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Improving the Flash Flood Frequency Analysis using dendrogeomorphological evidences in the Arenal River crossing Arenas de San Pedro Village (Spanish Central System)

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The flash flood frequency analysis in mountainous catchments presents specific scientific challenges. One of the challenges is the relevant gradient in precipitation intensity with altitude. Another challenge is the lack of information from rainfall or discharge gauge stations or from documentary sources.
Dendrogeomorphology studies the response in the wood growth pattern and the botanical signs on the trees affected by geomorphological processes. With regard to the flood frequency, the dendrogeomorphological evidences bring forward valuable infomation about single past events (with annual or even seasonal precision) and their occurrence periodicity. The main macro-evidence that we can find in the tree trunk is a stem scar originated by a wound in the bark of the tree. When the tree grows, this wound remains reflected in the tree ring sequence. The best way to analyze the tree ring sequence is by using a complete section of the trunk, this couldn't be possible unless the tree is cut down. Due to the unfeasibility of cutting down the trees, in Dendrogeomorphology is enough to obtain an increment core, using a Pressler borer.
Nevertheless, this study has been based on complete stem sections analysis facilitated for the felling works in the riverine vegetation in the Arenal River, carried out by the Tagus River Water Authority. These felling works have allowed us to obtain sections and to analyze the stump of the tree in situ.
On this way, 100 samples of Alnus glutinosa and Fraxinus angustifolia located by the river along the Arenal River crossing Arenas de San Pedro Village (Ávila, northern slopes of the Gredos Mountain Range in the Spanish Central System) have been analyzed. This village is known for its historical problems of flood during extreme events.
A meticulous fieldwork has been carried out. Every sample was analyzed locating its geomorphological position, the distance to the riverbed and the height of the stump in which the evidences were observed. Using a hand magnifying glass and preparing the section with a gouge, manual skills of count were used to obtain the time of the evidences in the stumps. At the laboratory, the sections were polished and the count was made using a magnifying binocular glass. Later on, the samples were scanned and the WinDendro software was used.
As a final result, the temporary distribution of floods in this section of the river for the last 50 years was obtained. As well, an analysis of how this not systematic information improves the flash flood frequency analysis in mountainous catchments has been determined.