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Application of a stochastic rainfall model for disaggregation

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In Spain, there are daily series of precipitation from the early century with a strong statistic certainty. This scale is however not enough detailed for some hydrological applications. The precipitation data in smaller aggregation time scale are more scarce (i.e. hourly series). In this research, the first results of rainfall disaggregation in the North of Spain are presented, using the modified Bartlett-Lewis rectangular pulses model.

In Northern Spain big changes in precipitations can occur in small distances. The precipitation gradient, which exists between the Cantabrian Cost and the Ebro River Valley, must be mentioned. In order to get this gradient, we have chosen 3 stations located in a 115 km transect, namely San Sebastian, Yesa and Cascastillo. The precipitation ranges from 1400 mm/year in the northern area to 460 mm/year in the south. The stations have historical 10 minutes rainfall data, with a spans ranging from 69 year in San Sebastian to 15 years in Yesa and Carcastillo.

We considered different stochastic disaggregation models that can be found in the bibliography. We chose Bartlett-Lewis due to its conceptual simplicity and capacity to simulate storms with different nature. Six model parameters are estimated from 24 hour and 48 hour accumulated rainfall data for every month. Based on these estimated parameters the model infer 10 minutes, 30 minutes, 1 hour, 2 hours, 6 hours and 12 hour historical statistics. The estimated model parameters are physically reasonable.

First results show the model's ability to capture the temporal and spatial structure of rainfall events in two difference climates. The descriptive statistics are simulated

with precision at several disaggregation scales. Mean and zero rainfall probability are correctly obtained for period of time smaller than one hour. In addition the variance is slightly underestimated for smaller scales. The model is shown to be very sensitive to the sets of moment equations used in the parameter estimation.