



Application of a stochastic rainfall model in flood risk assessment

M. A. Campo (1), A. Sordo (2), D. González-Zeas (2), J. C. Cirauqui (1), L. Garrote (2), and J. J. López (1)

(1) Department of Projects and Rural Engineering, Public University of Navarra, Pamplona, Spain

(miguel.campo@unavarra.es), (2) Department of Hydraulic and Energy Engineering, Technical University of Madrid, Madrid, Spain

In Spain, daily series of precipitation data are widely available in many sites from the middle of last century. However, neither the length nor the time resolution of those series is enough for some hydrologic applications. For instance, in order to evaluate the probability of occurrence of peak discharges in a small-size basin (100 km²), hourly precipitation data are required. In this paper, preliminary results of the application of a stochastic disaggregation model are presented. The model is used for the generation of precipitation time series, which are then introduced into a rainfall-runoff model for hydrologic design purposes.

The Alloz basin, located in the North of Spain with an area of 134 km² and available daily precipitation (from 1965) and hourly discharge (from 1964) data, was selected for the study. The modified Bartlett-Lewis model was selected for stochastic precipitation disaggregation, due to its conceptual simplicity and its ability to simulate storms of different nature. The six model parameters were estimated every month from 24-hour and 48-hour precipitation data. A time series of 10000 years of hourly precipitation data was generated using these parameter values. This time series of precipitation was analyzed to extract the main storm events of every year, which were simulated with an event-based rainfall-runoff model to obtain the maximum peak discharge of every year.

First results show good model skill to capture the temporal structure of precipitation events and its associated basin response. The simulated time series not only reproduces correctly the observed basic statistics which were used in model calibration, but also shows a good fit of the series of yearly maximum daily precipitation data and yearly maximum discharge.

It can be concluded that the modified Bartlett-Lewis model is an adequate tool for the generation of long time series of high temporal resolution of precipitation data for hydrologic application. In future work, spatial variability will be included in the Bartlett-Lewis model to asses its applicability to midsize and large basins.