

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

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## **Abstract**

Skillful forecast of precipitation in a sub-seasonal lead time represents a useful information for decision makers. In this study, we aim to improve the precipitation forecast using a stochastic weather generator (SWG) based on analogs of the atmospheric circulation in order to reach the sub-seasonal lead times (from 2 to 4 weeks). The SWG showed the capacity to forecast precipitation within 5-10 days (Krouma et al, 2022) and temperature within 40 days (Yiou and Déandréis, 2019) with promising probabilistic scores. In this work, we adapt the parameters of the SWG to optimize the simulation of European precipitations from ensemble dynamical reforecasts of ECMWF and CNRM. We start by computing analogs of Z500 from the ensemble member reforecast of ECMWF (11 members) and CNRM (10 members). Then, we generate an ensemble of 100 members for precipitation over Europe. We evaluate the skill of the ensemble forecast using skill scores such as CRPS and ROC curve and obtain reasonable forecast skill scores for lead times up to 35 days for different locations in Europe (Madrid, Toulouse, Orly, De Bilt and Berlin). We compare our SWG forecast with other precipitation forecasts to further confirm the benefit of our method.