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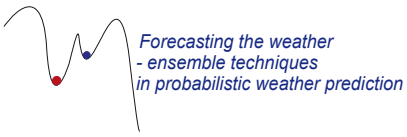

Comparing different meteorological ensemble approaches for hydrological predictions

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Prediction of the hydrological response of a watershed to rainfall can be handled by coupling hydrological and meteorological numerical weather prediction (NWP) models. This is especially true for small and medium-sized catchments (less than 10000 km2), characterized by short response times, where the sole observed precipitation is not suitable to drive hydrological models for timely forecasts and adequate emergency planning.

The reliability and the practical use of such a flood forecasting system is tightly connected with the accuracy of precipitation data. Quantitative precipitation forecasts (QPFs) issued by meteorological models are affected by errors which can be relevant at the scales of interest for hydrological purposes. The ensemble forecasting approach takes into account different sources of uncertainty, providing a probabilistic prediction of possible future weather states. If these possible scenarios are used as an input for the hydrological model, then the uncertainty propagates in the flood forecast, providing a more informative and probabilistic hydrological prediction.

During the last decade, different ensemble approaches have been developed for application to mesoscale models. This study aims at comparing two ensembles, focusing on the short/medium range that share some characteristics, as almost the same number of members, the model resolution (about 7 km), the driving global ensemble prediction system of ECMWF (EPS-IFS), but are obtained through different methodologies:

1) A multi-model ensemble, based on three mesoscale models (BOLAM, COSMO, and WRF) each of them initialized by 5 representative members of EPS-IFS.
2) A single-model approach, based on COSMO-LEPS (Limited-area Ensemble Prediction System) ensemble, the operational forecasting system with the COSMO model, driven by 16 representative members of EPS-IFS.

The forecast hourly rainfall fields are used to drive the distributed rainfall-runoff model TOPKAPI whose results, in terms of discharge prediction, allow to evaluate the ensemble performance, concerning a recent severe episode affecting the Reno river basin, located in Northern Italy.