Role of Continental Margin Geometry on Structural Styles and Prospectivity in Southern Sicily

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ABSTRACT

Interpretation of seismic datasets acquired in offshore waters of southern and eastern Sicily provides important constraints on the evolution and prospectivity of the Alpine fold-and-thrust system in the Central Mediterranean. The integration of well data with the seismic interpretation together with fieldwork in coastal and inland exposures demonstrate the important role that late-stage (Pleistocene) out-of-sequence (break-back) thrusting has played along the leading edge of the thrust system. The effects are especially acute along the Gela Thrust, the movement on which has controlled structural styles, caused a narrowing of the original foreland basin and controlled the active petroleum system. The new interpretations suggest that the form of the passive continental margin precursor governs the arcuate shape, form and timing of the Gela Thrust. The occurrence of two (western and eastern) promontories effectively pinned the southerly propagating fold-and-thrust belt with the central part of the Gela Thrust segment being able to advance southward in the intervening embayment. The Gela Trough initially formed as a flexed foreland basin in response to thrust sheet loading. The basin was locally translated southwards in piggy-back fashion until the point when locus of deformation impinged upon steeply-dipping reactivated extensional faults that formed above faults originally formed during the syn-rift activity along the African continental margin. Whilst some of the faults took up strain through minor amounts of contractional strain (structural inversion), their main effect was to create a footwall buttress, something that led to deformation reverting on to the Gela Thrust and narrowing of the foreland basin. The insights gained from the integrated study provide an explanation for why structures are complex and traps are small in the thrust hinterland and the main petroleum play is located in the semi-authochonous foreland.