

**FLYSCH – MOLASSE SEDIMENTS OF THE
PALEOGENE FORELAND BASIN OF NORTH ARABIA,
SHIRANISH AREA, NORTH IRAQ**

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ABSTRACT

The Paleogene clastic strata of northern part of Iraq are represented by the Kolosh Formation (Paleocene – Early Eocene) and the Gercus Formation (Middle – Late Eocene). Detailed investigations of these strata at Shiranish area of north Iraq including stratigraphic association, lithofacies type, petrographic investigation, and mineralogical analysis of heavies and clay fractions disclose the geological aspects and the nature of the Paleogene Foreland Basin, which is developed along the north – northeastern margin of the Arabian Plate.

Analysis of lithofacies association of the Kolosh sediments shows that it represents a distal turbidite facies of an unattached submarine fan complex that is developed far from feeding channel systems. The Gercus lithofacies is characterized by predominant continental section with a possibility of shallow marine influence near the bottom of the section.

The petrographic analysis of sandstones from both units shows the predominancy of litharenite type with significant occurrence of feldspar, igneous and metamorphic rock fragments in Gercus samples. Petrofacies analyses of these sandstones show that the Kolosh sandstones were derived from “Recycled Orogen” province, and developed as a part of the foreland system. The Gercus sandstones show similar tendency with clear effect of arc-volcanicity. Heavy and clay minerals analysis show assemblages, which support similar interpretation.

The sediments of Kolosh and Gercus formations are believed to represent the flysch – molasse facies of the distal part of the Paleogene Foreland Basin, which is developed in North Iraq as result of the advancing Bitlis Nappes onto the northern Arabian margin.

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HISTORY AND GEOLOGICAL SETTING OF INTERMONTANE BASINS IN THE ZAGROS FOLD – THRUST BELT, KURDISTAN REGION, NE IRAQ

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ABSTRACT

It is mentioned previously that the intermontane basins, in northeastern Iraq, are developed in Early Paleocene. In present study, the timing, geographic location and geological setting of these intermontane basins are studied from Iraqi Zagros Fold – Thrust Belt during Tertiary. This study is achieved in accordance to the previous literature and recent sedimentological studies. The terrigenous clastic cutoff and facies comparison with their distribution are used as evidences for spatial and temporal development of intermontane basins. The study concluded that the first intermontane basin is developed during Middle Eocene.

It is observed that the present position of the Thrust and Imbricated Zones of Iraq was an area of subsidence and generation of the intermontane basin during Middle Eocene. Concurrently, with this subsidence and directly to the southwest of the latter zone a narrow paleohigh was developed, which separated the subsidence area from the main basin. The present position of the paleohigh coincides with the boundary of the High Folded and Imbricated Zones. In these intermontane basins the flysch facies (sandstones and shales of Walash and Naopurdan Groups) are deposited at the beginning while later molasse facies (conglomerate of upper part of the Red Bed Series) are deposited. Concurrently, in the area of the present Low Folded and Mesopotamian Zones (main water body of the main foreland basin) thick succession of pure carbonate (Pila Spi Formation) was deposited signaling total cutoff of clastic sediments from the latter zones. In contrary, during Early Paleocene till Middle Eocene clastics (conglomerate and sandstone) influx was continued from source area into early Zagros Foreland Basin and mixed (occasionally) with carbonates of Sinjar Formation in many places. During Early Paleocene – Middle Eocene, intermontane basin was not generated as cited in previous studies to trap transferred sediments from source area, except some basin irregularities on which reefal limestones of Sinjar Formation are deposited. The separation of early Zagros Foreland Basin into two smaller basins (Main foreland basin and intermontane basin) decreased the current circulation and wave activity, therefore lagoonal dolomitic limestone of Pila Spi Formation was deposited.

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THE HYDRO – STRUCTURAL INTERRELATIONS IN PART OF AL-RAZZAZAH BASIN, IRAQI WESTERN DESERT

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ABSTRACT

The studied basin is located to the west of Al-Razzazah Lake extending between longitude 42° 00' – 43° 45' E and latitude 32° 00' – 33° 15' N. It is a part of Al-Razzazah hydrogeological basin, including many wadies such as Ghadaf, Ubaiyidh and Slugi. The exposed geological formations in the area range in age from Cretaceous to the Pleistocene with various lithologies. This variation in lithology has remarkable effective impression on the geomorphological units represented by the karst features, shallow depressions and the intermittent wadies. The main aquifers in this basin lie within the Umm Er Radhuma, Dammam and Tayarat formations; which consist of intensively faulted fractured and karstified limestones and dolomites. Groundwater flow is from west and southwest toward east and northeast. Through structural study of the basin, it was found that a relation exists between the direction of the groundwater flow with the direction of the major faults. The Nukhaib Graben is considered as a site of groundwater accumulation, as a recharge area, while the discharge area is located and expresses itself in a series of springs along the Euphrates Fault Zone where the groundwater is shallow and will participate in the recharging of Al-Razzazah Lake. The analysis of the lineaments, delineated from satellite images and aerial photos show that the N40°– 60°E are the prevailed direction in addition to the N20° – 35°W trend. The transverse lineaments (E – W) control the behavior of the groundwater flow and the direction of the main wadies in the basin. According to the structural relation, an attempt was carried out to specify the best locations for exploitations through connecting the lineaments density map with the distribution of the hydraulic conductivity. It is concluded that there are no rules controlling the movement of groundwater through the faulted and karstified carbonate aquifers, and each case should be treated separately.

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GEOLOGY AND STRUCTURE OF WADI SHALGHAH AREA, EAST ERBIL, NORTH IRAQ

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ABSTRACT

The structure of the studied area is a simple anticlinal limb and located within the Foothill Zone of Iraq, which is a part of the Zagros Simply Folded Belt, it is a part of the western limb of NW – SE trending Bana Bawi Anticline. This is confirmed by four constructed cross sections and a structure contour map constructed on the top of Pila Spi Formation. However, a small parasitic terrace like structure imposed on the limb of the major Bana Bawi Anticline occurs in the extreme eastern margin of the studied area, which is attributed to the northwestern plunge of Taq Taq Anticline.

The studied area is built up of clastic rocks of Injana, Mukdadiyah and Bai Hassan formations, which form almost badland morphology with continuous strike ridges that are formed due to differential weathering.

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**EVALUATING WATER QUALITY OF WARAZ
MOUNTANEOUS AREA, USING CONTAMINATION INDEX,
SULAIMANIYA GOVERNORATE, NORTHEAST IRAQ**

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ABSTRACT

This study aims to investigate the degree of contamination of Cadmium and Copper on both surface and groundwater in Waraz area, using Contamination index (C_d). For this purpose, surface and groundwater samples were collected from various locations of Grdazubair Stream and groundwater of Waraz Village. Grdazubair Stream, in the studied area is highly contaminated with Cadmium (Cd) and showed contamination index ($C_d > 3$). Contamination index (C_d) increases moving from up to down-stream along Grdazubair Stream. Groundwater also shows high degree of contamination. A source of the contamination in water of the area is geogenic and derived from sulfide mineralization in the exposed igneous rocks of the area. Water of the studied area is not useful for drinking purposes, because of high degree of contamination with health risky elements like Cadmium. Contamination index represents a useful tool for evaluating quality of surface and groundwater in the mountainous area.

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PETROGRAPHY, DIAGENESIS AND DEPOSITIONAL ENVIRONMENT OF NAHR UMR FORMATION, FROM SELECTED WELLS IN CENTRAL IRAQ

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ABSTRACT

Nahr Umr Formation is a siliciclastic deposit of the Mesopotamian basin. This formation is mainly composed of sandstone interlaminated with siltstone and shale, with occurrence of thin limestone beds. Nahr Umr Formation is subdivided into three lithostratigraphic units of variable thicknesses on the basis of lithological variations and log characters.

Mineralogically and texturally, mature quartz arenites and sandstones are the common type of the Nahr Umr Formation. The sandstones are cemented by silica and calcite material and have had a complex diagenetic history and are cemented by silica and calcite. Compaction, dissolution and replacements are the main diagenetic processes.

Prodelta; distal bar; distributary mouth bar; distributary channel; over bank and tidal channel are the main depositional environments recognized for the Nahr Umr Formation, within the studied wells. This formation was deposited in shallow marine and fluvial – deltaic environments and exhibit progradational succession of facies.

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ORIGIN OF CHERT NODULES IN KOMETAN FORMATION FROM DOKAN AREA, NORTHEAST IRAQ

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ABSTRACT

Kometan Formation, in most localities, contains sporadic and rare chert nodules, but in Dokan area, these nodules become widespread and associated with well-developed and high amplitude stylolites. They are mainly distributed along or around the bedding planes. The long axes of nodules and stylolite surfaces are aligned parallel to the bedding plane. Field observations and statistical analysis (rose diagram of long axes) showed that nodule elongation and stylolite peaks have no any relation with the known tectonic stress directions of the area. Therefore, the growth of the nodules and stylolites are attributed to deep burial diagenesis of the rocks of the formation under vertical lithostatic pressure and not due to tectonic stress. This result contradicts with the previous studies, which supposed that stylolite peaks have directions of North – South and East – West.

Microscopic studies showed that nodules are developed by both displacement and replacement during deep burial. The microscopic criteria for emplacement are: **1-** The limestone around nodules shows exceptional crowding of planktonic forams due to the dilatational relations with country rock. **2-** They are associated with stylolites, this mean that the nodules compressional environment is favored by nodules and stylolites on expense of host limestone. While the criterion for replacement includes presence of partially dissolved and replaced forams directly at the contact between the chert and limestone. The local accretions of silica for replacement and displacement growth are assisted by diffusion and moving of watery solutions. The presence of widespread chert nodules and stylolites in Dokan area and their absence in other areas is attributed to exertion of the vertical lithostatic differential pressure at Dokan area. While the surrounding areas were performed as pressure shadow or the pressure was hydrostatic type (equal in all direction). The load pressure is estimated indirectly by comparing with calcite compensation depth (CCD) pressure under which limestone dissolve and silica increases in deep oceans.

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APPLICATION OF CHANGE DETECTION TECHNIQUES IN MARSH AREAS, SOUTH IRAQ

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ABSTRACT

The marshes in the southern part of Iraq are considered as one of the most important water bodies in the world. This is due to their economical and environmental importance, because they include huge water and fishery resources, as well as their historical and tourist importance.

Large environmental changes took place, due to the dryness of the marshes during the nineties of the last century. Therefore, this study is found to be very necessary to record these changes, using remote sensing techniques. The application of change detection techniques aims to discover all types of changes that took place in Al-Huwaiza Marsh during the last 27 years, from 1975 – 2002. This is achieved by using Landsat MSS images, dated in 1977 and Landsat ETM+ dated in 2002. After application geometrical corrections, the desertified areas, development of sabkha, highly saliferous soil and absence of vegetation were clearly determined.

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BENEFICIATION OF ATTAPULGITE – MONTMORILLONITE CLAYSTONE BY DISPERSION SEDIMENTATION

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ABSTRACT

The beneficiation of attapulgite – montmorillonite claystone has been studied with dispersion sedimentation technique using polyionic salts as dispersant. The study was performed on attapulgite-rich claystone sample from the Digma Formation exposed in the Western Desert of Iraq. The clayey materials mainly consist of attapulgite and montmorillonite minerals, together with quartz, calcite, dolomite and gypsum as impurities. Calcite represents the major impurity associated with the clay. Type and dosage of dispersant (namely sodium hexametaphosphate, and tetrasodium pyrophosphate) and slurry solid concentration were tested to understand their effect on the beneficiated process. The results showed that tetrasodium pyrophosphate was the best for achieving good beneficiation of attapulgite clay from dilute crude slurry.

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