AGU Fall Meeting
San Francisco, USA
13–17 December, 2004

Eos Trans. AGU, 85(47)
Abstract T53B-0488

Miocene to Quaternary Folding and Thrusting Offshore Lebanon From SHALIMAR Seismic Profiles

H. Carton [1], S. C. Singh [1], A. Elias [2,3], P. Tapponnier [2], A. Briais [4], A. Sursock [3], R. Jomaa [3], M. Daëron [2], G. King [2], E. Jacques [5]

[1] Laboratoire de Geosciences Marines, Institut de Physique du Globe de Paris, 4 place Jussieu, Paris, 75005, France
[2] Laboratoire de Tectonique et mecanique de la lithosphere, Institut de Physique du Globe de Paris, 4, place Jussieu, Paris, 75252 France
[3] Lebanese Center for Geophysical Researches, Bhannes, Beyrouth, BP 16-5432 Lebanon
[4] Observatoire Midi-Pyrenees, 14, avenue Edouard Belin, Toulouse, 31400 France
[5] Ecole et Observatoire des Sciences de la Terre, 5, rue Rene Descartes, Strasbourg, 67084 France

The dense grid of 6-channel seismic profiles, complemented by 25 high-resolution profiles, shot offshore Lebanon during the SHALIMAR cruise provides exceptional insight into the stratigraphy of the top 3.5 km of sediments, and into the evolution of Miocene to Quaternary tectonic deformation. The topmost sediments are Plio-Quaternary turbidites, reaching a maximum thickness of 1000-1300m near shore between Beyrouth and Batroun, from an average of 400-600m north of Tripoli, south of Saida, and farther west in the Levantine abyssal plain. Two strong reflectors mark the top and base of the seismically transparent Messinian evaporite layer, which thins landwards from a maximum thickness of 1500-1900m. Deeper down, regularly bedded horizons likely represent Miocene carbonates, and stronger reflectors below, Eocene and Late Cretaceous limestone. There is no trace of reactivation of the passive, Mesozoic Levantine basin margin north of Tripoli. The whole sediment sequence is essentially undeformed, with the evaporite layer pinching out at the base of the continental slope. A rough erosion surface related to the Messinian emersion event, unconformably draped by the Plio-Quaternary sequence, reaches down to 1700m depth. By contrast, strong shortening affects Messinian and younger sediments between Tripoli and Saida. Steeply east-dipping thrust faults mark the base of the steep continental slope. Offshore Jounieh, folding of the turbidites and underlying sediments extends as far as 30 km from the coast. Up to 4 rows of large west-vergent anticlines, 4-7km wide, underlain by mostly blind thrust ramps are observed; extensional faulting affects the turbidites above the hinges of these fault-bend folds. The Plio-Quaternary growth of the anticlines, synchronous with offshore sedimentation, has dammed onlapping units of turbidites into broad and deep piggy-back synclines. The base of the Messinian evaporites is offset by east-dipping thrust ramps, and diapirs have risen in the pinched cores of several anticlines. South of a NNW-striking lateral ramp system, the submarine region between Saida and Sour shows much less evidence of Neogene shortening. The 90km-long, thin-skinned, fold and thrust belt observed between Saida and Tripoli therefore represents the Miocene-Quaternary foreland thrust-wedge linked with the growth of Mt Lebanon. The offshore d,collements and thrust ramps likely root into a steep crustal ramp plunging beneath the coastal flexure. Overall, the amount of shortening in the last 15 Ma may be on order of a few tens of kilometers.