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Development of a radar precipitation field nowcasting methodology based on scale decomposition.

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Short lead-time forecasts (nowcasts) of precipitation at a high resolution are important for real time flood forecasting systems, such as that developed during the EC project MUSIC (EVK1-CT-2000-00058). Extrapolation of radar precipitation fields can provide such forecasts and offers a useful alternative to numerical weather prediction. The development of such a nowcasting scheme for the MUSIC project is reported. A recently developed radar reflectivity extrapolation scheme is described in which different scale features are separated, evolve at different rates and are recombined to provide a best forecast. Such an approach appeals as the link between scale and feature lifetime is recognized explicitly. The effect of choosing alternative transformations of precipitation, prior to the separation step, is investigated by comparing four alternative transformations using a dataset from northern Italy. Forecast skill is found to be highly sensitive to the choice of transformation and the best of the alternatives is found to be the simplest. Different scale structures observed in rainfields such as fronts, rainbands, cluster potential regions and raincells are generally considered to have differing relative motions. A modification to the extrapolation scheme is therefore evaluated in which advection is allowed to vary with scale. An ensemble forecasting extension to the model, able to provide a stochastic extension to the best estimate forecast, is demonstrated. There is little indication in the scientific literature of the relative skill achieved by the various radar extrapolation methodologies available. The methodology is therefore compared against alternative extrapolation methodologies including cell tracking and advection based models for a range of catchments.