HYDROLOGIC RESPONSE ESTIMATION OF THE ARROYO CABRERA
(SPANISH CENTRAL SYSTEM) FLASH FLOOD 1997 EVENT

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ABSTRACT: The arroyo Cabrera Watershed (Sierra de Gredos, Spanish Central System) is prone to castatrofic floods as the long geomorphic evidences demonstrate. On 17 December 1997, in response to a torrential rainstorm, a debris slide that subsequently evolved to a hyperconcentrated flow took place in the headwater of this watershed. Use of methods including hydrogeomorphic and precipitation-runoff models, as well as field observations enables to estimate the hydrologic response regarding this event. To this end, critical rainfall which is the minimum steady-state rainfall predicted to cause instability was determinated, by implementing a physically based model of hillslope stability. It combines steady-state hydrologic concepts with the infinite slope stability model and depends on soil mechanical and topographic factors that were estimated from a 5m grid DEM and using ArcView SHALSTAB. Since critical rainfall is defined for 24-h periods this precipitation value has been distributed in time, based on rain gauges located within the catchment, and by applying the Intensity-Duration law defined for the study site. The design hyetograph storms defined in this way were used as input in a semi-distributed model that aims to study watershed response to the 1997 storm event and whose basin model was defined from a 5m grid DEM and applying the ArcGIS 9.2 GIS extension HEC-GeoHMS. This precipitation-runoff model was previously calibrated an validated implemented automated procedures and based on both streamflow and rainfall data collected at 10-min intervals within arroyo Cabrera watershed. To this end, 7 observed hydrographs were used to calibrate the model and other 3 more for validation.

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