

Analysis of the rainfall conditions inducing torrential activity in the Portainé catchment (Eastern Pyrenees, Spain).

Marcel Hürlimann (1), Rosa M Palau (1), Marc Berenguer (2), and Jordi Pinyol (3)

(1) Department of Civil and Environmental Engineering, BarcelonaTECH UPC, Barcelona, Spain, (2) Centre of Applied Research in Hydrometeorology, uPC BarcelonaTECH UPC, Barcelona, Spain, (3) Department of geotechnical and geological hazard prevention, Cartographic and Geological Institute of Catalonia, Barcelona, Spain

The Portainé catchment is situated at the south flank of the Pyrenees and drains a total area of 5.72 km². Its altitude ranges from 950 m to 2439 m asl and the Melton ratio is 0.62. Bedrock consists of folded and largely fractured Cambro-Ordovician metapelite, sandstone and greywackes and is covered by colluvium. A ski resort is located in the upper part of the catchment and the access roads cross the drainage network at various points. Since 2006, ten important torrential processes (debris floods and debris flows) have occurred and caused considerable damages along the road. Previous to 2006, no evidences of important torrential activity have been found.

Herein, the critical rainfall conditions of the recent debris floods and debris flows were analysed. A common drawback of precipitation analysis for torrential flows in mountainous areas is the fact that no meteorological station is situated inside the affected catchment. This was also the case at Portainé, where rainfall measurements in the basin are only available since 2012. Previous to 2012, the data of nearby meteorological stations were used and different techniques were applied to estimate the rainfall amounts in the catchment. Moreover, measurements of the weather radar were used for selected events to study the effect of spatial variability. Finally, historic trends on the precipitation amount of a nearby meteorological station were investigated.

The results show that most torrential flows occurred in summer (June to September) due to rather short and intense storms. Only one small event in November was triggered by a long-lasting rainfall. Values of the peak hour precipitation for the different events mostly exceeded 10 mm/h (a minor torrential flow was triggered by 5.1 mm/h) and total accumulated rainfall ranged from 19 to 113 mm. Strong spatial variability was detected in most events comparing the measurements of the nearby raingauges and specially the radar observations. In spite of this fact, overplotting the triggering rainfalls in the standard intensity-duration plot shows a good correlation. Moreover, the intensity-duration values fit rather well with other published threshold lines (specially the well-known Caine 1980 threshold).

Analysis of historic rainfall time series showed that no significant increase of important rainstorms has been observed during the last decades. This fact, together with the lack of observed events prior to 2006, supports the hypothesis that the construction and enlargement of the ski resort may have played a significant role in the occurrence of the torrential flows in the catchment. However, further investigation is necessary to assess the different governing factors.