



Hydrological dynamics in a Mediterranean coastal drainage basin: the river Daró (2004-2010)

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The Daró river basin is located northeast of the Iberian Peninsula in the province of Girona with an area of 322 km². At its highest point (535m) is the Parc Natural de les Gavarres, and in the lower part the river arrives to the fluvial area of the Baix Ter and subsequently its outlet to the sea. The Daró River basin has progressively experienced changes related to tourism development due to promoting increased urbanization which increases the risk of flooding in the lowlands that allows for environmental degradation, increasing levels of risk associated with forest fires, and droughts, among others. Automatic recordings have been taken since 2004 by the Catalan Water Agency (ACA) at two gauging stations: La Bisbal d'Empordà and Serra de Daró. Also included in the records are rainfall data from meteorological stations administered by the Meteorological Service of Catalonia (METEOCAT) located close to the measurement points. The data used was provided by the ACA at intervals of 5 minutes to be summarised at hourly intervals between 2004 and 2010. Once reviewed, the most important flood hydrographs were compiled for analysis. In the case of rainfall registers, the data was obtained from METEOCAT via virtual consultation offered at hourly intervals. It is by means of these data that evaluates the characteristics of the drainage basin are evaluated, taking into account their relationship with the seasonal periods and their magnitude. It also assesses the relationship and differences in water response between the two measurement stations. The average rainfall for the two meteorological stations is 669.7 mm. Using an annual distribution of mean precipitation, the year 2005 has the highest rainfall (Serra de Daró station, 1049.6mm) and 2009, the lowest (Serra de Daró station 444.0 mm). The annual rainfall variation coefficient of variation at La Bisbal is 27% and 31% at Serra de Daró. Considering the seasonal average distribution, autumn is the wettest with 208mm followed by spring which has an average rainfall of 205mm, then by winter with 167mm and the driest is summer with 85 mm. The 87% of time in flow La Bisbal is in the range of 0 to 1m³/s Serra is 76%. The direct runoff of all floods in the La Bisbal is 701.3mm being 48% of the entire period and Serra is 363.6 mm representing 34% of the total runoff. The total runoff for the Serra de Daró station is 1147.4 mm representing 31% of total precipitation, and at La Bisbal d'Empordà it is 1466.0 mm, 44% of precipitation. July has the lowest rainfall, but it is not until August when the water level reduction is visible in the two measurement stations (3.5 mm to 1.7 mm Bisbal and Serra). In August and September, the average monthly runoff both in La Bisbal and in Serra represents less than 20% of monthly precipitation. On the contrary, the months of April, October, and November have the highest representation of runoff at more than 45% of precipitation. At the La Bisbal station, the measurements for April 2004, October 2005 and January 2006 exceeded 100 mm, the same as at the Serra station in April 2004 and October 2005. A total of 13 events were collected at the two stations. The October 2005 flood was the most important with a direct runoff of 197.3 mm at La Bisbal and 97.6 mm at Serra and a maximum discharge flow of 331.4 m³/s and 292.9 m³/s respectively. The average response time between the two stations is 2.2 hours. The study shows that floods occur in a short time frame. Direct runoff and floods represent 48% of the elapsed total at La Bisbal d'Empordà and 29% at Serra de Daró. The difference in runoff as recorded is due to anthropogenic activity in the basin.