AAPG International Conference
Barcelona, Spain
September 21-24, 2003

Eduard Saura[1], Antonio Teixell[1] (1) Universitat Autónoma de Barcelona, 08193 Bellaterra, Barcelona, Spain

Complex 3D Inversion Geometries at the Leading Edge of an Antiformal Stack: Field Studies and Forward Modelling

Partition of structural styles has been observed in the southern limb of the Axial Zone antiformal stack of the Pyrenees, controlled by pre-orogenic structural and sedimentary features. Integration of mapping and balanced sections allows visualisation of the 3D pattern of the study case. Several sections have been modelled using Midland Valley's 2D-Move software. The study zone is characterised by a Hercynian basement and discontinuous extensional Permo-Carboniferous basins, uncomformably overlapped by Triassic sandstone and shale. Irregularly distributed Tertiary molasse constrain timing of compressional deformation. Two structural units were defined: Axial Zone and Nogueres Zone. The first displays thrust sheets of great dimensions which may involve Permo-Carboniferous basins, in which case, inversion of extensional faults occurs and shortening is partitioned in basal slip and bedding-parallel backthrusting. Otherwise only basal slip takes place. To model its emplacement, a fault parallel flow (FPF) mechanism is used, determining the angular shear value from ramp dip and heave. Backthrusts have been modelled the same way. Nogueres Zone thrust sheet presents a similar structural partition. Where Permo-Carboniferous extensional basins occur, thrust sheets are small and short-cut features usual. In other cases, thrust sheets and their heave are larger. Modelling results validate predicted ramp angles, fit observed extensional and inversional fault-related folding, and reproduce 3D slip and geometric variations within single thrust sheets. The modelling of complex, successive imbrications yields unrealistic results for upper thrust units and suggests that angular shear is not transmitted in a self-similar way through the thrust pile, as implied by the FPF algorithm.