Improving risk prevention through flash flood ensemble early warning

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Ongoing changing climate has raised the attention towards weather driven natural hazards. The consequences of recent catastrophic floods have stressed the need for improving current early warning systems and for developing a culture of risk prevention in the society. In the framework of KULTURisk and IMPRINTS (EU-FP7) projects we describe a flood alert system for small catchments prone to flash flooding, capable of monitoring a large portion of the European domain. Operational streamflow simulations are produced through distributed hydrological modeling of ensemble weather forecasts. A long-term reforecast dataset is run through the same hydrological model to derive coherent warning thresholds. These are compared with operational ensemble discharges in a threshold exceedance analysis to produce early warnings.

A case study in the Southern Switzerland is tested over a 17-month period and system performances are evaluated by means of different quantitative and qualitative analyses. Results from three different predictors derived from the ensemble streamflow are compared, also by accounting the persistence of lagged forecasts. Significant improvements in the detection of discharge threshold exceedances are achieved by fitting gamma probability distributions to the raw ensemble streamflow. Further discussion underlines the limits of predictability towards extreme events in small catchments due to the comparatively coarse space-time resolution of current meteorological input data.