

Spatial and temporal rainfall variability in a small river catchment of the Spanish Central System

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The Cabrera Stream catchment is a small catchment (15.5 km²), which is on the northern slope of the Gredos Mountain Range in the Spanish Central System. The altitude ranges (between 1923 and 735 m a. s. l) and the high slope (20 percent of mean) of the catchment causes a high space-time variability of precipitation. The reliability of the registered rainfall data will depend on the number and the location of the rain gauges. Therefore, the design of an instrumental network presents specific challenges. There are six raingauges installed since 2004 in order to analyze the spatial and temporal characteristics of rainfall as an input of the calibrated distributed precipitation-runoff model. They were also installed to record extreme rain events that could trigger hyperconcentrated flows like the one which took place in December 1997, which generated considerable infrastructure damage. Multicriteria Evaluation was applied in a geographic information system in order to define the optimal position of the gauges using factors such as topography, slope, aspect, curvature, geology, land uses, vegetation and accessibility. Subsequently, eight heavy rainfall events have been considered in order to analyze the spatial and temporal rainfall variability during intense precipitations. The maximum intensity value of each event during different timespans was calculated (124h, 112h, 11h, 130', 110') and different interpolation techniques (ordinary krigging, krigging with external drift, splines, IDW) were used in order to obtain areal rainfall estimations. These findings were calibrated in order to analyze the best interpolation method. Furthermore, the estimated values were compared with the observed values and a success rate was calculated. The results show the spatial and temporal characteristics of the rainfall dataset generated by the high density rainfall network and have improved the data quality of hydrometeorological model inputs. Keywords: orographic rainfall, geostatistical analysis, krigging, hyperconcentrated flow, Spanish Central System