GEOMETRY AND CHRONOLOGY OF BASEMENT FAULTING IN THE FARS ARC: A VIEW FROM STRUCTURAL AND MORPHOLOGICAL ANALYSIS

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In the Zagros Fold Thrust Belt (ZFTB) of Iran it is firmly established that the basement is involved in the deformation. The strongest line of evidence for this assertion comes from the relatively intense mid-crustal seismic activity (Jackson and Fitch, 1981; Berberian, 1995; Talebian and Jackson, 2004). Molinaro et al. (2005) and Sherkati et al. (2005) shown that in the Eastern Zagros Mountains basement control on surface structures only occurred at a late stage of the tectonic evolution. In other words, the current thick-skinned style of Zagros deformation succeeded a more general thin-skinned phase of orogeny. This chronology is particularly well illustrated by spectacular interference patterns, in which early detachment folds are cut by late oblique basement faults. This leads up to form sigmoid structures on surface, one of those is presented in figure 1. The majority of folds visible on the satellite

![Figure 1](image)

**Figure 1** (I) Structural (Landsat 7 photo) and (II) shaded relief (SRTM data) maps of folds in the eastern limb of the Fars Arc. Length of profiles a) and b) in degrees. c) Conceptual model for the evolution of the Shab anticline
photo in Fig. 1 (I), located in the eastern limb of the Fars Arc, display E-W trends. However, one anticline (Shab anticline) presents a marked deflection in trend to a NE-SW orientation in its central part. Such deflections are frequently observed in folds in the eastern limb of the Fars Arc and have been classically interpreted as the effect on the cover of strike-slip movement along underlying basement trends. However, the along strike topographic profile of the Shab anticline shows that this deflection is associated to a distinct step in topography. This step becomes even more apparent when considering the position of the top of the Asmari formation, reconstructed from geological maps. Such a step, of approximately 1500 m is compatible with reverse movement along an underlying NE-SW trending basement fault. This is confirmed by the observation, directly south of the Shab anticline and in line with the NE-SW trend, of another anticline thrusting towards the east over a syncline.

River network analysis and incision depth in the valleys also give constrains on the relative chronology of folding and basement faulting. It is worth noticing that main rivers are parallel to the trend of folds but cut through the trend of basement faults with an abrupt change in river profile. This is the result of a network forming in the same time than folds growth that controls it geometry. In a second time the already formed river network is disturb by vertical movement along basement faults without any possibility of avulsion because the valleys are already controlled by folding.

Systematic morphological analysis (large scale topography and river network) combined with structural analysis allows constructing a general map of basement faulting with vertical uplift associated to it. The faults show an increase in segmentation in the eastern limb of the Fars Arc, which is associated to a partitioning of basement uplift along each fault. This change in geometry from West to East may be related to the influence of inherited transverse structures within the Arabian basement, related to the Oman Line transform fault system which developed during Permo-Triassic Neotethys rifting.

References