

DEVELOPMENT OF A FUZZY RULE-BASED FLOOD FORECASTING FOR THE IPOLY/IPEL RIVER

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In this paper a fuzzy rule based method for flood forecasting is presented. Fuzzy rules are used to describe typical flood events. The rule arguments are upstream water levels and areal precipitation. The rule responses are predicted peak water levels downstream. For a given state the applicability of the rules is checked and their degree of fulfillment (DOF) is calculated. The responses are then combined according to the DOFs yielding a forecast. The fuzzy rules are derived from a set of observed flood events. A discrete number of possible water levels are defined as fuzzy sets for the forecasting gauges and the forecast site. The best rules are then derived using these fuzzy sets using a combinatorial optimization technique - in this case simulated annealing. The number of rules is fixed a priori by the user, and can be varied according to the performance of the model. The methodology is applied to the Ipoly/Ipel river. Forecasts based on different possible arguments are presented and compared. An adaptive rule estimation method for possible operational forecasting is also presented. The rule systems are verified using cross-validation. The results show that fuzzy rules offer a flexible and simple non-linear tool for forecasting with the advantage of simple adjustment for any location.