



Peneplanation and deep dynamics in the Pyrenees

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The morphology of the Pyrenees is characterized by the presence of high-elevation, low-relief erosional surfaces considered as remnants of a single composite erosional surface recently dissected. This erosional surface is intersecting the Pyrenean tectonic structures and is overlapped by Late Miocene continental deposits giving an upper-limit age for their development.

The origin of these surfaces is still debated. Two major interpretations have been proposed. The first considers that the high-elevation, low-relief erosional surface was a post-orogenic peneplain developed near sea level and later uplifted. The growth of mean elevation up to the present day in the Pyrenees is considered post-Miocene and caused by the thermal erosion of lithospheric mantle below the Eastern Pyrenees where extension and thinning of the lithosphere is induced by the Mediterranean Sea opening. This interpretation is not compatible with the presence of high-elevation, low-relief surfaces in the Central Pyrenees. The second proposes that the rise of the efficient base level of the chain has resulted in the progressive inhibition of erosion and relief smoothing at high elevation. According to this later interpretation low-relief erosional surfaces at high elevation do not equate to post-orogenic uplift. This interpretation does not infer different dynamics between Central and Eastern Pyrenees for the formation of these surfaces.

We use field observations, GIS methods, geophysics and thermochronology to decipher between these two interpretations by investigating the relation between the elevation of these surface remnants and deep structure of the chain. We conclude that (1) the presence of high-elevation low-relief surfaces in Central Pyrenees (2) the presence of a thick crustal root at the base of such surface remnants and (3) the similar level of erosion in both the Central and Eastern Pyrenees favours the second type of interpretation.