

GEOMORPHOLOGY

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ABSTRACT

The landforms of the Western Desert are result of the interaction of structure, lithology and climate. The tectonic history of the Stable Shelf, in which the Western Desert is located, has controlled the development of the main landforms and lithology.

The lithologic column of the exposed rocks in the Western Desert consists of limestone, dolomitic limestone, dolomite, sandstone, marl, claystone and phosphorite with rare gypsum. The rocks have been faulted, fractured and exposed in major plateaus after they have influenced by movement of, Hijaz, Najid and Alpine Orogenies.

The paleo-climates have denuded the major plateaus in steps form and caused development of different topographic features, because of their oscillation between tropic, humid and arid climates in repetition forms. The effect of the present arid climate gives rise to mechanical break down of the surface.

The landforms are classified according to relief building forces and geomorphic processes. The genetic units are; structural – denudational, denudational depositional, fluvial, solutional, evaporational and eolian origins.

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TECTONIC AND STRUCTURAL EVOLUTION

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ABSTRACT

The available geological information including stratigraphic sequence, unconformities pattern, drill-hole data, seismic and structural elements have been integrated to infer the tectonic and the structural evolution of the Iraqi Western Desert.

The Western Desert is a part of the northern Arabian Platform, where relatively thin Phanerozoic sediments cover the Precambrian N – S and NW – SE fractured continental basement complex. The platform itself is divided into two parts, a stable one to the west (within which the Western Desert is located) and an unstable one to north and east. The boundary between the two parts of the platform is taken along Anah – Abu Jir Fault Zones.

The Paleozoic sequence is dominated by silici-clastic sediments deposited in a shallow epicontinental sea in a relatively stable conditions, whereas the Mesozoic sequence show a major change in the depositional system from a primary silici-clastic Paleozoic regime to a major carbonate deposition with interspersed clastic episodes. However, the Cenozoic sequence displays gradual retreat of the sea and final transition to the continental conditions.

Structurally, the two major Paleozoic orogenic movements (Caledonian and Hercynian) were identified by their effects on sea level changes rather than their orogenic deformation. On the other hand, however, the sedimentation pattern through most of the Mesozoic era was a reflection to a fluctuating sea level and periodical movements of Hail – Rutbah Arch. Nevertheless, by the late Tertiary a significant tectonic activity took place along the boundary of the stable/ unstable parts of the platform, causing the structural inversion of Anah Graben, and a limited right lateral strike- slip movement on Abu Jir Fault Zone.

Finally, conclusive evidences on the nature of Hauran Fault System as well as the recent activity along Anah – Abu Jir Fault Systems are introduced.

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STRATIGRAPHY

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ABSTRACT

The stratigraphy of the Iraqi Western Desert is reviewed. The oldest exposed rocks are Permian in age, belong to the Ga`ara Formation, whereas the youngest are Pliocene – Pleistocene, belong to the Zahra Formation. The exposed stratigraphical column is represented by 32 formations. Moreover, eight main types of Quaternary deposits, which have wide geographic extent are reviewed too.

For each exposed formation, the exposure areas, subsurface extension, main lithology as described inform of members and/ or informal units, thickness, fossils, age, depositional environment and the lower contact is described. Because, almost all formations are described by different authors from different localities, therefore all descriptions of different authors are reviewed, with occasional comments. The paleogeography is reviewed briefly.

Each formation is discussed, for majority of them the present author`s opinion are given, with many recommendations for future studies. Some new ideas dealing with many aspects for many formations including proposals for establishing new formations are given, too.

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HYDROGEOLOGY

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ABSTRACT

The regional topography of the Iraqi Western Desert is characterized by gradual increase in elevation from east to west with some exceptions. In general, the drainage is towards east and northeast. All wadis in the region are intermittent. Generally, the Western Desert is covered by carbonates, clastic and marl. The dip of the strata is almost gentle and towards northeast and east directions, in the western parts is westwards.

The main aquifers in the region are within Suffi, Ga`ara, Mulussa, Ubaid, Muhaiwir, Rutbah, Ms`ad, Hartha, Tayarat, Umm Er Radhuma, Akashat, Dammam, Ratga, Euphrates, Injana formations and Quaternary deposits. Ga`ara aquifer is considered as the most important one, on a regional scale, due to its wide extent and high content of water. Most aquifers are recharged from rainfall and runoff of the intermittent wadis in form of leakage losses into permeable strata and through fractures, fissures, joints and cavities, especially into shallow aquifers. It is assumed the presence of a hydraulic connection between aquifers to some extent. Leakage of water is either downwards or upwards, depending on piezometric relation of aquifers, lithology, structure and extent of water-bearing horizons.

Groundwater discharge zone is located in the area along the right bank of the Euphrates River. Water river discharge is either in form of underground inflow into the Euphrates, Habbaniya and Razzaza lakes, or in form of springs.

The general trend of the groundwater is towards northeast, following the discharge zone along the right bank of the Euphrates River. Locally, different directions of flow may occur through out the region, depending on the geological setting of water-bearing horizons and nature of structure and topography.

Groundwater level varies from about 300 m below ground surface, in the western parts to artesian or near ground surface, in recharge zones along Euphrates River. Salinity of water increases with depth and also towards discharge zones. It ranges from fresh in the western parts to very high salinity in discharge areas. Water type also varies from bicarbonate or mixed to mainly chloridic or sulphatic in the discharge zones.

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MINERAL RESOURCES

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ABSTRACT

The Iraqi Western Desert is rich in mineral deposits and industrial rocks. Important deposits were identified including phosphorite, kaolinitic claystone, montmorillonite – palygorskite claystone, quartz-sand, bauxite, flint clay, porcelanite, uranium, ironstone, heavy minerals sandstone, feldspathic sandstone, limestone and dolostone. Most of these deposits are restricted in occurrence to the Western Desert. All of these mineral deposits and industrial rocks are sedimentary in origin including marine and continental deposits. They range in age from Permocarboneous to Pleistocene, occurring mostly as bedded stratiform deposits with some exceptions such as karst bauxites and flint clays.

The formation of the mineral deposits and industrial rocks in the Western Desert was controlled by paleogeographic and climatic factors. Tectonic and structural factors were important in some cases. The type, specifications and reserves of these mineral deposits provide a very promising potential for future development of this region.

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