

The Emergent Salt Diapirs in the East Zagros, Iran

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Abstract

The emergent salt diapirs of the east Zagros, Iran have been investigated by their structural positions. The study area is including of Zagros orogeny belt and Persian Gulf that both of them have been formed on northeastern part of Arabian plate. There are 84 emergent salt diapirs that originated from Hormuz formation with Infra-Cambrian to Cambrian age. Based on location, shape and orientation of the emergent salt domes in the east Zagros hinterland and Persian Gulf foreland basin, internal motivation forces in the salt deposits has been predominant compared to later tectonic forces. In the other words, most of the emergent salt diapirs are pre-orogenic diapirs and they had got prominent role as pines in determining the shape and location of next structures during to the Zagros orogeny. Finally, Neogene continental collision has a supplementary role to diapirism and salt reactivation. However there are an evidence to syn-orogenic emergent diapirs that they have got an important role in the progressive deformation.

Keywords

Emergent, Diapirs, Tectonics, Zagros, Iran

1. Introduction

Investigation of emergent salt diapirs in the east Zagros region in Iran (Figure 1), is the main purpose of this research. Dominant structural trend in the study area is E-W. From tectonics point of view, it contains the overthrusted and simple folded belts of Zagros that formed on the northeastern part of Arabian plate's passive margin [1]-[3]. Zagros Mountains have been continued to East Taurus Mountains in Turkey and have named Zagros-East Taurus hinterland. Zagros-East Taurus hinterland is an external platform (fold and thrust belt) in north

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margin of Arabian Craton. Vergence of folding in this hinterland is toward south and southwest.

The Hormuz Salt formation with Infra-Cambrian to Cambrian age had been deposited on northeastern part of Arabian plate. The name of the Hormuz salt with up to 1000 meters thickness was taken from the Iranian Hormuz Island, in the Persian Gulf.

Based on previous work on the salt and mud diapirism [4]-[15] and neotectonic regime in Iran [16]-[21], Zagros in south Iran is the most active zone [22]-[43]. Then, Alborz [44]-[83] and Central Iran [84]-[99] have been situated in the next orders.

2. Materials and Methods

Neotectonic regime of the study area is due to the Neogene collision between the Arabian and Iranian plates [100]. The Zagros sedimentary rocks shows the syn-rifting facies of passive margin from the late Proterozoic to early Permian (Hormuz to Zakeen formations), post-rifting facies of passive margin from early Permian to the late Cretaceous (Faraghan to Gurpi formations) and foreland facies of syn-orogeny from the late Cretaceous to recent (Pabdeh to Bakhtyari formations) [101]. The sedimentary succession in the study area has got about 10 km thickness. Some of emergent salt diapirs are pre-orogenic, because they are situating far away related to orogenic belts, too. The salt islands such as Abu Musa, Tonb-e Bozorg and Tonb-e Kochak are the best example of these salt diapirs. Also, there is another interesting phenomena that is related to some emergent salt diapirs. The Banded Iron Formation or BIF on top of Hormuz salts is an evidence to rifting stage or intense subsidence in the continental passive margin.

Emergent salt diapirs of the east Zagros have got different shapes and sizes. These different morphologies are controlled by various factors, for example, position related to other structures, the time of emergence, the rate of salt dissolution, which is controlled by the rate of erosion, the bulk rate of salt emission from the source layer, and eventually by the tectonic activity [102]. These emergent salt diapirs of Zagros can be divided into two regions: The first region is Zagros hinterland with 74 emergent diapirs. The second region is north margin of Persian Gulf, with 10 emergent diapirs.

3. Results and Discussion

There are 84 emergent diapirs that can be considered as the most extensive salt basin of Zagros. Because, based on previous studies, such as [103], there are six type salt diapirs by investigation of the present-day surface morphology of them. They believe that nearly all the diapirs of the study area were already active prior to Zagros folding either as emergent diapirs forming islands in the Paleogene to Neogene Sea or as buried domes initiated at least by the Permian. They have been reactivated by subsequent tectonic events.

Therefore, most of salt domes are pre-orogenic emergent diapirs, and had a prominent role in determining the shape and location of folds during the Zagros orogeny. The position of some salt diapirs which they have been located on the plunging noses of anticlines (Figure 2) is an evidence to pine role of salt dome before the orogeny (Figure 3).



Figure 2. Geographical distribution of the salt diapirs in the east Zagros. Locations of Figures 3-5 have shown by red rectangles.

It means that, they can be pre-orogenic emergent diapirs. But, there are several salt glaciers such as Chah Bano, Dehkuieh and Mazijan which some of them such as Gach and Burkh have been flowed on the limbs of anticlines (Figure 4). Therefore, they can be syn -orogenic emergent diapirs because their shape and location have been controlled by folds and faults interactions during orogeny. These salt structures are the more active and they have got an important role in the progressive deformation of faults and folds.

Also, there is another interesting phenomena that are related to some emergent salt diapirs. The islands such as Hormuz, Larak and Hengam (Figure 5) which are evidences to Halokinesis or internal trigger are predominant compared to tectonic processes or external trigger in these parts. Because they are very far from the Zagros suture zone.



Figure 3. Interpreted ETM+ Satellite Image of salt diapirs (1: Kalat, 2: Charak, 3: Darbast, 4: Bastak) on the plunging noses of charak, Gezzeh and Nakh anticlines. Map located in **Figure 2**.



Figure 4. Interpreted ETM+ Satellite Image of the main salt glaciers (1: Gach, 2: Burkh, 3: Kurdeh, 4: Mazijan, 5: Chah Bano, 6: Dehkuieh) related to anticlines. Map located in **Figure 2**.



Figure 5. Interpreted ETM+ Satellite Image of some salt islands (1: Hormuz, 2: Larak, 3: Hengam in the Persian Gulf. Map located in Figure 2.

4. Conclusions

Based on the shape and orientation of emergent salt domes in the east Zagros, although salt diapirism has effected by collision forces, but it has not triggered by it. It means that Halokinesis (internal trigger) are predominant compared to tectonic processes (external trigger) in the east Zagros and Persian Gulf. Therefore, rifting event at Paleozoic is the main factor to Hormuz diapirism in the Zagros and Persian Gulf.

Hormuz diapirs have an important role for structural positions because most of them are pre-orogenic emergent diapirs and have a prominent role in determining the shape and the location of the next structure as a pine during the Zagros orogeny. Finally, Neogene continental collision has a supplementary role to diapirism and salt reactivation. However, there is an evidence to synorogenic emergent diapirs that they have got an important role in the progressive deformation of faults and folds.

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