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Using dendrogeomorphological and hydraulic methods for peak discharge estimation of flash flood

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The study of processes such as flash floods in ungauged mountain basins often requires the combination of different techniques enabling numerical models to be developed in order to understand the processes.
In this study, we have focused on the use of detailed topography obtained with Terrestrial Laser Scanner (TLS) and dendrogeomorphological evidences to reconstruct the peak discharge of an remarkable event that took place on December 18th 1997, in the stream Arroyo Cabrera (Gredos Mountain Range, Spanish Central System).
The methodology was carried out on a river reach characterized for presenting a hydraulic jump on stable bed-rock and numerous scarred trees caused by the impact of rocks and woody debris during the event. Along a 500 m stretch, a high-resolution Digital Elevation Model (DEM) was built with an average precision of 5 mm based on more than 4 million points taken using a TLS. Subsequently, both topographic and dendrogeomorphological data were included in bidimensional hydraulic models.In addition, we propose a methodology to define scenarios based on the deviation between the PSI and the results of hydraulic model that allows convergence in the estimation of flow.
The results obtained from the methodology developed allow the magnitude of the event studied concerning the transported flow of an unknown flash flood event. We also discuss the use of PSI from trees to future paleoflood studies. Knowing the advantages and disadvantages derived from each case provides useful information for producing future flash flood hazard maps in ungauged catchments, with exposed goods of great vulnerability.
Keywords: Terrestrial Laser Scan, Dendrogeomorphology, Digital Elevation Model, ungauged basins, Spanish Central System.