



Comparison of analogue modeling results with pull-apart structures in the Neogene Fortuna basin (SE Spain)

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The intramontane Fortuna basin is situated at the contact of the Internal and External Zones of the Betic Cordillera. It consists of a sequence of marine-mixed siliciclastic/carbonate facies, marls and evaporites to continental siliciclastics from Tortonian to Quaternary. Basin development was influenced by the regional Crevillente Fault Zone at the NW margin, which acts as oblique slip fault with varying sense at different stages of the basin evolution. Structural analysis reveals a complex internal geometry of the Fortuna basin with several small pull-apart basins at sinistral and dextral releasing stepovers of the Crevillente Fault Zone. To investigate the complex geometry and the kinematic development, we compare these structures to the results of analogue models by Dooley & McClay (1997) and McClay & Dooley (1995).

GIS integrated datasets of remote sensing and field data display two small pull-apart basins connected to the Crevillente Fault Zone, one in the East of the Fortuna basin and one in the West. Both are characterized by a typical box-like graben structure bounded by high-angle dip-slip and oblique-slip extensional faults. Comparison of the stepover geometry on the base of the offset angle demonstrate that they were opened by overlapping releasing sidesteps of the main faults. This is supported by kinked basin sidewalls with tilted sediments. To study the geometric and kinematic evolution of the Fortuna basin we construct balanced cross-sections from surface data. The comparison of these cross-sections with vertical sections of the analogue models helps to constrain the geometry of measured faults at depth, unexposed faults, which has implications on the amount of subsidence, and the basinal structure in three dimensions. The unconformity between tilted Tortonian sediments and subhorizontal quaternary

sediments of the basin in the East separates prekinematic from synkinematic sedimentary units. According to the stratal architecture, the pull-apart basin was opened by 4 km of sinistral displacement along the Crevillente Fault during the Pliocene (?) to Quarternary.

The basin in the West is characterized by an unconformity between tilted prekinematic sediments of the Lower Tortonian and subhorizontal synkinematic sediments of the Upper Tortonian and Quarternary. In combination with structural data, a dextral displacement at the Crevillente Fault Zone of 5 km in the lower part of the Upper Tortonian can be shown. This activity caused the partitioning of the Fortuna basin in a Subbasin in the N and a Subbasin in the S. Further development was mainly restricted to the Subbasin in the S.

Dooley, T. & McClay, K. (1997): Analog Modeling of Pull-Apart Basins. AAPG Bulletin 81(11): 1804-1826

McClay, K. & Dooley, T. (1995): Analog models of pull-apart basins. Geology 23: 711-714