Successive Development of Large-Scale Recumbent Fold and Boudinage Structures in Extensional Shear Zones. Examples from the Alboran Domain

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The internal structure of a series of dome-like Alpujárride carbonate massifs (e.g. Turón and neighbouring “windows” in the eastern Alpujarras, Sierra de Lújar in the western part of the region; the Tejeda mountain in the Granada-Málaga provinces or the Sierra Blanca-Sierra de Mijas in the western Betics) can be interpreted as large boudinaged folds which resulted of a progressive deformation process of competent thick layer sequences (the Triassic carbonates). These rocks were formerly folded and later modified, as a result of stretching. The previous folds underwent changes in shape leading to bowing of the axial directions, sheath- and, eventually, boudinaged-folds formation.

An early contractional event and associated high-pressure metamorphism, which probably occurred about 50Ma ago, affected Alpujárride rocks. The previously thickened continental crust underwent stretching and thinning which seem to have closely followed crustal thickening. As in other regions affected by late orogenic extension, complicated structural geometries with extensional structures superimposed on early contractional folds developed. A particularly intriguing fact is the occurrence of recumbent folds developed in relation with the extensional tectonic event (Vissers et al., 1995; Orozco et al., 1998; Orozco et al., 2004). The folds very probably initiated by vertical shortening in steeply inclined competent layers (e.g. quartz levels; quartzite or carbonate sequences) and the geometry of these folds was later severely modified by strong imposed shear strain (e.g. low dipping ductile and brittle extensional shear zones of lower Miocene age). Where initial folds had a slightly curving axis the structure become modified, the interlimb angle is strongly reduced and the axial directions become much more considerably bowed than those of the initial folds. Finally, boudinage and intrafolial or boudinaged folds, at different scales, may be formed.

Keywords: Boudinaged folds; Extensional shear zones; Betic-Rifean orogen