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Reactivation of preexisting fabrics during upper crustal brittle deformation: a case study in the southern Central Andes of Argentina

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Preexisting fabrics affecting basement rocks commonly exert an important control on the structure of subsequently formed rift basins or fold and thrust belts. In this contribution, we selected a region that suffered several deformation episodes to study the role of preexisting discontinuities during following brittle deformation stages. The selected area corresponds to the northern part of the Cenozoic Malargüe fold and thrust belt, located in the southern Central Andes of Argentina. During the Late Paleozoic, this area suffered an intense compressive deformation related to a regional orogenic phase. Later, during Early Mesozoic times, a widespread extension produced the opening of the Neuquén rift basin, represented in the studied area by the Atuel depocenter.

We studied the extensional structure of the Atuel depocenter by integrating previous detailed stratigraphic studies with new structural data. It corresponds to an important hemigraben developed in the hanging wall of a west dipping NNW striking master normal fault (La Manga fault). The internal structure of the depocenter is conformed by NNW and NNE striking normal faults and WNW striking accommodation faults. Bimodal distribution of normal faulting can be explained in terms of polyphasic rifting, with changes in the extension direction, or by oblique rifting, with reactivation of oblique previous fabrics. Upper Paleozoic NNW striking shear zones present in the basement of the region suggest that oblique rifting could have been the mechanism that controlled the opening of this rift depocenter, although we can not discard a later change in the extension direction.

The east verging Malargüe fold and thrust belt has been uplifted from Miocene to Re-

cent times in response to compressive stresses related to the convergence between South American and Nazca plates. The western part of this belt presents a thick-skinned deformation related to tectonic inversion of the Mesozoic normal faults, evidenced by uplift and exposure of thick sequences of synrift deposits. On the other hand, the eastern part of the belt is characterized by shallow detached thrust sheets of N to NNW trend, with no evidence of Mesozoic synrift sedimentation neither at surface nor in the subsurface. The boundary between these structural styles has a NNW trend and coincides with the eastern border of the rift basin, marked by the presence of the La Manga fault. This fault shows a marked Neogene inversion, transferring displacement to the cover.

In conclusion, the present structure of the studied area is the result of several phases of deformation. The Mesozoic extensional architecture of the Atuel depocenter was controlled by the reactivation of NNW trending Paleozoic shear zones, while the structural style and evolution of the Neogene compressive deformation was strongly controlled by the inversion of Mesozoic normal faults.