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Drainage reorientation and river incision in W Iberia through DEM analysis, cosmogenic nuclide dating and process-based numerical modelling

Loreto Antón (1), Angel Rodés (2), Daniel Garcia-Castellanos (3), Raimon Pallàs (2), Gerardo De Vicente (1), Antonio Oláiz (1), Régis Braucher (4), Didier Bourlès (4), and Fin Stuart (5)

(1) Grupo de Tectonofísica Aplicada, Dept. de Geodinámica, Universidad Complutense de Madrid, 28040 Madrid, Spain. (loreant@geo.ucm.es), (2) RISKNAT Group, Dept. Geodinàmica i Geofísica, Universitat de Barcelona, 08028 Barcelona, Spain, (3) Group of Dynamics of the Lithosphere, Institute of Earth Sciences "Jaume Almera", CSIC, 08028 Barcelona, Spain, (4) CEREGE UMR 6635, Plateau de l'Arbois 13545, Aix en Provence, France, (5) SUERC, Rankine Avenue, Scottish Enterprise Technology Park, East Kilbride, G75 0QF

The Duero basin, in northern Spain, is the largest of the intraplate Cenozoic basins in Iberia. This basin is drained by the Duero River, which flows westward through an intraplate granitic domain (Variscan Basement) before reaching the Atlantic Ocean.The development of the present fluvial systems in the area is related to a change in the drainage pattern in the Duero Basin, from endorheic to exorheic. Headward erosion of the Atlantic drainage network captured the central Iberia rivers and ultimately caused a reorientation of drainage.
Owing to the scarcity of reliable chronological data, the post-Miocene evolution of the hydrographic network in Iberia is not well understood. The timing of the capture of endorreic fluvial systems by the Atlantic network as well as the fluvial incision rates in the region are poorly constrained. In the Duero Basin no numerical chronology of fluvial terraces is available and absolute dating techniques are required to better constrain the fluvial network evolution.
The study area is located on the western border of the Duero Cenozoic basin: an uplifted low relief landscape where the basement crops-out. Morpho-structure in the area is dominated by deeply incised fluvial valleys, and by a drainage pattern strongly controlled by tectonic fractures. The Duero river forms a deep (up to 400 m) gorge called "Arribes del Duero", incised mainly in granitic bedrock.
The timing of drainage reorientations and the processes responsible for them can be constrained by combining tectonic, geomorphic and dating techniques. DEM analysis of the present drainage network reveals changes in main trunk direction and in the concavity and steepness of longitudinal profiles in the study area. 15 surface samples and 3 depth profile samples were collected from bedrock surfaces in the Arribes de Duero. 10Be concentration data that revealed contrasted patterns of denudation will be combined with 21Ne data (analyses underway) to help deduce the age of fluvial incision. Quantifying incision rates is key to constrain the evolution of drainage in W Iberia, and to improve numerical models of drainage network evolution.