Geophysical Research Abstracts
Vol. 19, EGU2017-11690, 2017
EGU General Assembly 2017

The influence of tectonic inheritance on Syrian Arc folding (Levant basin)

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The Levant basin located in the southeastern corner of the Mediterranean Sea is the last remnant of the Tethys marginal basins. The basin accumulated more than 15 km of sediments during its ∼250 m.y life span and consecutively recorded tectonic activity which was associated with the Tethys Ocean generation and termination. A series of elongated folds developed since the Late Cretaceous throughout the Levant region extending from the Palmyra Mountains in Syria, through the mountain backbone of Israel, to the northern Sinai ridges, known as the Syrian Arc Fold Belt. Observation from onshore and shallow marine subsurface, which have partly experienced erosion or non-deposition, provided important but partial information regarding the origin, timing of activity and spatial evolution of the Syrian Arc. Trying to fill up missing information, we take advantage of the continuous stratigraphic record offshore in order to document folding evolution in time and space. Using >27,000 km of 2D seismic lines we interpreted axial plain of 72 folds. A detailed analysis of thickness variation across each fold was carried out, distinguishing between onlapping patterns, syn-tectonic depositional pattern, and post deposition truncation patterns. Altogether our study maps orientations, amplitudes and lengths of folds and determines the history of folding in the basin, distinguishing between episodes of activity and quiescence, and evaluates deformation rates.

Our results demonstrate that the Syrian Arc fold belt extend north-westward to more than 200 km offshore Israel, folding begun during the Late Cretaceous (Santonian) and continued for more than 80 m.y. till the Early Pliocene. The various folding episodes included reactivation of folds and generation of new ones. Interestingly, fold's axes orientation remained relatively constant (NE to NNE) for more than 80 m.y., regardless of the ∼ 150 anticlockwise rotation of Africa with respect to Eurasia since the Late Cretaceous and the development of new active plate-boundaries along the Levant borders since the Oligocene.

Larger scale observations suggest the Levant folds are a part of a wider compressional belt, extending from Morocco to Syria, along the northern margins of the African-Arabian plate. Based on this observation and on our detailed analysis, we suggest that folds orientation is primarily determined by the shape and preexisting deformation along the continental margin. That is, folding orientation over 80 m.y. of Late Cretaceous and Tertiary shortening was dictated by deformation that had shaped the African-Arabian margin in the Late Paleozoic and Early Mesozoic.