The Kuh-e-Gachab triangle zone in the Central Basin of the Iran Plateau in the Semnan area, central Iran

SOHEILA BOUZARI[1], ANDRZEJ KONON[2], MAREK KOPRIANIUK[3] and ALI A. JULAPOUR[4]

[1]Islamic Azad University, North Tehran Branch, Geology Department, Tehran, Iran;
s_tectonic@yahoo.com
[2]University of Warsaw, Faculty of Geology, Poland; andrzej.konon@uw.edu.pl
[3]Polish Oil and Gas Company; marek.koprianiuk@pgnig.pl
[4]National Iranian Oil Company

During the continent–continent convergence of the Arabia and Eurasia plates, after the Late Eocene inversion of the back-arc rift, the area of the Iran Plateau underwent broad subsidence resulting in the formation of the Central Basin (Morley et al., 2009). New 2D seismic data made by NIOC as well as field investigations in the NW–SW-trending arm of the Central Basin suggest that during the main stage of shortening (Middle–Late? Miocene to Pliocene) the strain concentrations resulted in the development of the thin-skinned Kuh-e-Gachab, Kuh-e-Gugerd and Garmsar structures. These structures are built of Oligocene–Miocene/Pliocene? rocks belonging to the Lower Red, Qom and Upper Red formations. Seismic data suggest that one of the structures comprises the south-verging Kuh-e--Gachab anticline cored by a complex array of thrusts and bounded by the north-dipping Kuh-e-Gachab thrust. The geometric arrangement of these thrusts forms a triangle zone within the Qom Formation dominated by limestones with higher density than the overlying deposits of the Upper Red Formation. An active-roof duplex comprising at least four duplicated south-directed thrust sheets formed above a blind thrust rooted in the Lower Red Formation. The duplex predated or was synchronous with the process of tectonic wedging, which resulted in the development of a backthrust rooted in the Qom Formation. During later layer-parallel shortening involving the triangle zone as a buttress transfer of shortening to the surface, ramping from a detachment horizon within the evaporates of the Upper Red Formation could be initiated. With continued shortening could be formed the out-of-sequence Kuh-e--Gachab thrust propagating through the younger deposits of the Upper Red Formation up to the surface, followed by the Kuh-e-Gachab anticline as a fault-bend fold. According to this interpretation, formation of the triangle zone could predate folding and thrusting in the Upper Red Formation. During the deformation process, two salt evaporate levels played a significant role as detachment horizons. The main detachment horizon was rooted within the Lower Red Formation, whereas the second detachment horizon was localized along the evaporates belonging to the Upper Red Formation strata. Internal geometry of the Kuh-e-Gachab anticline varies considerably along--strike. The size of the triangle zone decreases to the east. Variations in the style of deformation between the size-reduced triangle zone in the western part of the Kuh--e-Gachab structure contrast with smaller shortening

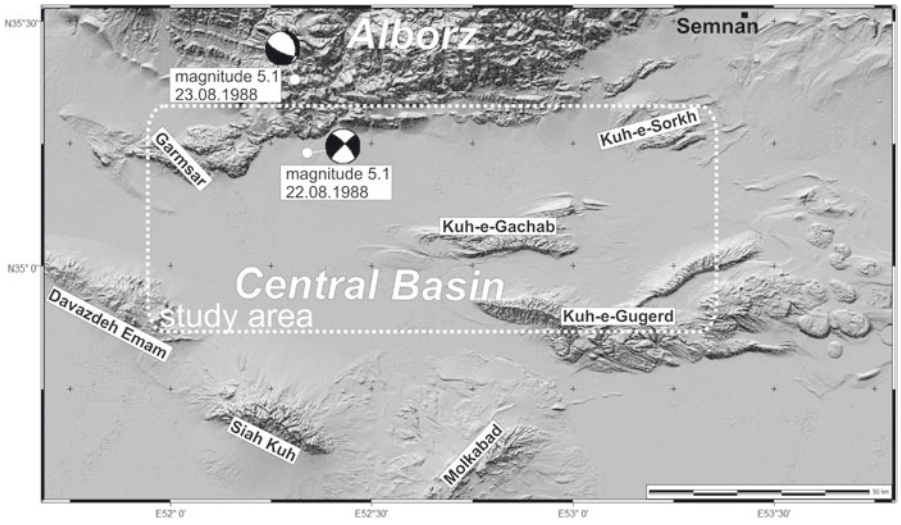

Fig. 1. Location of the thin-skinned Garmsar, Kuh-e-Gachab and Kuh--e-Gugerd structures with CMT focal mechanisms in the north-eastern arm of the Central Basin draped over a shaded-relief SRTM image. Focal mechanisms are taken from the Harvard CMT database.

in the eastern part. Variations of the thin-skinned structural style suggest that thrusting prevailing in the western part was controlled by the occurrence of a thinner detachment layer comprising evaporates contrary to the eastern part, where a few dozens of salt diapirs occur within the Kuh-e--Gugerd structure, suggesting increasing thickness of the mobile detachment horizon. Contractional deformations are still active south of the Alborz Mountains, which is confirmed by the present-day seismicity observed e.g. in the Garmsar structure where focal mechanisms show sinistral movement and oblique thrusting. Contraction is also suggested by GPS data displaying that present-day shortening in the Central Basin south of the Alborz fold--and-thrust belt is ~3 mm/year (Vernant et al., 2004).

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Appearance and characteristics of the Modra Massif sedimentary cover (Malé Karpaty Mts.)

LUCIA LEDVÉNYIOVÁ

Department of Geology and Paleontology, Faculty of Natural Sciences, Comenius University, Mlynská dolina G, SK-842 15, Bratislava, Slovak Republic; ledvenyiova@fns.uniba.sk

Sediments of the Tatric cover of the Modra Massif appear in the form of a narrow stripe surrounding the massif from SW to N, to NE direction. They consist of Upper Permian Devín Formation deposited on the Upper Paleozoic Tatric metasediments and followed by Lower Triassic Lúžňa Formation and the Middle Triassic carbonate complex. The whole sedimentary cover is weakly metamorphosed with predominant dip direction of beds towards the NW. The fracture zones have mostly N–S direction with the eastern dip. From the tectonic viewpoint, the cover units of the Modra Massif were folded into a system of dipping or horizontal folds with the SE vergency, laterally sinking in the SW direction. The folds have round anticline closures filled with basement rocks, and tight to pinching out synclines from which the Middle Triassic carbonates were pushed out.