FUZZY RULE-BASED PREDICTION OF EXTREME PRECIPITATION

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Monthly precipitation in Hungary is modeled using the Hess-Brezowsky circulation pattern types and SST as forcing functions or inputs. Although, there is significant statistical dependence between these individual inputs and precipitation, the weakness of the dependence prevents the use of a multivariate regression analysis for reproducing the probability distribution function of observed precipitation. In order to utilize the existing relationship between forcing functions and precipitation a fuzzy rule-based modeling technique is used. The first part of the observed input and precipitation data is used as the learning set to identify the fuzzy rules. Then, the second part of the data is used to validate the rules by comparing the frequency distributions of precipitation calculated respectively with the fuzzy rules and observed data. Example results are presented for two different climatic regions of Hungary. One of them represents a wetter climate while the other refers to the drier conditions of the Hungarian Plains. The fuzzy rule-based model reproduces the empirical frequency distributions in every season. However, as expected, the statistical prediction is better in winter, spring and fall than in the summer. The potential of the approach is important in climate change studies when the fuzzy rules obtained as described above can be used with input data stemming from GCM to predict regional/local precipitation reflecting GCM scenarios.