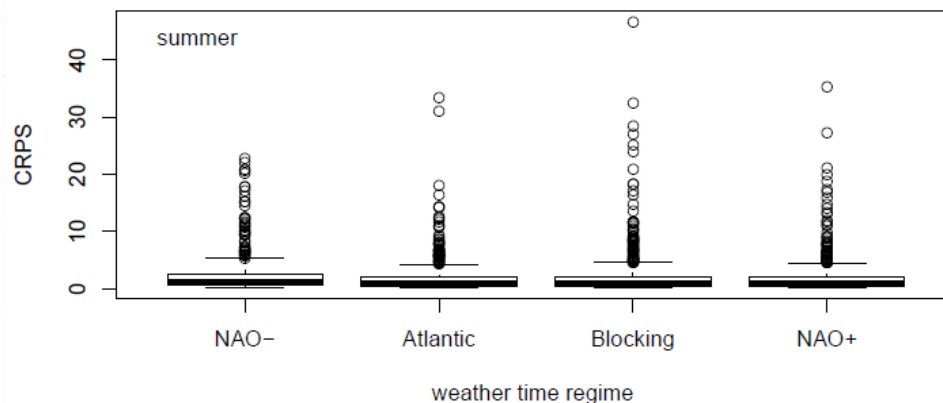
- Seasonality and weather regimes



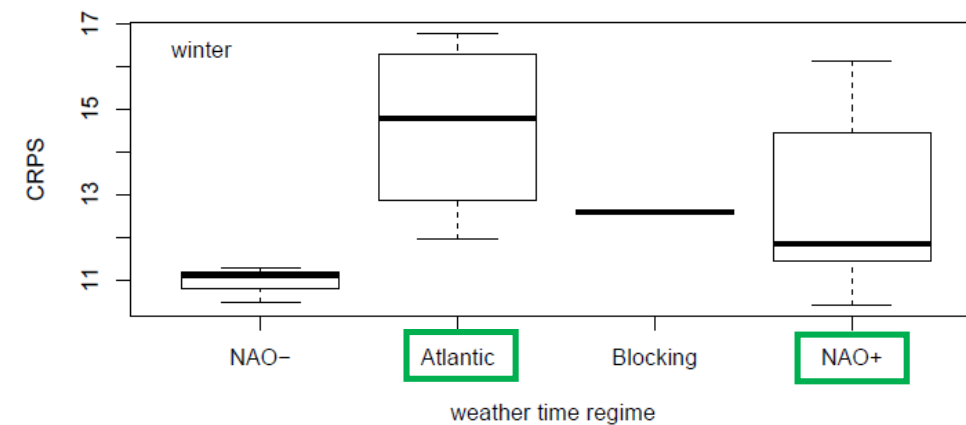
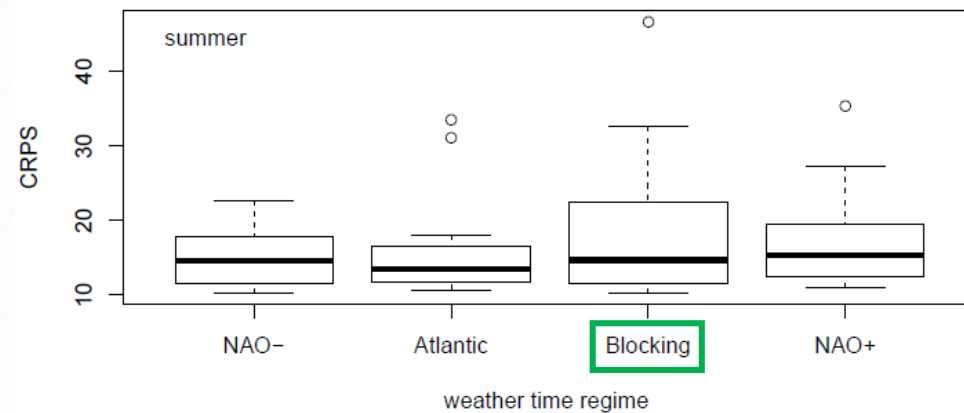
Results

- CRPS and weather regimes

Daily CRPS and weather regime



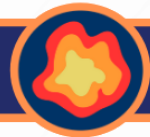
Large values of daily CRPS and weather regime



Conclusion

- The performance of analogues weather generator shows skill over 5 days (correlation/ CRPS).
- The weaknesses of our model are related to specific weather regimes (Atlantic ridge/NAO+) and specific transition of weather regimes
- This is consistent with what Faranda et al. (Rep. Sci. 2017).

Thank you for your attention!



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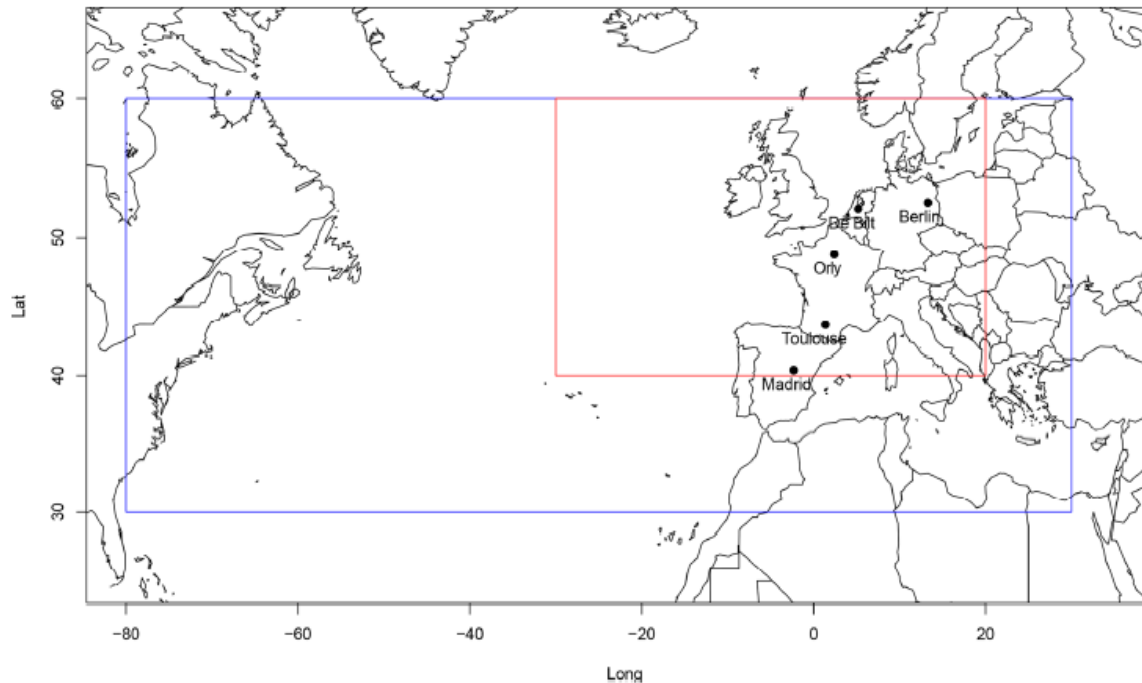


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Methodology: Analogue of circulation



Source: Yiu and Déandréis (2019)

- Computed on data from NCEP reanalyses

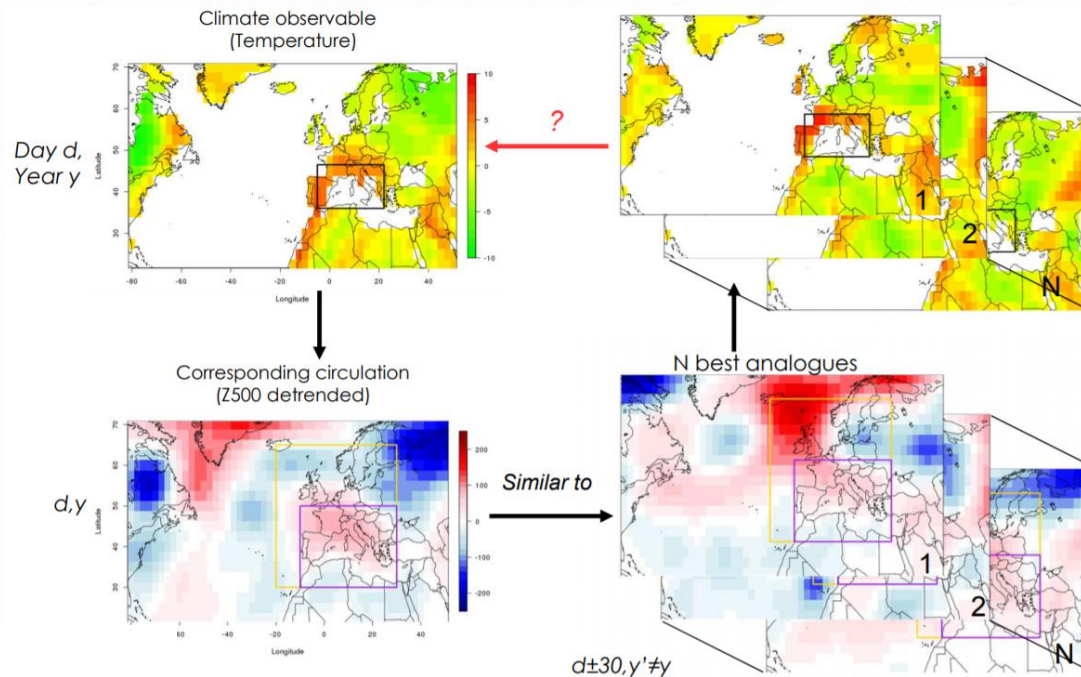
01/01/1948 → 31/12/2019

- Based on atmospheric circulation

Geopotential heights

- Small region: 30°W-20°E;40°-60°N

Methodology: Analogue of circulation



Source: Aglaé Jézéquel *et al* (2018)

Criteria of chose of analogues:

- Strong correlation between d and $d+T$
- Small Euclidean distance