

STRATIGRAPHIC AND STRUCTURAL STUDIES ON THE SIMPLY FOLDED BELT OF THE ZAGROS MOUNTAIN RANGE, LURESTAN PROVINCE, IRAN

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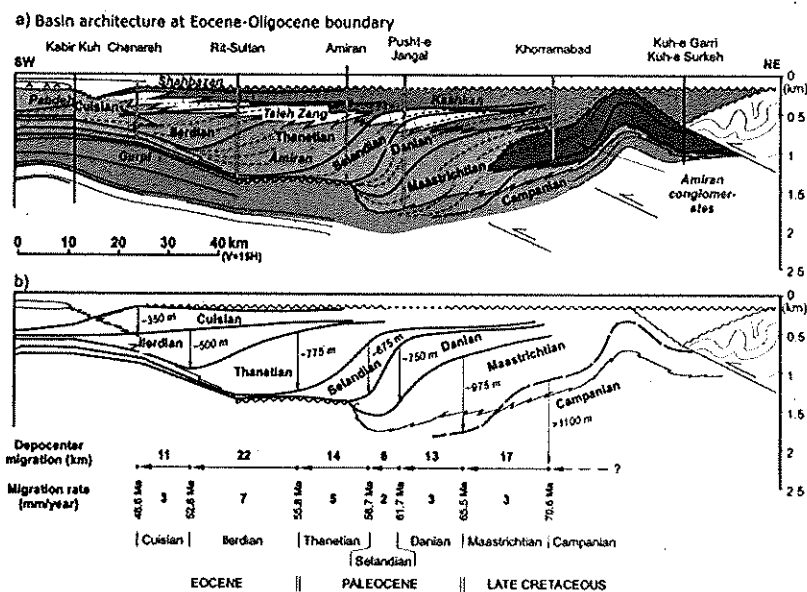
Introduction

For almost a decade the Group of Dynamics of the Lithosphere has studied the geology of the Zagros mountain range of Iran. This study employed both field based analyses and Remote Sensing to investigate: a) the Cenozoic stratigraphic evolution of the Zagros foreland basin; b) the timing of its deformation; c) the role of detachment levels on folding; d) the effect of the mechanical stratigraphy; e) the amounts of shortening; f) the relationship between folding and fracturing, and g) the effects of folding on sediment distribution. These studies have increased our understanding of this fascinating region and furthermore, have stimulated the development of new tools and methodologies to assist the investigation. In this contribution the main results achieved in the latest years, regarding both the stratigraphy and the structure of the Zagros mountain belt, are briefly summarised.

Results

The stratigraphy of the Lurestan Simply Folded Belt (SFB) was studied by measuring stratigraphic logs and dating samples by means of large foraminifera, calcareous nannofossil, palynological and ⁸⁷Sr/⁸⁶Sr analyses. One of the main results is the recognition of the Zagros foreland basin architecture during the Late Cretaceous-Eocene (Saura et al. 2011), which is markedly diachronous (Fig. 1) and characterised by syndepositional fold growth.

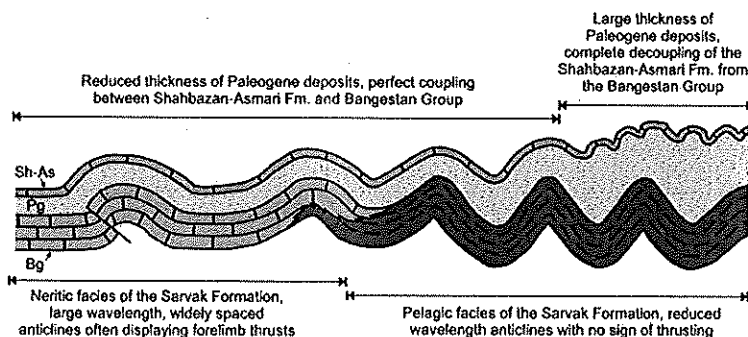
Fig. 1. Synthetic stratigraphic panel across the Lurestan Province (from Saura et al. 2011) showing the basin architecture during the early foreland basin stage (Late Cretaceous-Eocene). Note the marked transgressive character of the infill producing diachronous layer-cake architecture.



Despite the evident diachrony, the sedimentary infill of the foreland basin and the overall sedimentary cover of the SFB present a 'layer-cake' geometry in which competent units alternate with incompetent ones. This rheological profile permits the development of buckle folds and detachment folds whose spacing is governed by the facies and thickness of sedimentary units (Fig. 2; Casciello et al. 2009) and by the depth and number of detachment levels (Vergés et al. 2011a). The timing of deformation is constrained by magnetostratigraphy (e.g. Homke et al. 2004, 2010) and syndepositional structures, indicating a prolonged compression since the Late Cretaceous, which influenced sediment distribution within the early foreland basin (Saura et al. 2012), activated detachment/decoupling levels and deformed also the basement below the sedimentary cover (Emami et al. 2010). The overall shortening that affected the Arabian passive margin was calculated by integrating geophysical and area balancing techniques (Vergés et al. 2011b) to obtain an overall tectonic shortening of around 180 km for the sedimentary cover and 149 km in the Arabian basement. One of the most relevant consequences of the Arabian passive margin deformation is the folding and fracturing of rocks

that now constitute important hydrocarbon reservoirs. The distribution of fractures and their relation with folding was analysed by Casini et al. (2011) using field observations, interpretation of QuickBird and 3D photorealistic models. This analysis indicates that fractures developed during a complex evolution encompassing synsedimentary extension, early contraction, early folding, main folding and late to post-folding fracturing.

Fig. 2. Schematic cross section across the Lurestan Simply Folded Belt (from Casciello et al. 2009) showing the variability of folding in relation to the facies of the Late Cretaceous Sarvak Formation and in relation to the thickness of the Paleogene deposits separating the Sarvak Fm. from the Asmari Fm.



Conclusions

Studies conducted in the Lurestan Province of the Zagros Simply Folded Belt highlight a strong and two-directional link between stratigraphy and structure. Deformation (folding) influences patterns of sediment deposition and therefore facies and thickness, which in turn influence any later additional contraction. The link between stratigraphy and structure is such that in many instances information from one discipline can be used to draw conclusions regarding the other discipline and vice-versa.

Acknowledgements

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