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PRÉVISIBILITÉ DES ÉPISODES MÉDITERRANÉENS DE PLUIES INTENSES À L'AIDE D'UN JEU DE DONNÉES DE 30 ANS DE PRÉVISIONS RÉTROSPECTIVES

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Résumé :

The French Mediterranean region is prone to very intense flash-flood events induced by heavy precipitation events that may cause considerable human and material damage. Quantitative precipitation forecasts have dramatically improved in recent years yielding realistic intense rainfall estimations. Nevertheless, precipitation forecasting post-processing is even more required considering potential ensuing biases or systematic errors.

In this thesis, the predictability of intense precipitation in the French Mediterranean region is addressed using a 30-year ensemble reforecast dataset, which is based on the ensemble prediction system PEARP operational at Météo France.

Intense rainfall verification is essential before any calibration approach. The multiphysics technique, which aims to represent the model error in the PEARP system, is assessed on this basis, using the object-quality measure SAL on the whole reforecast dataset. Results show that rainfall ensemble forecasting is controlled by some parameterization schemes of the multiphysics. On another hand, distributions of spatialized rainfall volumes are successfully reproduced by the model, showing that the reforecast represent a meaningful information for intense rainfall ensemble calibration.

Further, we run two-post-processing methods based on the large-sized reforecast dataset, one relying on quantile mapping and another on extended logistic regression techniques. Both are applied to the reforecast as a methodological model testbed. The quantile mapping calibration significantly reduces the model biases, but the benefits in terms of discrimination power are weak. The extended logistic regression calibration shows larger improvements, both for weak and intense precipitation. Finally, the same extended logistic regression calibration is applied to the operational ensemble system PEARP. Though resulting calibrated forecasts skill is not globally improved, intense precipitation forecasting gets more discriminant suggesting such calibration could be efficiently tuned for operational purposes.

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