

Miocene shale tectonics in the Moroccan margin

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The Alboran Basin is a back-arc basin located in the hinterland of the Betic-Rif fold and thrust belt. It has been developed during the Miocene by the extensional collapse of the previously thickened crust building the Betic-Rif belt. The West Alboran Basin (WAB) represents the major sedimentary depocenter, with a Miocene thickness of more than 10 kms, exhibiting a large province affected by shale tectonism, mud volcanoes and volcanism. The high-quality 2D seismic profiles acquired on the Moroccan margin during the last decade reveal a complex history of the basin. This study deals with the analysis of seismic profiles along and orthogonal to the Mediterranean Moroccan margin with well Calibration from offshore Spain. It focuses particularly on the interactions between the gravity-driven tectonic processes and the consequent sedimentation in the basin. It is now well accepted that the formation of the WAB began in the Early Miocene (Aquitania - Burdigalian). The strong basinward thickening of these series on the dip profiles indicates a fast subsidence of the basin floor during the massive deposition of shales. The downslope migration (ductile shearing) of the Early Miocene fine-grained sediments initiated during the deposition of the Langhian siliciclastics. This was accompanied by a continuous basement subsidence and induced disharmonic deformation in the Mid Miocene units pre-dating the deposition of the Upper Miocene layers. The development of shale-cored anticlines and thrusts in the deep basin is the result of a compressive deformation at the front of the gravity-driven system lasting for about 15 Ma. However, the basin margins are weakly affected by syn-sedimentary extension, contrary to classical gravity-driven tectonics in passive margin.