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Spatial verification of high-resolution ensemble precipitation forecasts using local wavelet spectra

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Verification of numerical weather prediction models is a key aspect in meteorological sciences. The emergence of high-resolution numerical weather prediction models provides new challenges for spatial verification techniques to cope with small-scale features such as convective precipitation patterns. Traditional gridpoint-by-gridpoint comparison exhibits several problems, including the doublepenalty and the domination of the scores by small-scale features.

A wavelet approach developed for image texture analysis is applied to high-resolution quantitative precipitation ensemble forecasts provided by the COSMO-DE-EPS. A non-decimated discrete wavelet transform is used to estimate local wavelet spectra. We show that a discrimination solely on the basis of wavelet spectra is possible, and that we are able to correctly attribute observations from the regional reanalysis COSMO-REA2 to the corresponding ensemble forecasts. This is successful for both the spatially aggregated wavelet spectra using a linear discriminant analysis, and the locally stationary albeit smoothed wavelet spectra using pattern correlation.