



GEOMORPHOLOGICAL RESEARCH IN SPAIN

Scientific meeting in honour of Prof. Mateo Gutiérrez

Zaragoza, September 8-9, 2011

Abstract Volume & Field Trip Guide



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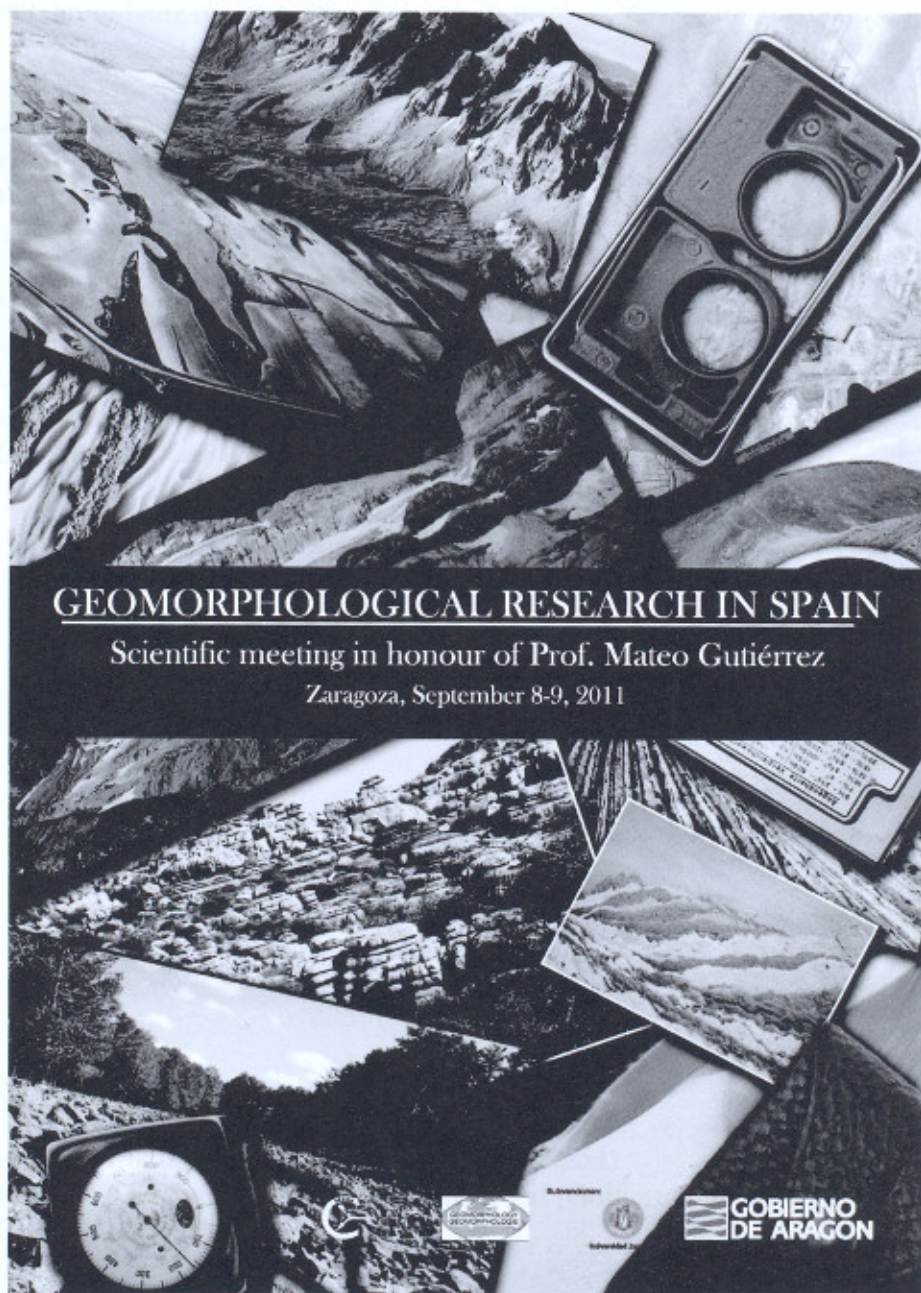


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Dendrogeomorphological research in Spain applied to flood risk analysis

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Dendrogeomorphology is a relatively young scientific discipline which uses the tree-ring record of roots, trunks and branches of trees and bushes to obtain information on the magnitude and frequency of geomorphic processes over time. In the case of flood research, the existence of trees and shrubs in fluvial systems enables to complement, and sometimes even replace, systematic and palaeohydrological records of past floods. The application of dendrogeomorphology to palaeoflood analyses worldwide during over forty years has allowed the improvement of frequency and magnitude estimations of past floods. New dendrogeomorphic approaches are being applied in Spain for palaeoflood analysis, including: (1) testing the application of isotopic indicators ($^{16}\text{O}/^{18}\text{O}$) to determine the meteorological origin of past floods; (2) using 3D anatomical analysis to understand the anatomical response of trees, in order to improve sampling efficiency; (3) using different dendrogeomorphic indicators to estimate peak flows with 2D hydraulic models and compare them with other palaeostage indicators; (4) improving the calibration of two dimensional hydraulic model parameters (e.g. roughness); and (5) applying stochastic-based cost-benefit analyses to select optimal mitigation measures. This paper reviews and discusses the main results obtained from the application of dendrogeomorphology to flood research in different study sites in Spain. The dendrogeomorphic analysis of pine trees in the Pelayo River bars and of alders in the Arenal River banks has allowed us to reconstruct the sequence of past flood events in these ungauged basins. The correlation between the dendrochronological analysis of a wooden deck in the Segovia Mint and documentary sources, enabled to determine the frequency of historical floods from AD 1583 to AD 1771. In Venero Claro reach, the combination of palaeostage indicators derived from dendrogeomorphological evidence with 2D hydraulic models was used to estimate past flood discharge and improve the hazard analysis. At Navaluenga village, dendrogeomorphic data has been used to calibrate hydraulic parameters (e.g. roughness), and to obtain non-systematic flow data to be incorporated in the flood frequency analysis. Results from the Canary Islands (Taburiente National Park) and Monfragüe National Park are also presented and discussed. The research carried out so far reveals that traditional dendrogeomorphic indicators offer high-potential, new possibilities for flood frequency and magnitude analysis that remain unexplored. The research projects MAS Dendro-Avenidas (www.dendro-avenidas.es; Spanish Ministry of Science and Innovation) and IDEA-GesPPNN (www.idea-gesppnn.es; Ministry of Environment, Agriculture and Fisheries) are exploring these novel research lines.