

## **Along-strike thickness variations of décollement levels controlling lateral changes in fold-and-thrust belts: the Barbastro-Balaguer Anticline (Southern Pyrenees)**

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The subsurface vertical and lateral distribution of two evaporitic levels (Middle-Upper Triassic and Eocene) is here studied to better understand their role as a controlling factor on the geometry and kinematics of the central part of the South Pyrenean deformation front. Field work with hundreds of bedding attitudes, 5 exploration boreholes (up to 5000 m deep), the residual Bouguer anomaly and the interpretation of 27 seismic reflection profiles (approximately 440 km of sections) crossing the different allochthonous units and the adjacent Ebro foreland basin have been analysed in this work. Subsoil information is crucial because part of the studied area is extensively covered by the Oligocene-Miocene molasse that prevents any direct observation of the structure underneath to be done. Interpreted key horizons and faults have been identified from the lithological description of partially reinterpreted lithological well data and surface geology. Lithological well data has been anchored to seismic profiles by means of sonic log data. Kingdom software has been used to perform the 2D interpretation of seismic reflection profiles, supported by 2.5D gravity modelling, in a georeferenced workspace and then, surfaces of key horizons and faults were built and assembled together in a 3D model.

The studied area is characterized from north to south by several minor thrust sheets, detached on the Middle-Upper Triassic décollement, which represents the basal décollement of the Pyrenees. Some of them can be linked with the South Pyrenean Frontal Thrust (SPFT) and others have structural continuation towards the NW. The SPFT displays a N160E trend and its hanging wall progressively deepens towards the west. To the east, this structure locally crops out. On the other hand, the footwall geometry of the SPFT shows very distinct features; the western part (External Sierras sector) displays a single ramp with moderate-high angle (20-30°) while the eastern part (linking zone to the Marginal Ranges) depicts mainly a ramp-flat geometry. Southwards, on the autochthonous deformation zone, the Barbastro-Balaguer Anticline (BBA) structure, which core is constituted by Eocene evaporites, seems to mimic the geometry of the SPFT. It displays a lateral change, from east to west, in both its orientation (N110E to N160E) and geometry (anticline to backthrust structure) probably linked to an important lateral thickness variation (as deduce from the residual anomaly map) of the Eocene evaporites that display a significant accumulation in the east and thin drastically and even disappear to the west. There, its distal pinch out is interpreted to promote the nucleation of the BBA backthrust. The distribution of the Eocene evaporites in the subsurface and the lateral changes in thickness are suggested to be significant factors during the late stages of the emplacement of the SPFT and associated structures.