



Palynostratigraphy and palaeogeography of the drilled sequence of Faraghan and Khabour formations in Kabir- kuh well#1, in Lorestan Province, western Iran

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The Kabir-kuh well# 1 is located at the core of Kabir-kuh anticline, which is the largest structure in the Lorestan Province, near the Iranian/Iraq border. The Kabir-kuh anticline is 220km long and 12km wide. The Kabir-kuh well# 1 is an exploration well which was spudded on the Garau Formation (Early Cretaceous) and completed in the Khabour Formation (Ordovician). The purpose of drilling was to test the hydrocarbon potential of the Triassic-Permian strata in the Lorestan province and to ascertain the nature of subsurface stratigraphic column for further regional exploration requirements. Based on well completion report of the National Iranian Oil Company, the Kabir-kuh well#1, drilled the following stratigraphic units, in descending stratigraphic order: Garau (Neocomian- Aptian), Gotnia (Late Jurassic) , Najmah (Late Jurassic) Sargelu (Middle Jurassic), Alan (early Jurassic), Mus (Early Jurassic), Adaiyah (Early Jurassic), Baluti (Early Jurassic), Dashtak (EarlyTriassic), Kangan (Late Triassic), Dalan (Late Permian), Faraghan (Early Permian), and Khabour formations. According to palaeontological log of this well, the stratigraphic units included in the interval from the Garau Formation (0.0'-340') down to the Dalan Formation (7404'-9720') contain microfauna which permitted to determine their age; however, the rest of the drilled sequence (9720'-10356') lacks microfauna. Therefore, a total of fifty core and cutting samples from pre-Dalan sediments (Khabour and Faraghan formations) were selected and treated for palynological content in order to determine the age relationships the drilled thickness of pre-Dalan sediments in the Kabir-kuh well#1. All samples contain well-preserved and abundant palynomorphs (acritarch, chitinozoan and pollen/spores).

A total 55 palynomorph taxa were identified, consisting of 35 acritarch species (20 genera), 9 chitinozoan species (7 genera), 7 pollen species (6 genera), and 4 spore species (4 genera). The encountered palynomorph taxa were arranged in four assemblage zones which in ascending stratigraphical order are as follows.

1) the assemblage zone I is present within 10356'-10210' and characterized by appearance and disappearance of acritarch species such as *Saharidia fragilis*, *Cymatiogalea cuvillieri*, *Vulcanisphaera africana* and *Cymatiogalea membranispina*. Likewise, these acritarch taxa are associated with *Lagenochitina destombesi* and *Conochitina* sp. Based on both acritarch and chitinozoan species this interval of clastic sediments of pre-Dalan is assigned to the Early Ordovician (Tremadocian) age.

2) the assemblage zone II extends through the depth of 10210' 10050' and it is marked by presence of acritarch taxa, consisting of *Arbusculidium filamentosum*, *A. iranense*, *Striatotheca principalis*, *S. triangulata*, *S. frequens*, *Aureotesta clathrata* var. *simplex*, *Barakella fortunata*, *Coriphidium bohemicum*, *C. persianense*, *Dicrodiacrodium normale*, *Goniosphaeridium splendens*, *G. connectum* and *Veryhachium trispinosum*. The above -mentioned acritarch taxa are associated with chitinozoan species including *Velatachitina veligera*, *Eremochitina brevis*, *Eremochitina* sp., *Siphonochitina formosa* and *Laufeldochitina clavata*. Based on the stratigraphical values of the above mentioned acritarch and chitinozoan taxa, this interval of the drilled sequence is assigned to Darriwilian (Arenigian-Llandeilian).

3) the assemblage Zone III includes the depth of 10050' to 9750' and it is marked by presence of acritarch species such as *Dactylofusa striata*, *D. spinata*, *Navifusa ancepsipuncta*, *Baltisphaeridium perclarum*, *Multiplicisphaeridium irregulare*, *Orhosphaeridium rectangulare* and *Villosacapsulla setosapellicula*. These acritarch taxa are associated with chitinozoan species consisting of *Ancyrochitina merga*, *Rhabdochitina usitata*, *Calpichitina lenticularis*, *Armoricochitina nigerica*, *Belonechitina* sp. and *Plectochitina sylvanica*. Based on stratigraphical potentials of the above-mentioned acritarch and chitinozoan taxa this interval of drilled sequence (10050' - 9750') is assigned to the Late Ordovician (Caradocian- Ashgillian) age.

4) the assemblage Zone IV occurs at depth 9750' to 9640' of the drilled sequence of Kabir-kuh well #1. This assemblage is marked by completed disappearance of Ordovician acritarch and chitinozoan species and appearance of miospore species including *Horriditriteles gondwanensis*, *H. ramosus*, *Laevigatosporites vulgaris*, *Punctatisporites gretensis*, *Potoneisporites granulatus*, *Nuskoisporites triangularis*, *Hamiapollenites* sp. and *Vittatina subsaccata*. Based on stratigraphical values the above -mentioned miospore taxa, this part of drilled sequence is assigned to the Faraghan Formation of Early Permian age. Therefore ,based on the above-mentioned assemblage

zones, there is a major hiatus between Ordovician and Early Permian. This hiatus encompasses the Silurian, Devonian and Carboniferous strata. On the other hand, the presence of acritarch and chitinozoan taxa in the Ordovician sediments of Khubour Formation such as *Striatotheca principalis*, *Arbusculidium filamentosum*, *Coryphidium bohemicum*, *Dicrodiacrodium normale*, *Lagenochitina destombesi*, *Velatachitina veligeri*, *Eremochitina brevis*, *Siphonochitina formosa*, *Laufelochitina clavata*, *Ancyrochitina merga*, *Calpichitina lenticularis*, *Armoricochitina nigerica*, and *Plectochitina sylvanica* represent relationships of Lurestan province to Peri-Gondwana Palaeo-continent during the Ordovician period.