

Improving the ensemble forecast of precipitation in Europe by combining a stochastic weather generator with dynamical models

Meriem Krouma^{1,2}, Lauriane Batté³, Linus Magnusson⁴, Constantin Ardilouze³, Damien Specq³, Pascal Yiou²
 (1) ARIA Technologies, (2) Laboratoire des sciences du climat et de l'environnement (LSCE)
 (3) CNRM Météo France (4) ECMWF

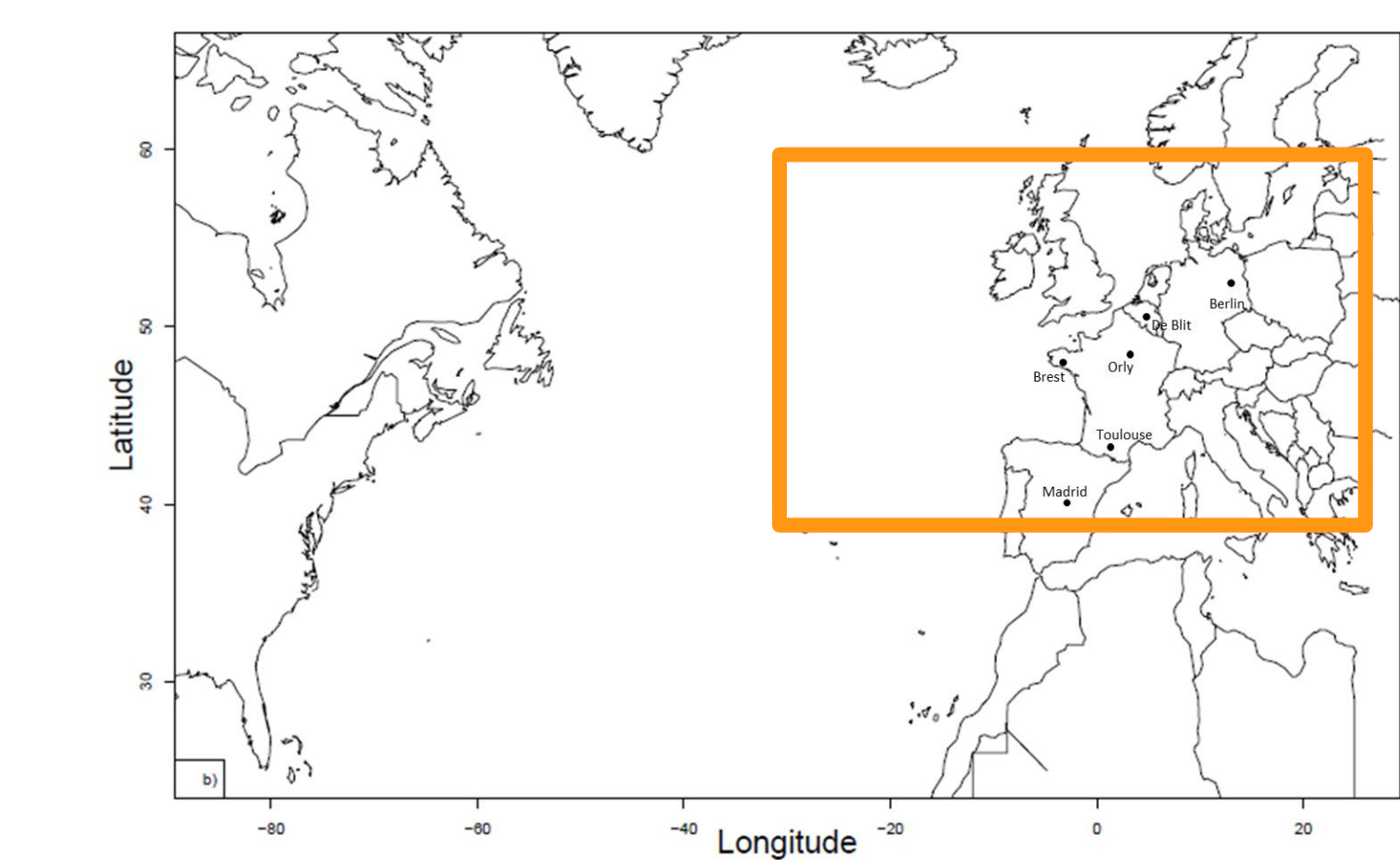
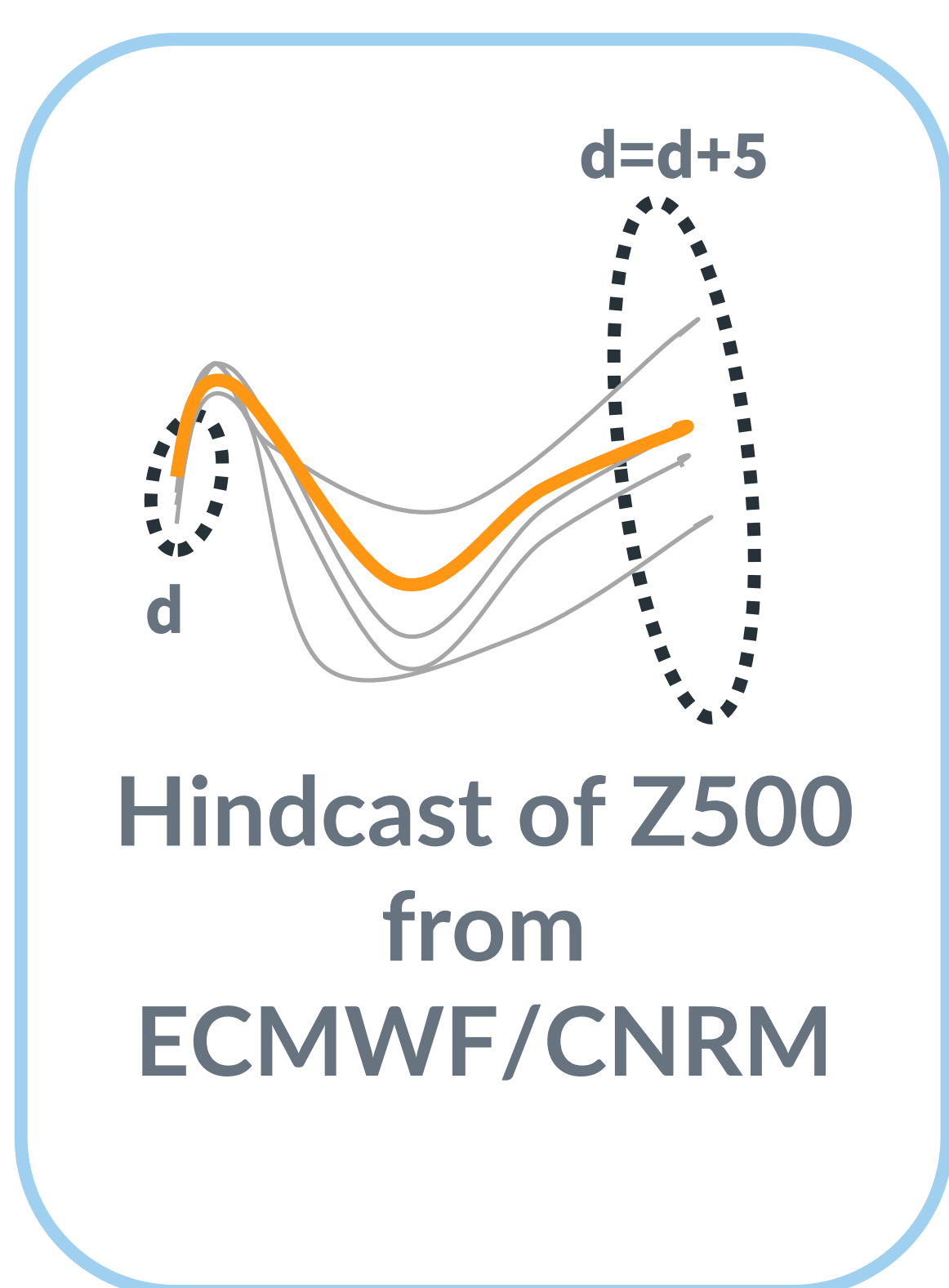
Motivation

An analog Stochastic Weather Generator (SWG) was adjusted to forecast average daily precipitation in Europe (Krouma et al., GMD, 2022). Promising forecast scores were obtained for up to 10 days for European precipitation at the station scale. In this study, we aim to improve the forecast skill of precipitation over Europe for sub-seasonal lead times using the hindcast (HC) of dynamical models such as ECMWF and CNRM with the HC-SWG.

Method

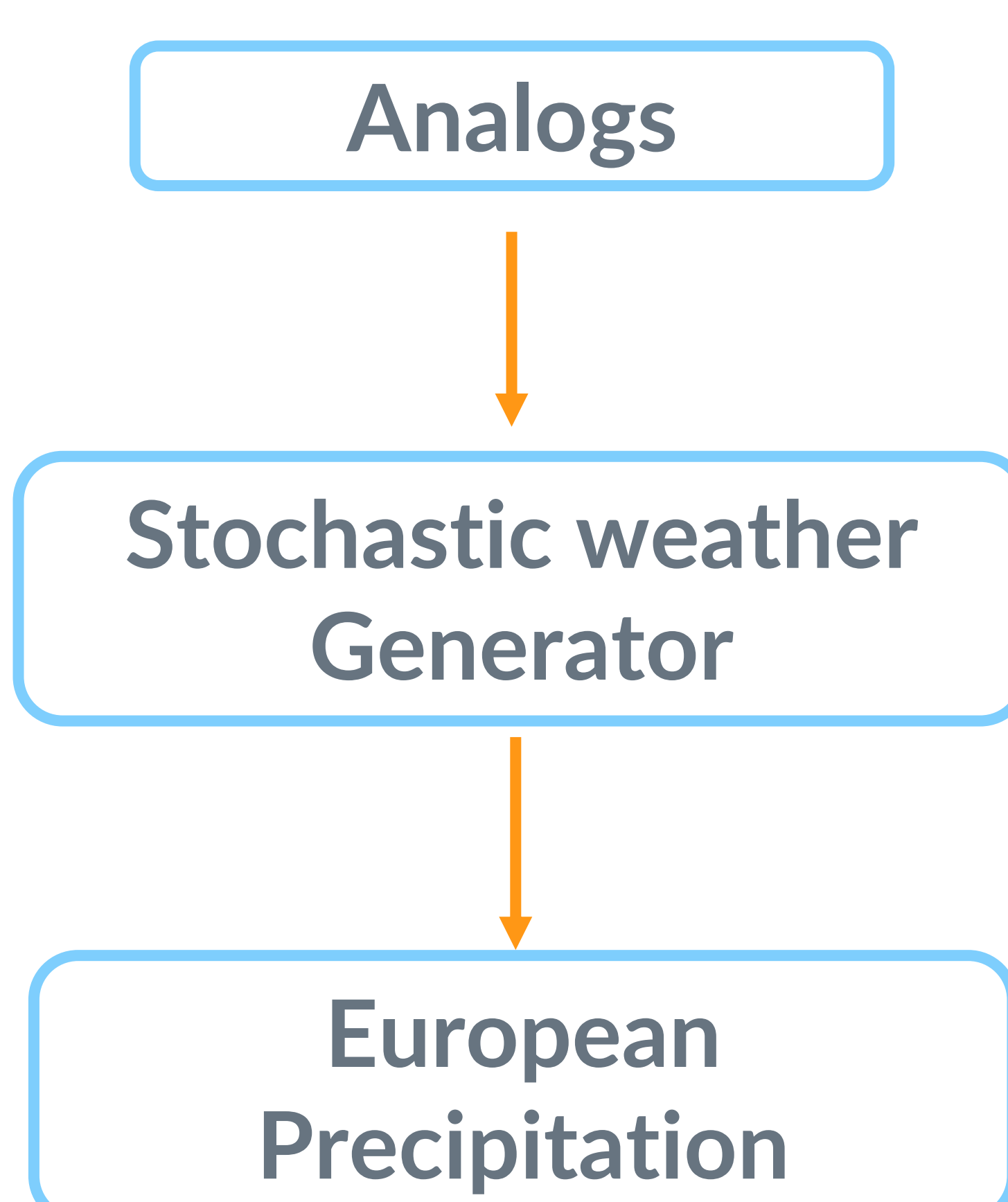
Forecast approach

1. Parameterization



Data	Characteristics
ECMWF CY47R2 1.5° x 1.5°	11 members 2001 - 2021
CNRM - CM 6.1 1.5° x 1.5°	10 members 1993 - 2018

2. HC-SWG



3. Forecast skill

Probabilistic score

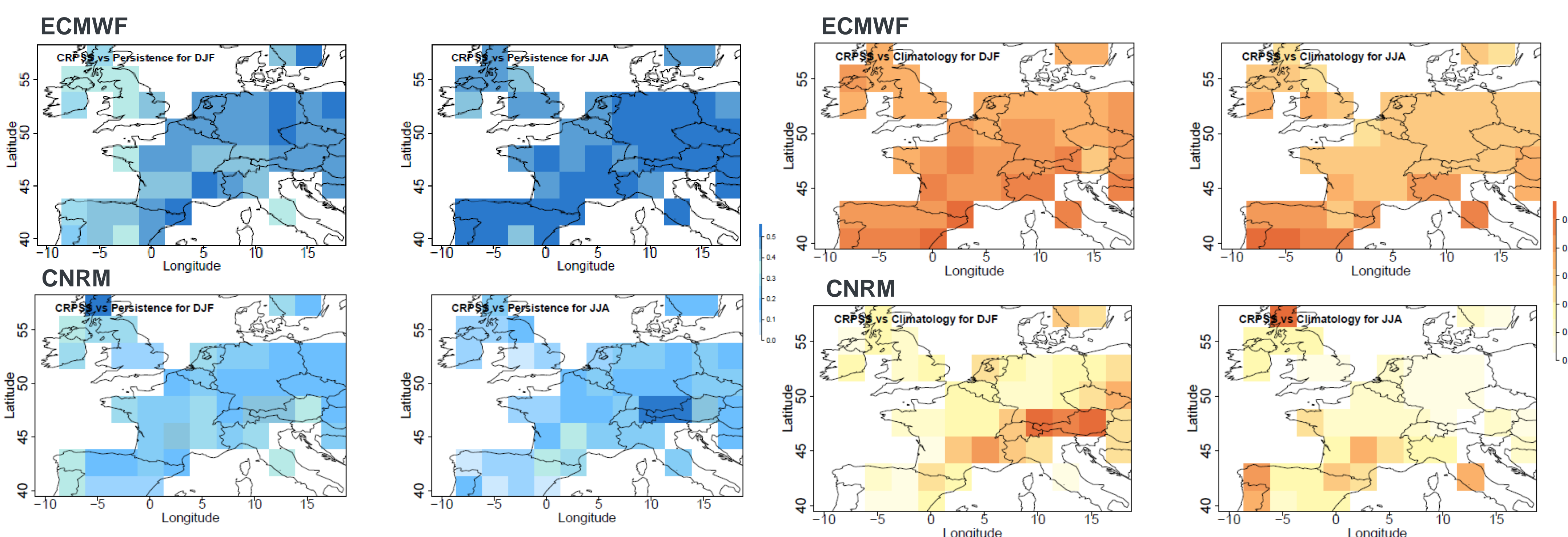
$$CRPSS = 1 - \frac{CRPS}{CRPS_{Ref}}$$

$$CRPSS =]0,1]$$

→ Good forecast skill

Results

Evaluation of the HC-SWG forecast of precipitation



The HC-SWG confirmed its capacity to forecast precipitation across Europe using the ECMWF and CNRM reforecasts of Z500 hPa 5 days ahead and up to 35 days.

Fig 1. the HC-SWG forecast skill @ European level

→ The forecast skill remains higher on the southern Europe for either summer or winter.
 → The comparison with the ECMWF precipitation forecast confirmed the performance of the HC-SWG forecasts until 35 days.

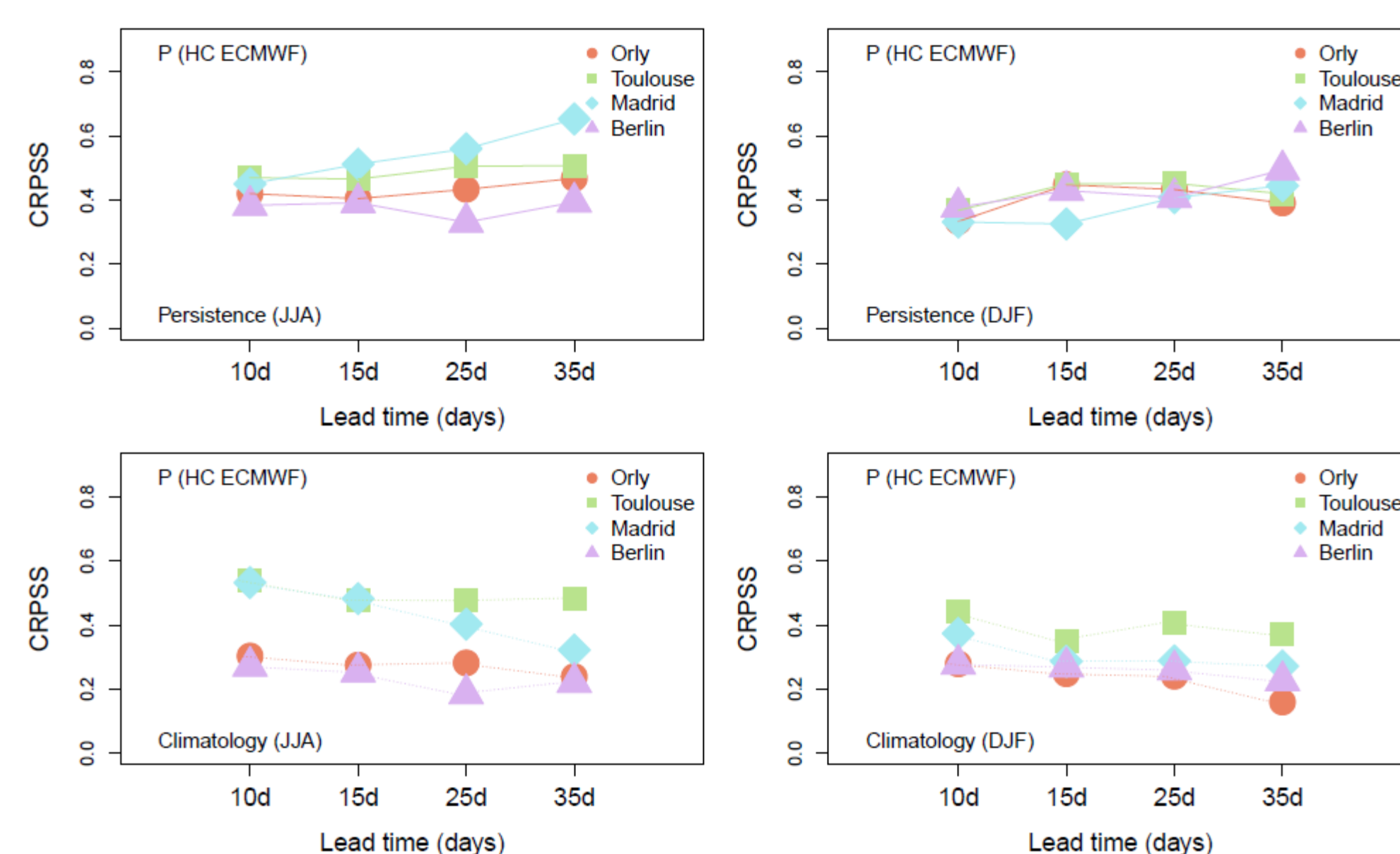


Fig 2. the HC-SWG forecast skill @ station level

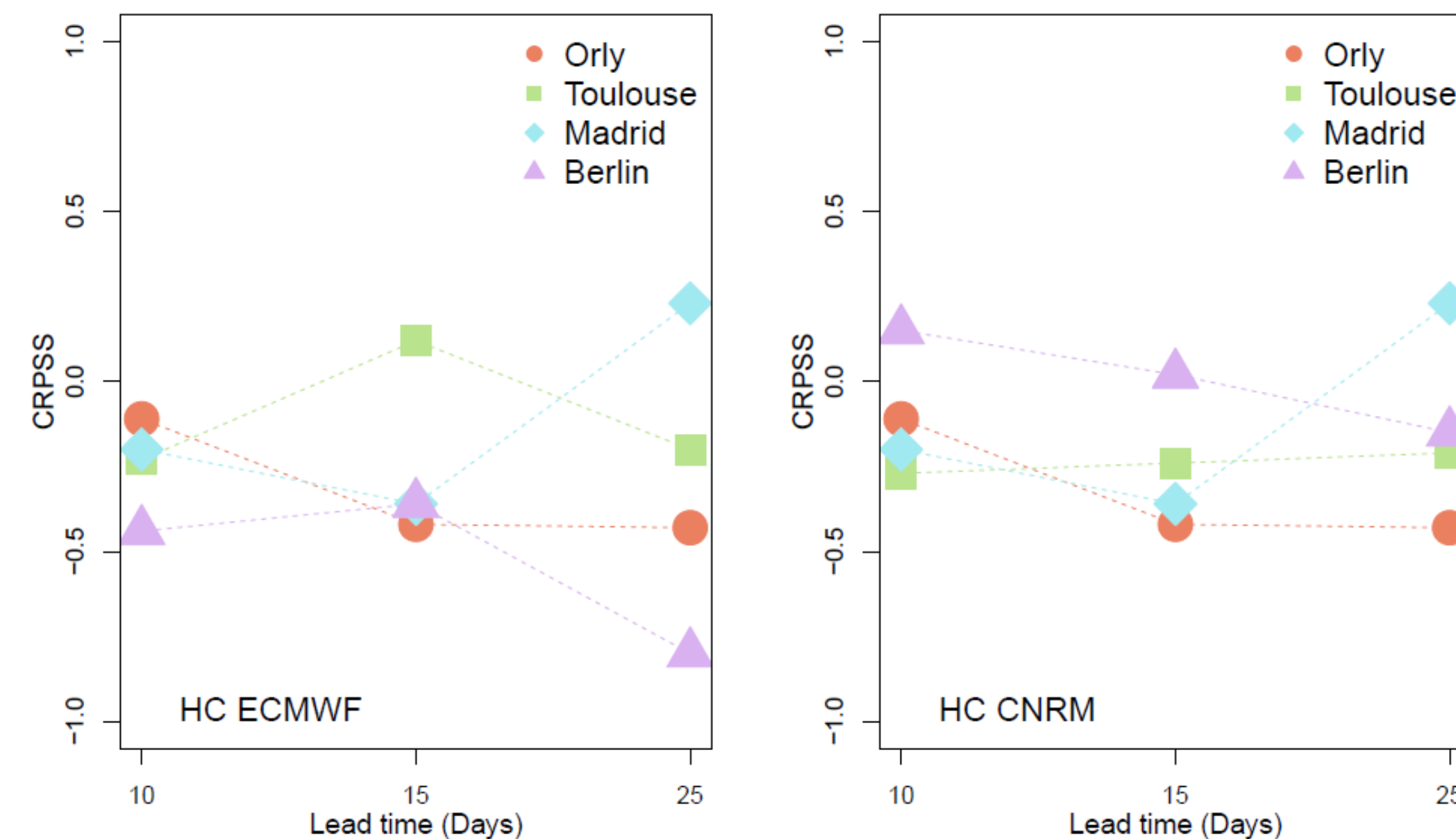


Fig 3. Comparaison between HC-SWG forecasts and ECMWF precipitation forecast