Selecting representative rain events considering a given structured basin

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Considering an hydrographic basin structured into sub-basins of different sizes and hydrologic conditions, the occurrence of high flow discharge over the whole catchment will not have the same features and effects whether flows in sub-basins are simultaneously high or high flood levels occur independently in each sub-basin. This is a major concern for the management of lower river reaches and for the choice of the suitable and efficient flood mitigating procedures, which depend widely on such spatial characteristics of the rainfall hazard.

A strategy to characterize the rainfall hazard has been developed. It is based on a stochastic rainfall generation model. Point rainfall distributions and spatial-temporal structure functions of rain fields are estimated from raingauge measurements. They are injected then into a rainfall generator (based on the geostatistical Turning Bands Method). The generator simulates rainfall events with hourly time resolution that can be aggregated up to one day with statistic parameters being reasonably well reproduced. The main advantage of these simulated rainfall events is that they provide an arbitrary number of realistic rainfall fields over the whole area, with respect to the observed data characteristics and properties.

In order to use these simulated rainfall fields in hydraulic numerical models, it is often necessary to reduce the number of events. The goal of this study is to develop a methodology to select a reduced number of events to explicitly simulate without losing the representativity of the rainfall hazard. A criteria is that the selected fields must cover a range of return period useful for hydrological studies.

We present two methods : one method consists in selecting for each subcatchment the k events rainfall with strongest rainfall ; the other method consists in selecting events

by applying a hierarchical classification method. The representativity of the selected sets is checked.

In the applications rainfall aggregated over time and rainfall aggregated over nested sub-catchments are included in the selection procedure ; this assures that the resulting sample will represent the characteristics of the rainfall hazard whatever the aggregation level ; i.e., not only at individual time steps and individual sub-basins.