# Probabilistic radar based rainfall warning system with an interactive user interface

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The damages due to heavy rainfall and flooding are often multiplied by the lack of targeted and probabilistic warnings for risk management in all forecast lead times from minutes to days. In many applications economical losses due to rainfall could be lowered by means of automatic and fast dissemination of warnings with individually tuned threshold criteria for each customer and application.

The main output products from the warning system being operationally tested in Finland consist of gridded local forecasts of the best estimate rainfall and exceedance probabilities of rainfall class thresholds in a continuous time range of 30 minutes to 5 days. Nowcasting up to six hours applies 51 ensemble member extrapolations of weather radar measurements together with lightning location data from the Nordic network (NORDLIS) and satellite data of convective rainfall (EUMETSAT CRR product). From approximately 2 hours to 2 days Poor man's Ensemble Prediction System (PEPS) is used applying the neighbouring time-space grid points from the high resolution numerical weather prediction model HIRLAM. The longest forecasts apply rainfall ensembles available in the form of ECMWF EPS data. The mixing of these five sources of ensemble forecasts in the overlapping lead time periods is performed applying mixing of probabilities only. In this way we avoid the frequently occurring difficulty of smooth mixing of discontinuous precipitation patterns.

During summers 2010-11 warning dissemination of radar based nowcasts of rainfall accumulation during the next 3 hours was tested. The dissemination applied SMS messages via mobile phones. In the interface the users could freely select the locations of the warnings but the rainfall classes and their risk thresholds were fixed by the service providers. The number of customers was some thousands. For the summer 2012 we aim to extend the service to cover all lead times and multiple accumulation periods. It will also include a dedicated user's interface in which an advanced customer can set individual warning thresholds (exceedance probabilities) for each class of rainfall. This system is obviously the first interactive user-tailored real time forecast application of remote sensing aimed for risk management of damages due to heavy rainfall and flooding. The probabilistic rainfall forecasts have been tested further by coupling them to urban hydrologic models and by utilizing the forecasts in wastewater treatment.