



## **Do we need big flood to cut spectacular river gorges?**

Loreto Antón (1,2), Alfonso Muñoz-Martín (2), Anne Mather (3), and Martin Stokes (3)

(1) Universidad Nacional de Educación a Distancia (UNED), Faculty of Sciences, Senda del Rey 9, Madrid 28040, Spain (lanton@ccia.uned.es), (2) Applied Tectonophysics Group, Depto. de Geodinámica, Univ. Complutense. C/ José Antonio Novais 12, 28040 – Madrid (Spain), (3) School of Geography, Earth and Environmental Sciences, Plymouth University, Drake Circus, Devon PL4 8AA, UK

The study of a historical erosional process occurred in a dam spillway in NW Spain evidences extremely rapid gorge formation in granite. Historic documents, photographs and surveys preserved at the Historical Archives allowed the reconstruction of the whole erosion process. A  $\sim 270$  m long,  $\sim 100$  m deep and  $\sim 100$  to  $160$  m wide amphitheater headed canyon was carved over 6 years. The study approaches the reconstruction of the scour site topography prior to the gorge formation and during the erosion events, and analyses the erosion mechanisms involved in the canyon cutting. Data reveal extremely high ( $>100$  m/year) erosion rates, the highest reported so far on earth, associated to small-moderate floods ( $\sim 100$ - $1500$  m<sup>3</sup>/s).

Results come to nuance the established models of erosion and gorge formation which are used to analyze the landscape evolution. The example demonstrates that moderate water discharges are capable of radical erosion suggesting that adjustments to changes such as drainage diversion and capture, or glacier outburst, may be initially much more rapid than has hereto been assumed. Structural preconditioning of the bedrock through jointing and faulting was the primary control on landscape change, conditioning gorge morphology and the rate at which erosion progress.