

CONTROLS ON FOLD DEVELOPMENT IN THE ZAGROS OROGENIC BELT

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The Zagros Mountains, geographically elongated from NW of Iran to Strait of Hormuz, are situated within the general context of the convergence between the Arabian and Eurasian plates (Fig.1). The Proterozoic-to-Recent sedimentary cover has been detached from the Pan-African basement and folded. The folds in this belt host giant hydrocarbon accumulations at different geological levels and better understanding of their geometry and kinematic evolution have crucial importance to promote exploration activities in the area.

In last decade Zagros fold belt has undergone extensive investigations, from which a general understanding of prominent structural characteristics and involved deformational processes have emerged (Sherkati & Letouzey 2004, Molinaro et al 2004, Sepehr et al 2006, Verges et al 2011, Jahani 2009). The mentioned works mostly concentrated in specific areas of the belt. The aim of this paper is to integrate achievements from different parts of the belt and to present an overview regarding controls on folding style through the belt. Meanwhile additional new available data (Seismic lines and well information) is used to improve interpretation.



Fig. 1. Different structural zones and main structural boundaries are shown on Digital Elevation model of the Zagros orogenic belt.

Results

More or less equal folded wide (250 to 210 Km) along more than 2000 Km strike of the belt indicate efficient decollement unit propagate deformation forward. But meanwhile distinct contrast in deformation style from tightly folded strata to broadly folded anticlines and different wedge taper could be seen in the Zagros. Sedimentary facies and thickness variation in addition to the pre-existing structures (Cretaceous N-S folds and salt domes) are the main factors controlled fold geometry, mechanism and localization. From east to west Fars, Central Zagros (Dezful Embayment and Izeh zone) and Lurestan are the main tectono-sedimentary subdivisions of the belt (Fig 1).

Fars salient shows detachment folds well propagated SW ward and could be divided to three distinct zones (North Fars salt basin (NFSB), Prolongation of Qatar high and southern Fars salt basin (SFSB)). The highest value of wavelength to length ratio among the belt and irregular strike are geometrical characteristics of folds in SFSB. Presence of thick halite at the base of sedimentary cover and thick Paleozoic sediments are the main reasons for this specific fold styles. Presence of

pre-existing salt domes and accumulation of thick sedimentary pile in subsided mini-basins in between localized thrusts and folds initiation and development. Despite of the same Triassic facies almost at entire Fars salient, this formation involved as a decollement level mostly in prolongation of Qatar high. Probably thinner Hormuz complex in this region blocked folding along deeper decollement and shortening accommodated by activation of this intermediate soft unit. Absence of pre-existing salt domes in Qatar high favored development of regular folds more or less parallel to the belt. In NFSB again because of thick halite at the base, Dashtak formation did not involved in folding as intermediate decollement level. Wedge taper at this salient is the least at the belt.

Central Zagros could be divided to Izeh zone and Dezful Embayment and High Zagros with some Hormuz salt diapirs. Wedge taper in Central zagros is two times higher than Fars. Less thick or absence of basal halite in Dezful Embayment increased friction at the base of sedimentary cover, and formed asymmetric anticlines with SW ward vergence separated by wide synclines. 3Km difference in elevation between Izeh zone and Dezful Embayment could be an indication of basement involvement in southern border of Izeh zone. In Izeh zone, tight folded structures are dominant. Vertical and Lateral facies change of sediments in Central Zagros complicated fold geometry and favored development of satellite structures around main anticlines. Inherited Arabic trends (Kazerun and Hendijan etc) well recognized in this part of the belt, where Zagros folds usually plunge to this pre-existing structures and do not cross them.

Further to the northwest, Lurestan salient consist of different fold geometries. Lateral and vertical facies variation is also the main reasons behind structural style variation in this domain. Disharmonic folding is the dominant fold style at central part of Lurestan because of dominant basinal facies of sediments. Dominant platform condition of Mesozoic sediments at southern part of the Lurestan zone, probably played the role of obstacle against folding and favored development of salient form of the zone. More than 3 Km difference in elevation between Lurestan and southern low lands covered by Neogene sediments shows probable involvement of basement in deformation. Uplifted basement accelerated erosion in Izeh and Lurestan compare to Dezful Embayment where subsidence and deposition of thick Fars group happened. Gachsaran Fm. south of this border played role of upper decollement level separate lower formations from passively folded and faulted Neogene strata.

Conclusions

Shortening despite of almost equal fold wide in Zagros differently accommodated along the belt. Dominant Platform condition, thickness variation of basal halite and Paleozoic sediments and pre-existing salt domes in Fars domain, Lack of Hormuz salt in Central zagros, sedimentary mechanical contrast and inherited N-S structures in Central Zagros and prominent basinal facies sediments and its rapid vertical and horizontal variation in Lurestan are the main reasons behind structural style variation through the belt.

References

- Jahani, S. 2009. Salt tectonics, folding and faulting in the Eastern Fars and southern offshore provinces (Iran). PhD Thesis. Cergy Pontoise University- France.
- Molinaro, M., J. C. Guezou, P. Leturmy, S. A. Eshraghi, and D. Frizon de Lamotte, 2004, The origin of changes in structural style across the Bandar Abbas syntaxis, SE Zagros (Iran): *Marine and Petroleum Geology*, v. 21, p. 735–752.
- Sepehr, M., J.W. Cosgrove, and M.Moieni, 2006, The impact of cover rock rheology on the style of folding in the Zagros fold-thrust belt: *Tectonophysics*, v. 427, p. 265–281.
- Sherkati, S., Letouzey, J., 2004. Variation of structural style and basin evolution in the central Zagros (Izeh zone and Dezful Embayment), Iran. *Marine and Petroleum Geology* 21, 535-554.
- Vergés, J., Goodarzi, M.G.H., Emami, H., Karpuz, R., Efstathiou, J., Gillespie, P., 2011. Multiple detachment folding in Pusht-e Kuh arc, Zagros: Role of mechanical stratigraphy. *AAPG Memoir* 94 Chapter 4, 69-94.