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A heteroscedastic error model and its operational application for flood forecasting

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The forecast of flood events especially extreme events needs robust tools. End users and decision makers need some general information: First, when the flood event will happen and how severe it will be. Second, how reliable is the forecast and its model in this case: risk of not forecasting the flood event, risk of false alarms. Many deterministic forecast models do not provide information about the reliability and uncertainty of their predictions. Therefore additional methods are necessary to determine this. Here a concept to estimate uncertainties of a rainfall runoff model is adapted for meteorological forecasts and operational use. For the runoff calculation an error model is constructed where the error is split into two major parts: errors due to meteorological input variables and those rising from process description and parametrisation. The latter can be derived from a sensitivity analysis of the rainfall runoff model. Stochastic simulations of the meteorological input variables precipitation and temperature can be used to quantify their influence on the calculated discharge. With this error model, confidence limits can be calculated that also take the possible heteroscedastic character of the occurring uncertainties into account. As a last step in the forecast chain, it is planned to adapt the system to meteorological ensemble forecast model COSMO-LEPS with focus on the estimation of the bias of these forecasts. The concept is tested for the catchment of the river Iller, a Danube tributary in South Germany. The rainfall runoff model LARSIM is used in water balance mode with a spatial resolution of 1km x 1 km and a temporal resolution of 1 hour.