

Structural analysis of the Izeh fault in the Zagros fold-thrust belt, using Satellite images and DEM

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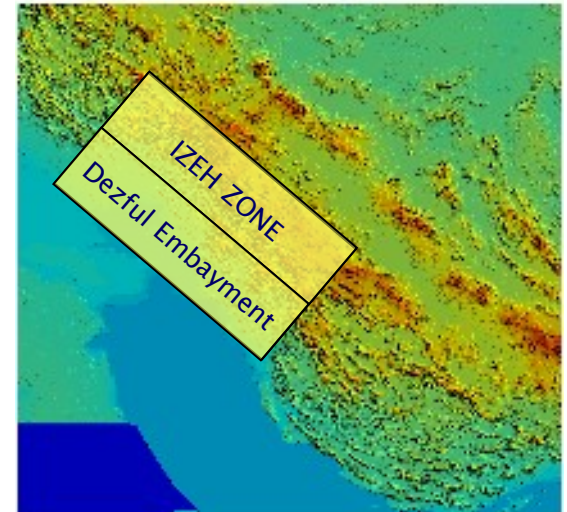
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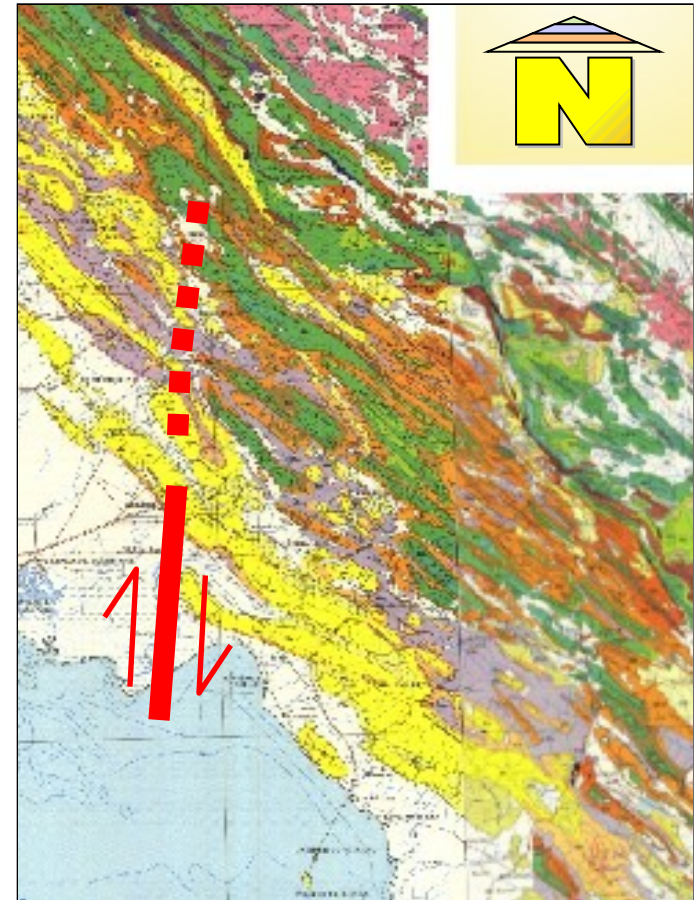
1- Introduction

- The Zagros fold-thrust belt in SW Iran is a part of the Alpine-Himalayan system that is considered as the result of collision between the continental Arabian plate and the so-called Iranian block belonging to Eurasia (Fig.1)
- Aeromagnetic data, regional stratigraphy, and recent seismicity implied that Zagros basement is segmented by many faults
- Based on structural styles, the Central part of the Zagros has been divided in two main structural domains (Fig.1)



1- Introduction (continue)

- In the Central part of the Zagros, a number of N-S trending transversal strike-slip faults have been recognized, which the most important of them is the **Hendijan - Bahr-e Gansar** fault (Fig.2)
 - a) Seismicity of the fault is Active. And, the focal mechanisms of its earthquakes implied on right-lateral displacements
 - c) The sedimentary basin of the Khami Group (Early Jurassic to Middle Cretaceous) has been controlled by this fault (the thickness and facies is varied across the fault). So, it seems that its origin is pre-zagros collision
- The influence of the Hendijan - Bahr-e Gansar fault is continued to the Izeh fault in central part of the Izeh zone
- Therefore, it seems that these faults are surface expression of a supra-regional lineament which can be introduced as **Izeh - Hendijan - Bahr-e Gansar** fault (Fig.2)





2- Main Objective

- The deformation system of the **Izeh fault** can't be recognize only base on the field observation. So, in order to study the effects of this fault, the **Remote Sensing techniques** have been applied
- The remote sensing imagery is too useful for regional structural geology studies, because of its global views



3- Material & Methods

Satellite Images and Maps

- ASTER image, Row/ path: 310301/316, (acquired in 2001)
- PAN images (IRS-1D Satellite), Row/ path: 68/49a, and 68/49c (acquired in 2001)
- Geological Map of Iran (scale 1: 1000000)
- Tectonic Map of Iran (scale 1: 2500000)
- Geological Map of the Kuh-e Asmari (scale 1: 100000)
- Topographical maps (scale 1: 25000)

3- Material & Methods (continue)

Procedures

- **Geometrical correction (of Maps and Images):** it has been done by “Ground Control Points Method” (Figs 3, 4, 5).
- **Image processing and enhancing:** using techniques to increase the image contrast, in order to recognition deformational features
 - a) Data Fusion
 - b) Spatial Filtering
 - c) And Sun angle filters (for detecting linear features of fault / fracture systems)
- **Digital Elevation Model (DEM):** a detail DEM of the area has been constructed by topographical maps. In order to identify and extraction the deformational features of the Izeh fault on DEM,
 - Color draped Images (Fig.6), and Shadow Images (Fig.7) (by changing the *Sun azimuth and elevation*) created
 - Also, 3D models constructed by draping satellite images (Figs. 8, 9,10) and geological maps on the DEM (Fig.11).



4- Structural Description and Mapping

- In this project, by using the different RS techniques, the characteristics of deformational system of the Izeh fault have been studied
- Many of the structural elements which can't be recognized in field surveys, are visible in Satellite images and DEM of the area. They can be identify directly or indirectly ([Fig. 12](#))
- The linear and curvilinear features usually representing the surface traces of steep faults, fault zones, linear arrangement of complex structures, and master joint systems.
- Some times, lineaments are represented by landforms (e.g. basins, domes, ridges, and etc.)



5- Results and Discussion

The RS studies provided many data about deformational system of the Izeh fault. It shows that in this area :

- Regional fault / fracture systems are associated with many subsidiary sets
- A few fault / fracture systems crossed throughout the geological units with different ages and/ or structural setting. These systems usually are associated with structural complexity
- In vicinity of the Izeh fault, there is an abrupt change in deformation pattern



5- Results and Discussion (continue)

- Throughout the deformation zone of the Izeh fault, displacement and / or dragging of the geological units has been occurred in a area with more than 40 km in length and 20 km in width
- Structural data suggest that the variation of the fracture pattern in this area is independent from folding mechanism, and is related to displacements of the Izeh fault

5- Results and Discussion (continue)

- The structural data indicate during the **Zagros orogeny** (Alpine phases), reactivations of the **Izeh fault** have been strongly affected the deformation pattern, as following :
 - The Asmari outcrops (Oligo–Miocene) had been dragged and rotated in a right–lateral direction (e.g. in the Kamar Deraz and Tukak anticlines) (Fig.13)
 - In the final stages of the Zagros orogeny, reactivation of the Izeh fault had been caused that the SE plunge of the Kuh–e Asmari anticline be narrower than the other parts (Fig.13)
 - The deformation mechanisms in the Izeh fault had been associated with dragging, displacement and/or rupturing of the Fars Group (i.e. Gachsaran, Mishan, and Agha Jari Formations) and Bakhtyari formation, too (Fig.13)
 - The deformed rocks and units of the Fars Group (Mio–Pliocene), and Bakhtyari formation (U. Pliocene) indicate that the Izeh fault has been reactivated in the younger phases of the alpine orogeny.



6- Conclusion

- The deformational system of the Izeh fault is characterized by interruption and / or displacement of geological units, dragged folds, and etc
- The structural complexity and variation of deformation pattern around the Izeh fault imply on a deep-seated structural control in this part of the Central Zagros
- It seems this fault is a surface expression of a pre-existing basement fault, which has been reactivated several times by the Quaternary or Recent stress fields. Origin of this fault can be attributed to a group of N-S faults in the Afro-Arabian basement which are so-called Arabian trends
- In a regional point of view, it seems, hydrocarbon accumulation and migration in the naturally fractured reservoirs of the SW Iran (Dezful Embayment) have been impacted by this fault system



Thank You