

RAINFALL PATTERNS AT THE FABRA OBSERVATORY IN BARCELONA

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Design storms in Barcelona have been traditionally developed following the Chicago methodology, without taking into account the real hyetograph shapes. In 1995, CLABSA carried out a first attempt to identify storm patterns and found out, through the study of the 19 most extraordinary cases, a rain classification in three types, and proposed a rainfall pattern for each of them. The main objective of this tesina is the investigation of rainfall patterns starting from a much bigger data base, using statistical methods.

The starting data are the Barcelona's Fabra Observatory's rainfall records between June 10th 1927 and October 10th 1992. From the original data (a list of instants when an increment of 0.1 mm in the total rainfall is reached), using specific software developed for this purpose, a new data bank has been generated, where the cases correspond to rain events and the variables are: starting instant, duration, total rainfall, shape of the cumulative rainfall-time curve (100 interval resolution), maximum medium intensities (MMI) for each of the 5-minute multiple intervals (up to 120 minutes), return periods associated with these MMI (calculated with the Fabra Observatory's IDF curves), length of the interval with the maximum return period. Two rain periods have been considered different rain events when separated by more than 90 minutes without rain. Those events with a duration below 10 minutes or a total rainfall below 5 mm have not been incorporated to the events data bank.

Using the events data bank exploratory analysis were carried out on the univariant variables (total rainfall, duration, starting moment, most unfavourable interval, maximum return period) and factor analysis were conducted on those 3 sets of variables describing curves (cumulative rainfall-time curve, MMI vs. interval length and return period vs. interval length). All these analysis produced several collateral results, but didn't reveal the existence of rainfall patterns.

It has been shown that nearly all extraordinary rain events take place between May and November. Therefore, all events taking place between December and April have been deleted from the events data bank. Among the removed rain events, the most extraordinary have been studied (none of them exceeding a 2-years return period), which have turned out to be long-duration low-intensity events with a uniform hyetograph.

The same statistical analysis as for the complete data bank were repeated for the reduced one, but neither in this case the existence of rainfall patterns was detected. Notwithstanding, through the analysis of the MMI-interval length curve of the 108 most extraordinary events, it was possible to identify and validate the CLABSA classification (obtained taking into account only 19 events), being the CLABSA-1 group the most clearly identifiable and separated from groups CLABSA-2 and CLABSA-3, which seem to be different parts of a continuous set.

It has been observed that the rain events are normally composed of a background rain (intermittent, low-intensity) and a relatively short interval which concentrates most of the total rainfall. This interval has been named event's main-rain.

CLABSA-1 extraordinary main-rains were identified and a simplified research on rainfall patterns was conducted. The analysis detected the existence of 5 rainfall patterns: initial peak, end-peak, S-pluviograph (two types) and trapezoidal-uniform. The end-peak pattern is not properly represented by the design storm which is currently being used. Therefore, it is advisable to make further investigations on the effects on this pattern to the Barcelona drainage system.

Finally, some proposals are made in order to establish a calculation basis for the simulation of synthetic rainfall series in the Barcelona region.