



Inversion tectonics in the Anayet Permian basin (Axial Zone, Central Pyrenees)

L. Rodriguez, J. Cuevas, and J. M. Tubía

Universidad del País Vasco UPV/EHU, Facultad de Ciencia y Tecnología, Departamento de Geodinámica. ap. 644-48080
Bilbao. Spain (lidia.rodriguez@ehu.es)

During Permian times the Pyrenees were characterized by extensional tectonics that opened subsident basins with pull-apart geometries. The Anayet Permian basin crops out in the western Spanish Axial Zone between the Aragon and Tena valleys. It is WNW-trending and it is filled by a continental Permian succession that represents the first post-variscan deposits in the area. Permian deposits rest discordantly over Devonian to Carboniferous limestones, sandstones and slates. In the Anayet basin, Permian deposits have been classically divided in four main detrital groups, mainly composed of sandstones and conglomerates, with three basic volcanic episodes interbedded (Gisbert, 1984, Bixel, 1987). Due to the lithological characteristics of the Permian rocks in this region, there are almost no accurate age constraints for these units.

A detailed structural study of the area, including mapping and balanced cross-sections, shows increasingly older rocks to the west of the Anayet basin. Moreover, it can be deduced a mean slope of around 11 % to the west for the basin. These data confirm that the basin depocenter was located to the west and that the Anayet basin was partitioned by N10 °E-trending normal faults. Although the contacts between the Permian and the Devonian-Carboniferous rocks are covered by quaternary deposits in most of its extent, a fault contact can also be recognized. The fault contact is a 3 m thick shear zone oriented N120 ° E and dipping 60° to the North. It develops breccias, fault gouges and sigmoidal S-C tectonites indicating a reverse motion. The contact places Permian slates and sandstones over Carboniferous limestones and is almost parallel to the alpine cleavage deforming Permian rocks. The slope of the contact together with the presence of younger rocks in the hangingwall of the reverse fault points out that the original contact was a normal fault reactivated as a high-angle reverse fault during the positive inversion tectonics induced by the Alpine Orogeny.

The high dip of the contact produced a buttressing effect during the alpine compression that concentrated the deformation near the fault zone and generated the cleavage of the hangingwall. Moreover, the higher abundance of fractures and calcite veins near the contact in the Carboniferous limestones of the footwall can be interpreted as an incipient stage to the formation of a short-cut-fault related with the buttressing effect. This process can explain the uncommon thickness of the fault zone, if we compare it with other alpine thrusts in this region.

The structural features described above support the interpretation of the southern limit of the Anayet Permian basin as a normal fault originated during the Permian rifting and inverted during the compressional tectonics due to the Alpine Orogeny.

Bixel, F., 1987. Le volcanisme stephano-permien des pyrenees petrographie, mineralogie, geochemie. Cuadernos de Geología Ibérica 11, 41-55.

Gisbert, J., 1984. Las molasas tardihercínicas del Pirineo, in: Geología de España. Libro Jubilar de J. M. Ríos, Comba, J.A. (Ed.). IGME, Madrid, 168-186.