



A structural model for the seismicity of the Arudy (1980) epicentral area (western Pyrenees, France)

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The Western Pyrenees presents a diffuse and moderate ($M \leq 5.7$) instrumental seismicity. It nevertheless historically suffered from strong earthquakes ($I=IX$ MSK). The seismic sources of these events are not yet clearly identified. We focus on the Arudy (1980) epicentral area ($M=5.1$) and propose here the reactivation of early Cretaceous normal faults of the Iberian passive margin as a potential source. The late Cretaceous inversion of this basin, firstly in a left-lateral strike-slip mode and then in a more frontal convergence, resulted in a pop-up geometry that attests/testifies of the presence of a deep crustal discontinuity. The present-day geodynamic arrangement suggests that this accident is reactivated in a right lateral mode. This reactivation leads to a strain partitioning between the deep discontinuity that accommodates the lateral component of the motion and shallow thrusts, rooted on this discontinuity. These thrusts accommodate near the surface the shortening component of the strain. Numerical modelling has shown that this concomitant activity of strike-slip and thrust faulting results in an extensive component that can rise 50% of the finite strain. The distribution of the instrumental seismicity fits well the structural model of the Arudy basin. Whatever the compressive regional context, the structural behavior of the system explains too the extensive stress tensor determined for the Arudy crisis if we interpret it in terms of strain ellipsoid. We identify too a 25-30 km long potential seismic source for the Arudy area. The size of the structure and its potential reactivation in a strike-slip mode suggest that a maximum earthquake magnitude of ~ 6.5 could be expected. The extrapolation of this model at the scale of the Western Pyrenees allows to propose other sources for the major regional historical earthquakes.