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The state of the art of the European Flood Alert System

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The European Flood Alert System is under development at the European Commission Joint Research Centre since 2003 to foster international information exchange on early flood warning within Europe. The aim of EFAS is to provide catchment wide flood forecasts indicating the probability of upcoming events between 3-10 days in advance with emphasis on trans-national river basins. EFAS is currently being prepared to go operational at the end of 2011 with a number of novel, state-of-the-art features being added to the current pre-operational system, which are presented here.

EFAS consists of a rainfall-runoff model with a routing component (LISFLOOD) that is set-up on a 5km grid for entire Europe and which runs in pre-operational model twice a day. The model is driven with both observed and forecasted weather inputs at the highest available spatial resolutions and calculates critical threshold exceedances with leadtimes up to 10 days. In order to achieve reliable flood probabilities with leadtimes beyond the scope of single, deterministic forecasts, EFAS is designed as a multi-model forecast system including full sets of Ensemble Prediction Systems (EPS) in the short- and medium term.

EFAS converts the multiple hydrographs into probabilistic information of critical threshold exceedance. At stations where observed, realtime data are available, the discharge output is post-processed (Bogner et al., 2009) and corrected hydrographs made available to the national hydrological services. Improved methods to estimate the overall predictive probability distribution are being developed and will be incorporated in the operational version of the system. Bias correction of temperature and precipitation EPS prior to input to the hydrological model have shown to improve the skill in the discharge forecasts in particular for the first days and will be included operationally also. A weak point of EFAS during the development phase has been the capturing of snowmelt driven floods. Therefore a novel satellite data assimilation technique is currently being tested with considerable success. A continental system such as EFAS requires a large number of reliable observation data. Currently two unique European databases for real time discharge data (ETN-R) and other hydro-meteorological data relevant for flooding (EU-FLOOD-GIS) are being operated in support to EFAS, allowing to improve model components, calibrate and validate the model results, and to calculate reliable long-term skill scores. Calculation of a number of different skill scores will be included operationally and calculated on a regular basis, including a modified CRPS which is more adapted for hydrological applications than the classical CRPS. An assessment of a 10-year EFAS analysis has shown that the skill has steadily improved over the past 10 years. It is expected that the inclusion of novel features will increase skill and performance of the system considerably.