



Structure of the Anayet Permian basin (Axial Zone, Central Pyrenees)

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The Anayet Permian basin was generated by strike-slip tectonics that opened subsident basins with pull-apart geometries in the western Spanish Axial Zone (between the Aragon and Tena valleys). A continental succession of Permian age, that represents the first post-variscan deposits in the area, fills the basin and covers discordantly Devonian to Carboniferous limestones, sandstones and slates. Permian deposits have been classically divided in four main detrital groups, with three basic volcanic episodes interbedded (Gisbert, 1984, Bixel, 1987): the Grey Unit (50-120 m, Estefanian to Kungurian) with slates, conglomerates, tobaceous slates, coal and pyroclastic deposits, the Transition Unit (50 m maximum) showing grey and red sandstones and lutites with oolitic limestones intercalated, the Lower Red Unit (250 m) composed of cross-bedded red sandstones and andesitic volcanic rocks at the top, and finally the Upper Red Unit (400 m minimum, top eroded) formed by three fining up megasequences of carbonates, red sandstones and lutites with lacustrine carbonates intercalated and alkali basalts at the top. Increasingly older rocks are found towards the western part of the basin, where its depocenter is located.

South-vergent angular folds deform the Permian sedimentary succession. Fold axes are N115 °E-trending, almost horizontal and are characterized by a remarkably constant orientation. Folds exhibit a long limb dipping slightly to the north and a short vertical limb, occasionally reversed. In the Anayet basin four main folds, with a wavelength of 400 m, can be distinguished, two anticlines and two synclines, with minor folds associated. Related to the angular folds an axial plane foliation, E-trending and dipping 40 to 60° to the north, is developed in the lutites. The more competent rocks, conglomerates and breccias, only locally show a spaced fracture cleavage. No main thrusts have been detected in Permian rocks. However, minor scale decollements, usually low angle to bedding-parallel, have been identified along low-dipping limbs of the folds. They can be recognized due to the high colour contrast between the red-coloured Permian beds and the concentration of calcite veins in the decollements.

The development of the structures above described has to be linked to the Alpine compressional tectonics. This interpretation is supported by the good correlation in geometry and orientation between the structures observed in the Permian basin and in southernmost areas of the South Pyrenean Zone, where the deformation is imprinted in Cretaceous to Tertiary rocks. In this regard, the southern border of the Anayet basin, at least in the western part, can be interpreted as a normal fault reactivated as a high-angle reverse fault during the positive inversion tectonics induced by the Alpine Orogeny.

Bixel, F., 1987. Le volcanisme stephano-permien des Pyrenees petrographie, mineralogie, geochimie. 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.