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Scale-dependent verification of ensemble precipitation forecasts from the COSMO-E model

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Ensemble forecasting is generally based on the assumption that the mean of the ensemble will result in the best estimate while the deviations of ensemble members around the mean are representative of the estimate error. It is thus important for the spread of an ensemble to properly represent the skill of a forecast. This is commonly referred to as spread-skill consistency.

In the context of precipitation forecasting, the quantification of the spread-skill relationship is not trivial. The scaling behavior of rainfall and its variability over a wide range of scales makes it difficult to summarize the error statistics within a single value. Instead, a spectrum of spread-skill statistics would be more appropriate and consequently help identifying at which scale the model is correctly representing the forecast uncertainty.

Recently, Surcel et al. (2015) has proposed a Fourier-based methodology to study the predictability of precipitation fields as a function of spatial scale, which also enables the definition of a decorrelation scale for the ensemble members. With the help of this newly developed tool, we verified COSMO-E ensemble forecasts of selected precipitation events over the Swiss Alps.

Such verification analysis is part of wider effort currently undertaken at MeteoSwiss to investigate a Bayesian approach for blending an ensemble precipitation forecast from the operational COSMO-E model with a stochastic radar-based extrapolation nowcast. In this context, it is important to use an appropriate tool for the verification of the spread-skill consistency of precipitation ensembles.

Reference

Surcel, M., Zawadzki, I., and Yau, M. K.: A study on the scale dependence of the predictability of precipitation patterns, Journal of the Atmospheric Sciences, 72.1, 216-235, 2015.