

## FUZZY SYSTEM FOR OPERATIONAL FLOOD FORECAST

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An innovative Fuzzy system development for operational forecasts of flood river levels is presented. The *Fuzzy-Flood-Forecast-Model* ( $F^3$ -model) provides a forecast without complex and expensive investigation of psychographical area characteristics and avoids complex discharge modelling of spatial soil zones. The  $F^3$ -system models the discharge formation of a river level on the basis of relevant discharge data at pre-levels as well as precipitation data in the catchment area. A Fuzzy-rule base describes admitted and plausible system relations in the form of *IF*  $\langle$  *premise*  $\rangle$  *THEN*  $\langle$  *conclusion*  $\rangle$  implications. The highly non-linear input-output relation results thus over a multidimensional function, which is defined by the fuzzy partitioning of the premise variables (input) and is computed by weighted linear functions over the input variables.

The Fuzzy rule base is generated from a generic model and then adapted automatically on the basis of data from earlier flood events. For this both conventional optimization procedures and genetic algorithms are used. The  $F^3$ -model is modular and area-specific improvements can be achieved by adding local input variables.  $F^3$ -models were developed for several levels at river Mosel and are actually installed in the flood reporting center. The systems provide very good results compared with crisp physical models.  $F^3$ -models can be transferred and adapted automatically to arbitrary river systems or comparable applications.