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Impact of diapirism on the style of shortening in the eastern Betic Cordillera: two balanced cross-sections from the External Zone

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The External Zone of the eastern Betic Cordillera contains Mesozoic to early Neogene carbonate- and marl-dominated continental-margin sediments widely detached from their basement along Triassic evaporites during latest Early to Mid Miocene shortening caused by the outward migration of the Alboran domain. Prebetic and Subbetic domains within the External zone are characterized by shallow-water ramp deposits and pelagic facies, respectively.

This contribution focuses on inherited structures influencing the style of deformation during Miocene shortening. The two balanced cross sections (from the Sierra de la Pila in the East and the Sierra de Ricote in the West) are separated by a Tortonian right-lateral fault. Both sections show typical thin-skinned fold-and-thrust belt geometries at a high structural level. The style of deformation, however, is different: In the eastern section a main thrust separates a hanging wall with Subbetic units from a footwall consisting of (presumably) Prebetic successions. The hanging wall shows in-sequence fault-bend folding with a clear ramp-flat geometry of single faults reflecting a transport direction top to the NW. The footwall, however, is mainly deformed by fault-propagation folding. Our data suggest that fault-propagation folding of the footwall (which accommodates about 25% of shortening) was prior to thrusting. As shortening persisted Subbetic units cut through these folded Prebetic rocks. Crests of footwall anticlines were sheared off; in places foreland-dipping limbs were overturned completely below the main thrust due to drag of the hanging wall during thrusting. Keuper evaporites of the hanging wall are juxtaposed to Cretaceous footwall marls. Displacement on the main thrust exceeds 5 km; shortening including internal deformation of

hanging and footwall totals 55%.

In the western section (Sierra de Ricote), no large thrusts can be detected. Anticlines of box-folds and fault-propagation folds form prominent ridges separated by synclines. In contrast to the eastern section (Sierra de la Pila), transport direction of minor thrusts is to the SE. The amount of shortening, however, is comparably high (50%). Overturned beds are a prominent feature: the Sierra del Oro mainly consists of upside-down Prebetic material (5 x 2.5 km in map view). However, we neither find evidence that these units are part of the overturned limb of an asymmetric fold nor evidence for this units being the footwall of a major thrust. We suggest that pre-orogenic late Cretaceous/Paleogene diapirism led to local folding and overturning. Furthermore deeper stratigraphic levels (Mid Triassic Muschelkalk carbonates and evaporites) are incorporated into fault-propagation folds in the western section. We argue that a thicker evaporitic succession (as compared to the eastern section which only contains Keuper evaporites) led to a weaker detachment resulting in a different structural style in accordance with critical Coulomb wedge analysis.