STATE SPACE APPROACH TO EXTREME RAINFALL FORECAST

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An innovatory approach to stochastic rainfall modelling and forecasting is presented. The suggested procedure makes use of the state space methodology, and, namely, the class of Dynamic Generalized Linear Models, in order to estimate, in a dynamic fashion, the time varying probability of rainfall occurence over a given interval of time, the Reference Time Window (RTW). In order to solve the non-linear filtering problem, a Bayesian recursive algorithm is implemented. A measure of uncertainty is generated via the estimation of posterior distributions for predictions. At a second stage, using the estimated probabilities and, more precisely, their sampling distributions in different RTWs, a dynamic model for the distribution of the total rainfall depth over an assigned RTW is defined. The whole procedure has been conceived to make use of information coming from a dense rain-gauge network. At both stages, in order to incorporate information coming from different measurement stations, non stochastic covariates can be easily included in the model. The covariates act as a sort of trigger for the forecasting system. In order to illustrate the procedure, an application to rainfall data recorded in a dense rain-gauge network located in Arno basin is presented. Particular attention will be paid to the analysis of very extreme events (outliers), typical of mediterranean regions.