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# Rainfall Stochastic models

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This work was carried out in north of Spain. San Sebastian A meteorological station, where there are available precipitation records every ten minutes was selected. Precipitation data covers from October of 1927 to September of 1997.

Pulse models describe the temporal process of rainfall as a succession of rainy cells, main storm, whose origins are distributed in time according to a Poisson process and a secondary process that generates a random number of cells of rain within each storm. Among different pulse models, the Bartlett-Lewis was used. On the other hand, alternative renewal processes and Markov chains describe the way in which the process will evolve in the future depending only on the current state. Therefore they are nor dependant on past events. Two basic processes are considered when describing the occurrence of rain: the alternation of wet and dry periods and temporal distribution of rainfall in each rain event, which determines the rainwater collected in each of the intervals that make up the rain. This allows the introduction of alternative renewal processes and Markov chains of three states, where interstorm time is given by either of the two dry states, short or long. Thus, the stochastic model of Markov chains tries to reproduce the basis of pulse models: the succession of storms, each one composed for a series of rain, separated by a short interval of time without theoretical complexity of these.

In a first step, we analyzed all variables involved in the sequential process of the rain: rain event duration, event duration of non-rain, average rainfall intensity in rain events, and finally, temporal distribution of rainfall within the rain event. Additionally, for pulse Bartlett-Lewis model calibration, main descriptive statistics were calculated for each month, considering the process of seasonal rainfall in each month. In a second step, both models were calibrated. Finally, synthetic series were simulated with calibration parameters; series were recorded every ten minutes and hourly, aggregated.

Preliminary results show adequate simulation of the main features of rain. Main variables are well simulated for time series of ten minutes, also over one hour precipitation time series, which are those that generate higher rainfall hydrologic design. For coarse scales, less than one hour, rainfall durations are not appropriate under the simulation. A hypothesis may be an excessive number of simulated events, which causes further fragmentation of storms, resulting in an excess of rain "short" (less than 1 hour), and therefore also among rain events, compared with the ones that occur in the actual series.