Geophysical Research Abstracts
Vol. 15, EGU2013-12193-1, 2013
EGU General Assembly 2013

Outcrop-scale analogue of post-rift gravitational collapse in passive margins (North-Iberian Cretaceous paleomargin)

Luis Quintana (1), Miguel Gutiérrez-Medina (2), and Gabriela Fernández-Viejo (3)

(1) Departamento de Geología, Universidad de Oviedo, Oviedo, Spain (quintana@geol.uniovi.es), (2) Departamento de Ciencia e Ingeniería del Terreno y de los Materiales, Universidad de Cantabria, Santander, Spain (miguel.gutierrez@unican.es), (3) Departamento de Geología, Universidad de Oviedo, Oviedo, Spain (gaby@geol.uniovi.es)

Most passive margins present gravity-driven deformation due to a post-rift tilting to the ocean or to a rapid increase in the sedimentary loading on the outer shelf during their late stage of evolution. The result is the generation of a proximal extensional domain, with normal faults that transfer their displacement through a detachment level to a distal contractional domain, commonly known as a deep-water fold and thrust belt. Usually all of these structures, normally underwater, are studied by seismic profiles, which entail major limitations in the description of their detailed geometry.

This work presents the study of an outcrop-scale analogue where these structures are present. The structure size is over 3 meters long and 0,5 meters thick, and was developed in an alternation of sandstones and shales in estuarine facies of Upper Albian-Lower Cenomanian age. These materials correspond to the North-Iberian Cretaceous paleomargin that nowadays crops out due to the later Alpine deformation that suffered this passive margin.

The proximal normal faults are basinward-dipping and present planar, listric and antilistric geometries. The main normal fault is formed by two planar segments, which together with the detachment level give rise to an apparent listric geometry. After a small translation zone, the distal contractional structures appear, which consist basically of an imbricate fan of landward-dipping thrusts. The thrust spacing and thrust displacement is reduced basinward at the same time that the number and size of folds increase. Of these, the most proximal are essentially fault-bend folds, while in a more distal position dominate fault-propagation folds. The deformation sequence both of the extensional and contractional structures is directed towards the basin, although there are minor out of sequence reactivations of proximal thrusts during the latest stages of the deformation.

The studied section runs sub-perpendicular to the North-Iberian Cretaceous paleomargin and sub-parallel to the transport direction of the normal and thrust faults hanging-walls, so that we have been able to make a balanced cross-section and calculate extension and shortening values. Thus it has been estimated over 23,5 cm of extension for the proximal area, and over 36,6 cm of shortening in the contractional structures. These results contrast with some regional studies in other margins where extension values are usually higher than shortening values. In our example, the lack of extension could have two explanations: 1) the presence of extensional structures towards the continent, out of the studied cross-section and/or 2) the underestimation of the calculated net extension if we consider distributed ductile deformation by vertical compaction of the poorly lithified sedimentary succession.