# **GEOKURDISTAN 2012**

# The First Geological Conference of Kurdistan



## Abstracts Volume

14-16 November Sulaimani www.kurdistangeology.com

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# **GEOKURDISTAN - 2012**

## The First Geological Conference of Kurdistan

**Abstracts Volume** 

November 14-16, 2012 Sulaimani, Kurdistan Region, Iraq

www.kurdistangeology.com

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## Welcome

#### .....

## In the name of God

Ladies and gentlemen...

Dear participants in the First Geological Conference of Kurdistan (GeoKurdistan 2012)

#### Good morning

On behalf of the Organizing Committee, the Kurdistan Geologists Organization and the Department of Geology/ University of Sulaimani, I would like to welcome you here and wish you a very pleasant and useful visit to Sulaimani. Also I hope that our meeting will be the starting point for the development and renewal of geology in Kurdistan.

#### Dear Colleagues...

Quantitatively, it is true that study of the geology of Kurdistan has developed in recent decades, but from the qualitative point of view there is still no great progress and up-to-date geological studies are very limited, and they are not integrated with those in the outside world. Isolation is the enemy of science. Only recently have we begun to cross our borders and publish studies of our region in international journals.

In my opinion, one of the most important factors for geosciences locally is the absence of such meetings as this, which is very important for the exchange of ideas and building new models in geology.

#### Our goals for this conference are:

to submit and discuss geological research on topics related to Kurdistan;
to determine the needs of geological studies in Kurdistan, and the deficiencies;

-to promote the participation of geologists from different areas and schools, which will create new ideas;

- to plan for new collaborative geological projects.

Indeed, the success of this conference will be dependent on your presentations, to be given here in the next couple of days. Our hope is that this meeting will become a systematic annual tradition, to be held every year, each time in a different city of Kurdistan. I hope we can determine

the location for GeoKurdistan 2014 at the end of our meeting.

Please write your opinions and criticisms about the conference in the feedback of the conference.

It is my pleasure to thank all our sponsors; the Asia Cell Company, University of Duhok, the Kurdistan Institution for Strategic Studies and Scientific Research, and the Halabja Group Company, who faithfully support the conference financially.

Welcome again, and have a wonderful stay in Sulaimani!

Ibrahim M.J. Mohialdeen Chairman of the Organizing Committee GeoKurdistan 2012 14-11-2012 Sulaimani Kurdistan

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GK-101:

## CONTRIBUTION TO THE STRATIGRAPHY OF THE WALASH SERIES, SULAIMANI AREA, KURDISTAN, IRAQ

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#### ABSTRACT

The Walash Group represents a sequence of siliciclast sediments with alkaline volcanics specially at the upper part. It forms the lower most thrust sheet of the Zagros Suture Zone. Three localities around Sulaimani area of Kurdistan region of north Iraq were chosen for sedimentological and stratigraphic review of this group. Examination field measurements correlation. includes and petrographic. sedimentological, and biostratigraphical analysis. The sequence in the study area has variable thickness with highest reaches 150m., and generally consists of greenish gary silty calcareous shale which alternates with thin to thick-bedded coarse grained sandstone and limestone. sedimentological evidences of turbidites origin. Sandstone beds show Based on occurrences of volcanic admixtures, the group is subdivided into two basic lithostratigraphic units: lower sedimentary unit, and upper sedimentary-volcanic unit. Petrographic analysis shows that the sandstones include two basic types: lithicarenites which is dominated by carbonate, quartz, chert, and volcanic rock fragments, and calcarenite with bioclasts and benthic forams as the main type of grains. Detailed biostratigraphic analysis especially from the shale interlayers samples near Kinjurine village, reveal the occurrence of both benthonic and planktonic foraminifera. Stratigraphic ranges of the identified planktonic foraminifera show occurrence within the Paleogene biozones of P5 - P9 which indicate Ypresian age (Lower Early Eocene). Similar age inferences reached from benthic foraminiferal assemblages. This study recall the attention to review the stratigraphic status of the group by renaming the upper part and introducing new name for the lower part.

GK-102:

## NEW GEOLOGIC SETTING OF BEKHME FORMATION

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## ABSTRACT

Since the first description of Bekhme Formation (Late Campanian-Maastrichtian) by Wetzel in 1950 (in Bellen et al., 1959), no updating is published by later studies except confirmation of the first description. However, few published studied are deviated from the majorities and give serious suspicions about many parts of the previous description. The present study try, on bases of stratigraphy, fieldwork and paleontology, to evaluate these doubts and try to give evidence for abandoning this formation and changing it's name to new formation (Perat Formation). Accordingly, it was proved that the top of Bekhme Formation is older than Late Campanian and it's actual age is Turonian-Campanian. Additionally, it is concluded that the related basal conglomerate is fault breccias and derived from overlying beds which is contradict the principle of sediment deposition which is always derived from underlying beds. The changing of the name is based on the analysis of evidence of the previous studies, and introduction of new ones in which new stratigraphic column, stratigraphic positions and new depositional basin, tectonic and paleogeographic setting are proposed.

GK-103:

## EVOLUTION OF GLACIAL LANDFORMS IN IRAQ AND IRAN BORDERS

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#### ABSTRACT

Duo to most towns, villages and man-made facilities are built at the foot of circus, glacial valleys and on deposit glaciers; thus, their study is important. However, studies were done on glaciers in Iraq and Iran; there are many glaciers that remain unknown. Impassable glaciers, away from population centers and lack of security, have been caused the glaciers located in the border between Iran and Iraq, have not been studied. The crest of the mountains of north – south in Iran and Iraq borders, are drawn from Oshnovieh to Sardasht, This area is located in Sulaimani and Hawler provinces in Iraq. Qandil mountain chain set between Iran and Sulaimani provinces have studied in this research. The mountains are located at the Sanandaj-Sirjan tectonic zone in the northern Zag-ros chain that has tens of mount with elevations greater than 3,000 meters. Qandil crest is the common border between Iran and Iraq, and not far from Turkey's borders. There are three mount that are called Qandil in this area include Large Qandil with 3448, Small Qandil 3275 and Ghochy Karan about 3600 meters. They are made of metamorphic limestone of Cretaceous. Rainfall averages is about 680 mm in the Iranian part that 65% of precipitation falls in the cold season. Average minimum temperature is 4.1 and maximum temperature 14.4 degrees Celsius. Sangsar is the nearest town to Qandil Mountain. Also there is several cities such as Rania in the north of bukan dam, Qaladiza, Pishtdar and Hajy Omaran that their life depends on the glaciers. In this research Digital elevation Model was extract of Aster data, then the drainage line was prepared using Hydro Model. The landforms of glaciers were drawn based on field research and panchromatic images of ETM+. Thermal bands (6.1 and 6.2) of ETM+ sensor were used to detect the cores of ice in the glaciers. The results were shown the snowline in the last glacial was in 1650 meters, that is 150 meters less than Wright in 1962. Glaciers expanded have remained landforms glacial in this area. The main glacial valley is called Sheikh Aysh extend east to west. The altitude of wall between Hesar Qandil and Hesar Sakran cirques are 300 to 600 meters. The elevation of them is 2650 meters. The LST index (land surface temperature) of Thermal Bands was shown the low temperature cores in the cirques. There are probably cores of ice under moraine (glacial deposit).

Key word: Glaciers, Cirques, Thermal Images. ETM+

GK-104:

## THE POTENTIAL OF MACRO AND MICRO ELEMENTS OF IRAQ SOIL WHICH TRANSPORT THROUGH INTO ATMOSPHERE

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## ABSTRACT

The main source of dust which transport through into atmosphere comes from North Africa, Iraq and Iran's desert. In many experiment we observed the capability of this kind of soil as fertilizers. In this study the amount of some chemical a biochemical compositions of different dust were measured. In result Iraq and Tunisia soil have a big potential of Iron and Zinc. GK-105:

## BIODEGRADATION ASSESSMENT FOR THE OIL OF THE EOCENE PILA SPI RESERVOIR, TAQ TAQ OIL FIELD, KURDISTAN REGION-NE IRAQ

#### Dler H. Baban

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## Kardo S.M. Ranyayi

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#### ABSTRACT

The 24° API oil from the Eocene Pila Spi reservoir in Tq-2 well, Taq Taq Oil Field has been examined to figure out the expected biodegradation effect. Organic geochemical analysis of the oil sample showed traces of the degrading effect as appeared from the ratios of the distortion C27-C29, methylphenanthrene (MP), trimethylnaphthalene (TMN) and phytane/nC18. The ratios of the main Saturated, Aromatic, and NSO compounds also indicated a possible slight degradation effect. Factors controlling the biodegradation process as temperature, salinity, and sulfur content were followed in the studied Pia Spi reservoir and all supported the existence of favorable environment for biodegradation. Accordingly, the difference in the density between the relatively heavy oil in the Pila Spi reservoir and the deeper light oil (47° API) of the Upper Cretaceous reservoirs in the Taq Taq Oil Field referred to biodegradation as one of the possible factors. GK-106:

## VITRINITE REFLECTANCE AS A TOOL FOR DETERMINING LEVEL OF THERMAL MATURITY FOR THE UPPER JURASSIC NAOKLEKAN AND BARSARINE FORMATIONS IN SARGELU LOCATION, KURDISTAN REGION, NE IRAQ

## Dler Baban Shadan Ahmed

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## ABSTRACT

Ten outcrop rock samples from the Upper Jurassic Naokelekan and Barsarine Formations (five from each formation) in Sargelu Village have been selected for determining the level of thermal maturation for their organic matter content using vitrinite reflectance technique. The studied samples contained different amounts of vitrinite particles. Some of the samples showed domination in vitrinite content reached to about 90% of the existed organic matters while some other samples contained only about 5% vitrinite. Traces of exinite also observed in all the samples while inertinite comprised a very rare content in only some of them. The rest of the organic matter content within the samples composed of non – fluorescence amorphous organic matters.

Bimodal distribution of the vitrinite reflectance values (Ro%) was obvious in majority of the studied samples indicating the existence of recycled vitrinite from older beds showing higher maturity condition and hence higher Ro values.

Acceptable number of indigenous vitrinite particles used for the reflectance measurement which all showed a thermally mature condition with mean values ranged between 0.79% and 1.25 % Ro. Accordingly, the studied section considered as inactive source beds that had generated and expelled hydrocarbons before stopping at the present time due to cropping out and diminish of temperature effect.

GK-107:

## BIOSTRATIGRAPHY AND BIOZONATION OF THE GARAU FORMATION VIA FORAMINIFERA IN DIREH WELL

## Mohamad Sharifi

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## ABSTRACT

The Garau formation is located in the Zagros basin that has continuous sedimentation during Cretaceous (Valanginian- Cenomanian) in northwest Iran and central-east of Iraq. The importance of this formation returns to its high potential hydrocarbon production at one of the most oil system productive regions in the world. However, this basal Formation is a possible source for some of the important reservoirs in Iran and Iraq. The counterpart formation of Gararu in the East of Iraq is called Balambo Formation. Both formations laterally were passed into shallower basin.

This study is focused on Garau foraminifera in the Direh well that is located in the southeastern of Sarpol-e-Zahab area. In this well, the Garau Formation has 695m thickness and mainly consists of gray argillaceous limestone, limestone and shale that overlay on the anhydrite and gypsum of the Gotnia Formation and the overlying unit is the Sarvak Formation. The present study is trying to biozonation and age dating of the Garau Formation using foraminifera. In this well, Garau formation begun with Valanginian, the lower parts of the formation do not show any index foraminifera, simply is known as Radiolaria Flood Zone (RFZ) which the fauna is dominant by Radiolarian spp., at contrast, upper part of the Garau Formation is standing at the Cenomanian. Finally, eight zones were introduced; two biozones (zone 12 and 20) and one subzone (subzone 13) is erected via the methods of James and Wynd. In terms of Permoli-Silva and Verga scheme, eight biozones is differentiated (that show more high time resolution). Also, top and base of most stages have been marked.

GK-108:

## MAGMATISM PHASES IN THE NORTH OF SANANDAJ– SIRJAN ZONE BY U-PB DATING STUDY (NW-ZAGROS MOUNTAINS)

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#### ABSTRACT

The NW-trending Zagros Mountains in Iran are a member of the Alpine–Himalayan orogenic belt and represent one of the youngest continental collision zones on Earth. Their development was characterized by a protracted magmatic history in an Andean-type setting culminated by collision during closure of the Neotethys Ocean between Arabia and Eurasia, a process that is still active today (e.g. Berberian, 1995; Golonka, 2004).

The Sanandaj–Sirjan Zone (SSZ), which runs parallel to the Zagros fold and thrust belt of Iran, underwent a multistage evolution starting with Neotethys initiation, its subsequent subduction below the Iranian continental crust, and eventual closure during convergence of Arabia towards central Iran. Plutonic complexes are well developed in the northern part of the SSZ and we have dated a number of them by IDTIMS U-Pb on zircon. The new data record the following events: a Mid Jurassic period that formed the Boroujerd Plutonic Complex (169 Ma), the Astaneh Pluton (168 Ma) and the Alvand Pluton (165 Ma); Late Jurassic emplacement of the Gorveh Pluton (157-149 Ma); Mid Cretaceous (109 Ma) formation of a I-type phase in the Hasan Salary Pluton near Saggez, followed by Early Paleocene (60 Ma) intrusion of Atype granite in the same pluton; and the youngest intrusive event recorded so far in the SSZ with the intrusion of granite in the Gosheh–Tavandasht Complex near Boroujerd at 34.9 Ma. These different events reflect specific stages of subduction-related magmatism prior to the eventual Miocene collision between the two continental blocks.

The results are consistent with the process of subduction of Neotethys oceanic crust in the Jurassic and subsequent continent– continent collision in the Miocene.

GK-109:

## CHEMICAL STUDY OF MARLY LIMESTONE IN THE SHIRANISH FORMATION AS RAW MATERIAL FOR MANUFACTURING PORTLAND CEMENT

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## ABSTRACT

Limestone rocks are widely available throughout the Kurdistan Region. It is considered the main valuable raw material for producing cement.

Based on lithological composition, the marly limestone of the Shiranish Formation selected to carry out chemical analyses for samples from different localities.

The selected samples were analyzed for major oxides and its chemistry was evaluated in regard to the raw materials for manufacturing Portland cement.

The data obtained from the analysis show that the selected samples are containing considerable percentage of required oxides which makes the selected samples as a cement rock. Consequently, it is found that the limestone from this formation is suitable for this kind of industry. GK-110:

## PETROLOGY AND GEODYNAMIC OF SAWLAVA OPHIOLITIC MASIF-A PART OF KURDISTAN OPHIOLITE COMPLEX

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## ABSTRACT

The Kurdistan ophiolite complex is a part of Zagros ophiolites that exposed in Oman, Neyriz, Kermanshah, Kurdistan and north western of Iraq. Sawl-Ava ophiolite is a member of Kurdistan ophiolite complex that consists of basalt, microgabbro and gabbros with related ultramafic units such as serpentinized dunite and wherlite. The phonocrystals in basalt and microgabbro are plagioclase and clinopyroxene. Main texture in baslt is porphyric and microlitic-glassy whereas in microgabbro is intersertal and microgranular. The main minerals in gabbros are clinopyroxene (augitediopside), plagioclase with labraduor composition and minor olivine. In peridotite minerals are olivine (Fo=88-91), clinopyroxene (diopsideclinoenstatite) and chromin-spinel (picotite).

Comparing geochemical data from this study with known standards reveals that basalts and microgabbros from Sawl-Ava ophiolite complex are toleitic with a source of magma between N-MORB and E-MORB. Gabbros with toleitic to calc-alkaline magma series show the abyssal MORB to oceanic ARC chractrization. The peridotites chemical shows the abyssal to suprasubduction zone source. The High volume of basaltmicrogabbro, low value of Ti and high content of Al and Cr# in perioditics cromian spinel reveal a high rate of partial melting (25-35%) and this fact suggesting that Sawl-Ava complex source is belong to mantle wedge with rapid spreading rate.

Key words: Petrology, Geodynamic, Ophiolite, Sawl-Ava, Kurdistan.

GK-111:

## GEOPHYSICAL, GEOCHEMICAL AND STRUCTURAL INVESTIGATIONS OF CHROMITE ORE IN KURADAWE VILLAGE MAWAT OPHIOLITE COMPLEX, KURDISTAN REGION, NE IRAQ

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## ABSTRACT

Small lensoidal podiform bodies of massive and disseminated chromitites have been examined in association with ultramafic rocks of the Mawat ophiolite complex (MOC), Iraqi Zagros Thrust Zone, northeastern Iraq. The chromite ore are surrounded by dunite envelopes of variable thickness, exhibiting transitional boundaries to harzburgitic host rocks. Gravimetric surveys serve a variety of scientific and economic objectives. In this surveys are employed for exploration and determine the dimension of chromite ore. The structural feature is studied to provide basic geological information about possible relationship between the host rocks and chromite ore. The primary chromite composition exhibits high Cr varieties; the average Cr# of chromite is 0.73, and have <0.2% TiO2 content, which may reflect the crystallization of chromite from boninitic magma. Measuring the attitude of the bedding planes show that such bodies make an angle of  $10^{\circ}$  -  $14^{\circ}$  with dunite wall and surrounding peridotite which is indicate that chromite ore of concordant type, as well as the podiform and hosted rocks are following regional strike of the NW segment of the Zagros Fold Thrust Belt (N30°W). The average dip of the hosted rocks is  $38^{\circ}$  while the average dip of the podiforms is  $(25^{\circ})$ .

Key word: Podiform, Zagros Segment, Gravimetric,

Gk-112:

## THE PATTERN OF GEOPARKS CREATION ON STABLE DEVELOPMENT GEOTOURISM AND LAND SOURCES PROTECTION

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#### ABSTRACT

Today the growing tourism industry has changed tourism to a phenomenon of the 21th century and all countries try not to be deprived of its revenues and allocate a share of the global ones. Therefore the competion in this area has led to increase the quality of tourist services .

Those countries which have more capabilities in all tourist areas such as historic, cultural, ecotourism, geotourism...., with more activities will increase the income, employment, protection of natural resources and the sustainable development based on the regional capabilities. In this research with a descriptive -analytic approach, we will try to scrutinize the main goal which is achieving sustainable development with the preservation of land resources along with applying geotourism capabilities. In addition, by studying the functional characteristics of geoparks and geotourism in sustainable development, we will scrutinize their role in protecting the land resources in Islamic countries, because creating and launching the geoparks are basic ways of protecting geological resources and 4 billion year old geological history. And finally we have concluded that by applying and proper using and introducing geo-tourist capabilities prevailing geoparks, with a reasonable and scientific method, we can achieve maintaining geological resources for future generations and also we can have appropriate economic income from sustainable development. In this way some countries especially Islamic ones, because of their intense interest of their authorities, try to have a disruptive or ill-matched growth and with any excuse they try to achieve this matter ,even by elimination of their land resources. With the construction of geoparks they can not only maintain these land resources and reasonably utilize them, but also they can provide the basis of sustainable development in geotourism industry.

Key words: geopark- geotourism- sustainable development- land resources- environment

#### GK-113:

## QUANTITATIVE MORPHOMETRIC ANALYSIS OF SAQEZ BASIN

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## **Extended** abstract

#### Introduction

Quantitative Geomorphology is a part of geomorphology that calculats some parameters and interprets with other characteristics, such az slope or landuse, in order to better understanding of the earth's surface. Physiography is the study of the physical properties and morphological conditions of a basin that is determining on the hydrologic characteristics and water regime. Awareness of physiographic characteristics of a catchment by using information about climatological conditions can provides a relatively accurate picture of the quantitative and qualitative performance of watershed hydrological system. Watershed physiographic features not only affect on the hydrological regime and the annual water production rate, flooding, severe soil erosion and sedimentation rates, but also indirectly affect the ecological status, climate and vegetation; greatly is influenced by the water regime of the watershed. Hence it is necessary that in watershed studies, physiographic features of a basin be studied prior to everything.

#### Methodology

In this study, physiographic characteristics of Saqez basin of the Zagros fold and thrust belt, in Kurdistan province, and Alamut basin of the Central Alborz Mountains, in Qazvin province have been calculated and compared with each other. Physiographic characteristics were calculated using 1/100000 Geological maps and 30M resolution Digital Terrain Model (DEM) in ArcMap software and ArcHydro. It goes on with the interpretations of the diagrams, such as Hypsometric and Strahler, and the results of calculation in this article attempted using main coefficients and indices to show the hydrological, climatic and erosion characteristics, that come in scientific texts. Qualitative properties, such as altitude, slope and roughness of two basins were considered, with the results of the calculation, in interpretation.

## Results and discussion

The measurement and mathematical analysis of the configuration of the earth's surface and of the shape and dimensions of its landform provide the basis of the investigation of maps for a geomorphological survey. This approach has recently been termed as morphometry. The area, altitude, volume, slope, profile and texture of landforms comprise principal parameters of investigation. Scientists applied various methods for landform analysis, which could be classified in different ways and their results are presented in the form of graphs, maps or statistical indices. Some of the calculated coefficients and indexes of this research are presented in Table1. Some of the results obtained for the two basins have significant differences with each other. For example length of main channel, lemniscate, shape factor ratio circularity ration; but similarities can be seen in some of indices, length ratio, circularity ratio and compactness coefficient. Hypsometric, Strahler diagrams and Clinograph show that two basins have different structure.

## Conclusion

Comparing the results of two basins helps us for better understanding of Saqez basin characteristics. Results indicate that Saqez basin compared with Alamut basin has more a evolved stream network and a less stable outflow. Furthermore, the surface formation of Saqez basin has more resistance and role of stream erosion is also much less than Alamout basin. Regarding the formation of the area and drainage density, bifurcation ratio and sinusoidal index; it can be said that role of tectonics in Alamut basin is more than it, in Saqez basin, and its infiltration is less than that. Analysis of the basin slope indicates that in spring, Saqez basin has a flood condition. In addition, the Talweg line (Trough Line) of main stream in Saqez basin is shifting to the East and Talweg line of Alamut main stream is shifting to the south. The main differences of two basins that affect hydrologic regim and sedimentation rate, are structure and roughness of two basins, that also affect other indices. Key words: Quantitative Geomorphology, Physiography, Morphometric Analysis, Saqez basin, Alamut basin, ArcHydro Tools

GK-114:

## BIOSTRATIGRAPHY OF PLANKTONIC FORAMINIFERA AND GEOCHEMISTRY OF THE CRETACEOUS/PALEOGENE ( K/PG ) BOUNDARY AT DUHOK AREA , NORTHERN IRAQ

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## ABSTRACT

The Cretaceous /Paleogene (K/Pg) boundary sequence crops out in a well-exposed section near Sad-Duhok at the southern limb of Bekhaire anticline, Duhok area, Northern Iraq. A detail lithostratigraphic, biostratigraphic and geochemical studies are achieved on the outcropping upper most part Cretaceous successions (upper part of Shiranish Formation) and the early Paleocene (lower part of Kolosh Formation). On the basis of high resolution analysis of planktonic foraminifera assemblages , three biozones (CF3 , CF2 and CF1) are recognized from the upper most part of Shiranish Formation and three biozones (Po , Pa and P1 ) and three subbiozones (P1a , P1b and P1c) are recorded from the lower part of Kolosh Formation. These biozones and subbiozones are correlated with their equivalents inside and out side Iraq.

The K/Pg boundary is also identified on the basis of the characteristic negative shift in carbon-13 isotope across the K/Pg biozones. Although the texture of the studied samples belong to the sandy, silty and clayey mud, the sand fraction varies drastically at 10 cm. below the K/Pg boundary line, accompanied by slight increase in oxygen-18 isotope. The XRD sample mineralogy is dominated by calcite (53% - 86%) and to lesser extent by quartz (12% - 28%) and clay (1% - 17%) with much less amount (0.5% - 2.0%) of feldspar. Dentritic celestite is spotted filling voids and fractures located at 15 cm. below the K/Pg boundary. Mineralogical variation across the K/Pg boundary is featured by the gradual decrease of carbonate and an increase in the accumulation rate of detrital material. Clay minerals at the K/Pg boundary line are Nasmectite, kaolinite, illite, palygorskite and Mg-chlorite. SEM

investigation show the presence of few spherules of variable size and composition and few grains of cleavageless conchoidal fractured siliceous material with lamellae in sediment sample of the K/Pg boundary. In general, the XRF major- and some trace-element bulk composition is in harmony with the variation in the bulk mineralogy, however, both groups of element show successive accumulation with the heavy trace-element enriched sediment precedes those enriched with light major-element. INAA rare earth element ( REE ) and ( Platinum Group element ( PGE ) are varied considerably across K/Pg boundary. Two samples ( one of them at the K/Pg boundary ) show REE variation trend similar to the REE trend of the Deccan basalt.

Keyword : bio-zone planktonics ; sediment texture ; mineralogical and chemical distribution ; oxygen-18 and carbon-13 isotopes variation ; SEM investigation.

GK-115:

## GEOCHEMISTRY AND PETROGENSIS OF HASAN SALARAN

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#### ABSTRACT

The Hassan Salarn granitoid complex is located 20km to southeast of Saqqez city in Kurdistan Province, western Iran. It is composed of two distinct granitic rock suites that have various petological and geochemical characteristics. They also have different origins and petrogenesis. G1 granitoids comprise alkali feldspar granite, syenogranite and quartz alkali feldspar syenite, whereas G2 granitoids are composed of monzogranite, granodiorite and tonalite. Geochemically, G1 granitoids are peralkaline, A-type and acmite-normative but G2 granitoids are subalkaline (calcalkaline), metaluminous, I-type and diopside-normative. G1 granitoids are also ferroan alkali and ferroan alkali-calcic whereas G2 granitoids are magnesian and calcic.

According to tectonic discrimination diagrams, G1 granitoids plot in the field of the within plate granites whereas G2 granitoids plot in the field of volcanic arc granites. Considering the method for classification of granites setting, G1 granitoids plot in the post-orogenic field but G2 granitoids plot in the field of mantle fractionated rocks. G1 granitoids contain higher concentrations of alkalies, Zr, Rb, Nb, Y, Th, Ce, high FeO/MgO ratios and lower concentrations of Mg, Ca and Sr, resembling post-orogenic A-type granites. It is possible that heat from a mantlederived magma which intruded into the lower crust, and/or rapid crustal extension have been essential generation of approriate melts producing G1 granitoids. Thus we can conclude that G1 granitoids were generated from a mixed mantle-crust source. Negative Nb anomalies and low contents of Ti and P probably indicate a subduction-related origin for protolith of G2 granitoids. Negative Nb anomalies and enrichment in Ce relative to its adjacent elements can be related to involvement of continental crust in magmatic processes. G2 granitoids are also enriched in Rb, Ba, K, Th, Ce and depleted in Nb, Zr and Y, indicating that they have had interacted with crust. G2 granitoids may result from contamination of mantle-derived magmas by continental crust during an subduction event.

GK-116:

## ORGANIC PETROLOGY OF THE MIDDLE TITHONIAN-BERRIASIAN CHIA GARA FORMATION, WELL K-109, KIRKUK OIL FIELD, NE IRAQ

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#### ABSTRACT

One of the prolific source rocks in the Mesozoic Petroleum System in Kurdistan is the Tithonian-Berriasian Chia Gara Formation, as well as sourced most of the Cretaceous reservoir of other parts of Iraq too including NE fields. Twenty samples were selected from the Chia Gara Formation in Well K-109, Kirkuk Oil Field, Kirkuk, NE Iraq for preliminary organic petrological study. The interval studied in the well is occurred at present-day burial depth: 2780-3090m. Very good quality polished sections made from each sample to be studied by means of maceral analysis at high magnification.

Two maceral groups have been identified which are liptinite and inertinite. Macerals of Vitrinite group have not been determined. The alginite (Telalginite and Lamalginite), bituminite and liptodetrinite macerals are the main constituents of liptinite. Only macrinite and inertodetrinite macerals identified from the inertinite group, especially at the lower part of the Formation. Other components such as organomineral complex, algal cysts are also determined with different percentages but present along the section. The lower part samples are rich with bituminite more than alginate showing an agreement with the organic geochemical results of the same section. The absence of vitrinite maceral group and the abundance of alginate and bituminite macerals are indicated to very limited plant supply from land, which is support the marine origin of the sediments. Dolomite rhombs in the samples have fluorescence. The content of pyrite in all samples is indicator for anoxic depositional environment.

Key words: Chia Gara Formation, Alginite, Bituminite, Organo-Mineral complex

GK-117:

## REGIONAL STRATIGRAPHICAL CORRELATION AND COMPARISON OF THE OLIGO - MIOCENE DEPOSITSIN DEZFUL EMBAYMENT, SW IRAN AND KIRKUK EMBAYMENT, N, NE IRAQ

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## ABSTRACT

The Oligo - Miocene deposits and their equivalents are one of the most important petroleum systems of the Middle - East, especially Iran and Iraq. In this paper, correlation between these important deposits has been discussed stratigrphically and sedimentologically, with some case studies (in outcrop and subsurface) in SW Iran and N, NE Iraq. Lithologically, the most thickness of the Asmari Formation (Oligo - Miocene) in Iran is deposited in Dezful area. These deposits, consisting of carbonate deposited in a shallow marine setting are the latteral equivalent of Kirkuk group in north and northeastern of Iraq. Results obtained from biostratigraphic studies including microfacies analysis and depositional environment of these deposits are compared in the sequence stratigraphic framework. It appears that there are the relationship between Dezful and Kirkuk embayments in the mentioned period.

The study demonstrated that the deposits in SW Iran and N, NE Iraq are almost the same with some minor discrepancies.

GK-118:

## OSTRACODA OF FAT'HA FORMATION (MIDDLE MIOCENE) FROM SECTIONS (DARBANDIKHAN, AGHJALAR), SULAIMANIAH REGION, NORTHEASTERN IRAQ

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## ABSTRACT

The present study involved in systematic of Ostracoda from the two outcrop sections of Fat'ha Formation, Sulaimaniah area, Northeastern Iraq. Fifty Five Ostracoda species belong to thirty three genera were described of which twenty six species previously described from other regions, twenty nine species did not previously described and might be represent new texa, one species and one genus left under open name, in addition to that new two Morphotypes recorded.

On the basis of stratigraphic distribution of the Ostracoda species recorded in the present study, three Ostracode Assemblage Biozones were proposed in Darbandikhan section, and two Ostracode Assemblage Biozones in the Aghjalar section. Correlation based on the geographical distribution of the recorded genera with India, Iran, Turkey, North Africa and South Europe, in order to identify the Bioprovinces during the Miocene and the nature of marine connections. Paleoecologically; based on the Ostracoda genera and the sedimentary evidence, the environment of the Fat'ha Formation in the study area identified. GK-119:

## ISLAMIC GEOPARK BRAND IN THE MIDDLE EAST: A POTENTIAL LEVER FOR SOCIO-ECONOMIC GROWTH

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## ABSTRACT

One of the biggest societal challenges facing the Middle East area is how to deliver much needed growth and jobs, while doing the right thing by the planet. The Middle east region due to having arid and semi-arid climate and visible outcrops and wonderful geo-phenomena is the best place for geotourism promotion. The aim of geotourism industry is its acting as a lever for economic- cultural – social development specially within geoparks.

Middle East area has spectacular landscapes and cultural sites and world's famous geological history of its rocks, Strata, minerals, fossils, etc. and landforms are of unique geological and geomorphological heritage.Finding new ways to improve management of resource stocks are just showing how increasing resource efficiency can also bring economic opportunities for this region.

Geopark brand associated with Halal Brand at Moslem's tourism industry creates a great opportunity for tourism promotion in this region. So, Geopark & Halal tourism services(Halal brand) is the proposed strategy to encourage sustainable development for numerous areas in the Middle East under called "Islamic Geopark Network";

This is a challenge that by no means is isolated to the Middle east but it could be bestowing more attraction to this area's geopark's future network.

Indeed, nomination and establishing some national and global geoparks in this region with considering Halal brand promotion could be acting as a sphere of influence for its surrounded

This article explores geopark and geotourism studies in the middle east. And finally proposes Isalmic network of Geoparks in the Middle east: with adding Halal brand to Geopark brand for this region to improve the living conditions of local communities.

Key words: Islamic Geopark Brand, geoturism, geoparks in Midle East, Halal tourism sevices

GK-120:

## THE ROLE OF TECTONICS IN DRAINAGE MORPHOMETRIC ABNORMALITIES; CASE STUDY: ZARAB, DIVANDARE AND SARDASHT BASINS

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## ABSTRACT

Neotectonics is a major factor controlling landform development in tectonically active regions, and it has significantly affected fluvial systems and mountain-front landscapes in Zagros, Iran. Geomorphologic characters like drainage network and their features such as drainage pattern, drainage anomalies, network connection angles and network order are important in identifying the active tectonics and spatial differences. Many researchers have investigated the relationship between tectonics and its role in the watershed drainage patterns, in organized and stream order discipline, and its relationship with tectonics. Ciccacci et al (1986) defined Hierarchical anomaly index (Hai), based which the influence of tectonic factors on hierarchical anomaly are determined. They defined it as ratio of the least first stream order, that should be added to the drainage network so that the network has a hierarchical order, to the total first stream order in the basin. Garnier and Pirrotta (2008) used Hierarchical anomaly and Bifurcation index (Bi) in four basins in Italy. Bahrami et al (2011) also used Hierarchical anomaly and Bi in four basins of Zagros. the results indicated that drainage anomalies in study areas were affected by tectonic and Hai have a better performance in determining of the basins active tectonics in camparison to Bi. The purpose of this study is to evaluate and compare the Hai in two basins of Zagros thrust belt and a basin in Northwestern branch of the iran.

GK-121:

## THE MIDDLE OLIGOCENE ROCK STRATA (TARJIL FORMATION) IN ASHDAGH, MOUNTAIN, SANGAW DISTRICT, SULAIMANI CITY, NE IRAQ

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## ABSTRACT

The occurrence of Middle Oligocene rock strata in Ashdagh Mountain previously proved like Baba Formation and Bajwan Formation; both of them belong to Middle Oligocene age; Baba Formation represents reef- forereef deposits and Bajwan Formation represents reef- backreef deposits. But Tarjil Formation was not proved in the mountain which is complementary of both Baba and Bajwan Formations and represents forereef- open sea deposits of the same age.

So, the aim of this study is proving the occurrence of Middle Oligocene sedimentary rock of Tarjil Formation.

GK-122:

## HYDROCHEMICAL EVALUATION OF CHAMCHAMAL CITY, SULAIMANI, NE IRAQ

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#### ABSTRACT

Tertiary Mukdadiyah and Bai Hassan Formations, in addition to the Quaternary deposits comprise the most potential unconfined fresh groundwater reservoir in Chamchamal area. It is located in the northeast corner of Iraq and occupies an area of 21 Km2. The main aim of the current study is to investigate the groundwater chemistry of the water bearing beds and assessing its suitability for domestic and irrigation purposes, as well as creating flow net map of the study area. This study shows that the water genetic type in the area is mainly Mg-HCO3 of meteoric origin that is due to the dissolution process of the carbonate detritus of the Quaternary deposits as well as carbonate cementation of the clastic rocks within the Mukdadiyah and Bai Hassan formations. This process is believed to be the major mechanism that controls the chemical character of water reservoirs in the aquifers within the study area. Based on the analyzed groundwater samples, the TDS concentration increases towards the north east in the direction of groundwater flow and this phenomenon may attribute to the enrichment of alkaline ions. Most of the analyzed hand dug wells appear slightly less concentration ions than those from deep wells; this may refer to the leaching process during wet season.

Almost all the aquifers have the same groundwater type, and this may reflect the interconnection between them. Based on the flow net map of the area, the groundwater moves from west and south west towards the east, all the groundwater flow is more or less resemble the direction of the drainage pattern towards the main stream which is located in the eastern part.
GK-123:

### COMPOSITION AND PHASE MINERAL VARIATION OF PORTLAND CEMENT IN MASS FACTORY SULAIMANI – KURDISTAN REGION NE- IRAQ

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### ABSTRACT

The raw materials, clinker, and cement from the Mass cement factory in Sulaimani City have been investigated using polarizing microscopy, Xray diffraction (XRD), Scanning Electron Microscopy SEM and chemical analysis. This study will discuss about the composition and phases mineral variation from different sample type of the factory. Chemical composition analysis using X-ray fluorescence is one of the important quality analyses for examining of cement and widely used in cement industries for a long time as a tool to estimate phase composition. X-ray diffraction is one of the established techniques as a qualitative tool to identify phase existing in the sample. Microscopic invistigation and X-ray diffraction of clinkers from Mass factory indicating the presence of five principle constitutes alite,  $(C_3S)$ , belite  $(C_2S)$ , aluminate  $(C_3A)$ , ferrite  $(C_4AF)$ , as well as minor isotropic residue (periclase, and free-lime). The obtained SEM - micrographis show alite with well developed external shape and hexagonal outline and it is larger than the other existing phase while belite is semi rounded and irregular outline phase. The chemical analyses of raw materials used in Mass cement factory indicate that the local raw materials are suitable for cement industry after addition some additative such as iron oxide and sandstone. The chemical and mineralogical analyses for studied clinker samples show that the dominant phases composition are C<sub>3</sub>S and C<sub>2</sub>S while the C<sub>3</sub>A and C<sub>4</sub>AF are less abundant. Transformation of mineral phases is found affected by different temperature during cement production. The different types of mineral phases are observed during the production.

**Keywords:** Portland cement, Mass Factory, Raw material, Clinker, Phase composition

GK-124:

# ECOGEOMORPHOLOGY APPROACH TO GEO EQUILIBRIUM

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### ABSTRACT

Highly organized vegetation patterns can be found in a number of landscapes around the world. The most common vegetation pattern found in arid and semi-arid ecosystems is usually referred to as spotted or stippled and consists of dense vegetation clusters that are irregular in shape and surrounded by bare soil. Vegetation stripes are a characteristic feature of semi-arid environments. Vegetation patterns dynamics can be determining the environment equilibrium. considered for The mathematical modeling helps to distinguish dynamics of patterns. Both deterministic and stochastic mechanisms may explain the self-organized vegetation patterns observed in nature. In this paper a new approach to investigate geo equilibrium has been introduced by vegetation patterns dynamics. The approach reproduces a wide range of patterns observed in water-limited regions, including drifting bands, spots, and labyrinths.

Keywords: Ecogeomorphology, Equilibrium, Vegetation patterns dynamics

GK-125:

# GEOCHEMISTRY AND AR-AR GEOCHRONOLOGY OF LUECOGRANITE DYKES FROM MAWAT OPHIOLITE: IMPLICATION OF CONTINENTAL COLLOSION BETWEEN ARABIAN AND EURASIA PLATE

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### ABSTRACT

Diachronous Daraban leucogranite (DL) dykes intruded discordantly into the basal serpentinized harzburgite of the Mawat ophiolite, Kurdistan region, NE Iraq. These are the first leucogranite dykes identified within the Mawat ophiolite, which are represent by coarse grained muscovite-tourmaline leucogranite. Ar-Ar muscovite stepwise (incremental) heating yields 37-38 Ma flat plateau ages. Geochemical features of DL dykes indicate orogenic granite like syncollisional granite in response to the initial continental collision between Eurasia and Arabia as result of initial stages of the opening of the Gulf of Aden. The obtained muscovite ages and geochemical features of DL together with the starting sedimentation in peripheral foreland basin in the Zagros domain are strong evidence of the northeastern Arabia continental collision with Eurasia. The Ar-Ar muscovite ages help bracket the onset of the Arabia-Eurasia collision in Kurdistan region of Iraq at Priabonian. The results imply that the Arabia-Eurasia continental collision predate the Aegean extension.

GK-126:

# STUDY OF BODY WAVE PHASES DETECTED FROM EARTHQUAKES RECORDED BY DEPLOYED SEISMOGRAPHIC ARRAYS IN KURDISTAN REGION-IRAQ

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### ABSTRACT

This paper is to investigate the different body wave phases from events recorded by new broad-band seismographic arrays installed in Kurdistan region- northeastern Iraq. From this network of stations which is located outside the Sulaimani city between lat. ( 35° 50' 52" ) and long.( 45°29' 43" ), a three-component digital data obtained that have been recorded continuously at a rate of 100 sps. The analyses include identifying the P- and S-phases from different azimuths, and locating the events. The processed local, regional and teleseismic earthquakes are in the studied area in the close proximity to the northeastern border of the Arabian plate and occurred over a period between (2008-2010).

In this research, the hypocentral depths are derived from the picked arrival times of P/Pg/Pn, S/Sg and Sn phases and a map has drawn which depicts the epicentral distances for the analyzed waveforms. Furthermore, the source magnitude have been calculated from the amplitude of the wave energy. The resulting events distribution reveals a distinct picture of the interaction between seismicity and seismotectonics of the region. The highest seismicity rate seems to be confined to the exceedingly active northern section of the Zagrose thrust zone. GK-127:

# THE RECOGNITION AND EVALUATION OF GEOMORPHOLOGICAL FEATURES OF THE "DOLANEH" CAVE, SARDASHT, IRAN

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### ABSTRACT

A cave close to the city of Sardasht, northwest of Iran, was explored through a filed survey in 2008. It was named the cave of "Tuzhal". During the survey, one aven and another cave were also explored within just five kilometers away from the first cave. The second cave was named "Dolaneh". The Dolaneh cave entrance size is about one meter in diameter. For more investigation, a group of four persons went into the cave. Their survey regarding its geomorphological features resulted in more information concerning the holes and Karstic landforms close to the Dolaneh cave entrance. The evidences show that there is a connection between Tuzhal and Dolaneh caves and other features in surrounding areas such as avens and karstic springs. Further investigation is needed through field work to identify all parts of the caves and karstic landforms in the area.

Key words: Geomorphology, Exploration, Karst, Cave, Dolaneh.

GK-128:

# A GRAVITY INVESTIGATION ALONG DARBANDIKHAN-KALAR HIGH WAY, NE IRAQ (IRAQI KURDISTAN REGION)

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### ABSTRACT

A gravity study has been carried out along the main road between Darbandikhan and Kalar towns, Iraqi Kurdistan Region in order to show an image of the subsurface geological situation regarding the property of subsurface structures and the basement configuration.

A total of (117) gravity points were measured, the observed data were processed using different analysis techniques. The hand smoothing method was used to approximate the regional gravity.

This area located in the foothill zone. It was found that the regional gravity anomaly is decreasing towards Darbandikhan, which suggests that the basement depth increasing in this direction. The local anomalies have been interpreted due to subsurface structures within the sedimentary cover.

GK-129:

### INITIAL GEOMORPHOLOGICAL OBSERVATIONS IN KARSTIC CAVE DISCOVERED IN ANCIENT AREA OF RABAT IN SARDASHT, NORTH-WEST OF IRAN

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### ABSTRACT

In 2012-06-05, during archaeological excavations in the east of little Zab river and close to the site of the ancient city of Rabat, a cave mouth was revealed. For more investigation on natural and human features, a group of experts went into the cave. The results of their field survey indicate that the cave clearly originated as the result of tectonic forces and solution of limestone. The main natural features of the cave include cauliflower stalactites and pearls of cave landforms. Due to the role of tectonic, the cave was impassable and only a short distance from the entrance, about 20 meters, is now accessible. Within this part, there is no sign of human habitation. The availability of karstic features such as avens, sinkholes, vauclusien and travertine springs and karrens within ten kilometers around the Rabat cave mouth show a possibility of connection between the caves, avens and karstic springs. Thus it is possible to have a great cave in this area. This cave, along with other natural and man-made features of the areas, such as natural waterfalls and ancient hills in Rabat city and the little Zab river basin are great potentials for geotourism and archeotourism development. Therefore, further investigation is needed through field work to identify the possibility of any connection between the caves, avens, and karstic springs. In addition, another investigation should focus on the relationships between the caves and ancient civilization of the areas. This requires a group of geomorphologists, geologists and archaeologists to do more field survey on the different features of the areas.

Key words: Geomorphology, Karst, cave, Rabat GK-130:

### ORIGIN AND SPATIAL DISTRIBUTION OF THE LINEAMENTS IN TAQ-TAQ OIL FIELD AREA-KURDISTAN REGION NE-IRAQ

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### ABSTRACT

Analysis of Lineaments was done through three levels of lineament analysis. Level (I) concerning analysis of Lineaments obtained from Landsat EnhanceThematic Mapper Plus (ETM+) image, while level (II) related to ground truth checking through collecting fracturing data such as joints, faults, veins, fissures, and Level (III) related to geophysical data which represented by seismic lineament map. All these data Statistically treated and analyzed for the purpose of access to the target of this paper which represent origin of these lineaments, and how the structure of the Taq-Taq controlling the spatial distribution of these lineaments.

Comparisons between those three level data analysis indicates that the lineaments within Taq-Taq structure has two origin, one of them related to the local-short lineaments which are reflect the small scale fractures (i.e. Joints, Faults, veins) sets and systems, which appears within the scale of outcrops in the area, while the major-long lineaments represents deep-seated faults as indicated by comprising with geophysical data (i.e. seismic lineaments). As well as the distribution of local and major lineaments may be used as a useful guide for location of area of high fracturing which give a location for high yielding petroleum. This study indicates that wells sited on, or close to crest and central part of the southwestern limb of the Taq-Taq anticline are more likely to have a higher yield than other wells. Such studies will clearly shows that the synoptic overview provided by remote sensed data can have an important role in assessing the hydrocarbon resources of an area and where more detailed survey work should be concentrated. GK-131:

### DEFINING STRUCTURAL DOMAINS OF THE ZAGROS-TAURUS MOUNTAIN BELT OF NORTHERN IRAQ

### **Graham Banks**

Western Zagros Resources Ltd. ("Western Zagros")

### ABSTRACT

The Kurdistan region of northern Iraq is attracting much attention from the oil and gas industry. With potential resource estimates of 40 BBO and 60 TCF of gas (U.S. Geological Survey, 2000), relatively little exploration, favourable PSCs, and relative stability and security compared with the rest of Iraq, the region has much potential to be a significant global energy player. Numerous wildcat wells have been drilled over the last three years and significant results, new plays and discoveries are now being announced monthly. Many major anticlines remain undrilled and play concepts like "fault-bound trap" and "stratigraphic trap" are yet to receive much consideration.

The region is dominated by the currently active Zagros and Taurus mountain belts and their currently inverting foreland basins. Yet few advances in defining, mapping or understanding fold-thrust-fracture relationships have been published to date.

Naturally the first stage of mapping such an underexplored area is with remote imagery: to discern lithologies and structural fabrics, and to highgrade areas for more focused exploration. ENVI software was used for advanced processing of Landsat and SPOT data. Results included:

□ Distinguishing between lithological units that are difficult to discern on aerial photos;

 $\Box$  Identifying lineament trends and their ages relative to deformation episodes (of much influence on hydrocarbon recovery) on regional to sub-kilometre scales;

 $\Box$  Identifying relationships between lineament trends, shearing, fold geometry and reactivation of deep faults.

There are currently four published structural domains for the Zagros-Taurus mountain belt of northern Iraq. However their definitions are subjective, vague and highly misleading from a New Ventures perspective. For example the, "Low Folded Zone" refers to a tectonic region dominated by long thrusts at surface (sometimes surface data is the only data type available to make decisions on further exploration). More objective classifications, that better describe the deformation from a frontier exploration perspective, are required for the Iraqi Zagros-Taurus region.

Innovative remote imagery techniques and recent fieldwork have resulted in the defining of five longitudinal Zagros-Taurus structural domains. The three receiving most attention for hydrocarbon exploration will be discussed here. They have been objectively and appropriately defined and named, based upon styles of deformation discernible on public domain geological data. This Zagros-Taurus domain classification permits the New Ventures explorationist a clearer understanding of the Zagros-Taurus regions and their hydrocarbon prospectivity. It also permits prediction of variations in structural deformation, trap types and operational difficulties that could be encountered during exploration programmes. GK-132:

# AUTOMAT RECOGNITION & CLASSIFICATION OF MORPHOCLIMATIC ZONES USING TOPO-CLIMATIC DATA AND CLUSTER ANALYSIS METHOD (CASE STUDY: KERMANSHAH PROVINCE- IRAN)

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### ABSTRACT

Climatic geomorphology or the climatic morphology, cognition of the earth's surface, reviews the recognition of landforms affected by climate elements and factors. This branch of geomorphology concentrates on the distribution of landforms in relation to divisions of climatic regions on the surface of the earth. Yet, there have been no specific and detailed studies on automat classification of territorial units or regional morphiclimatic in Iran. In this reserch, the morphoclimatic regions of Kermanshah province were identified and classified by employing Gisbased cluster analysis technique (Iso cluster) and also using seven topoclimatic parameters (including: elevation, slope, annual precipitation, the average minimum temperature, absolute minimum temperature, number of days with temperatures below zero and the average annual temperature); as a result, five morphoclimatic regions and seven macro geomorphological units have been identified. Results showed that the above-mentioned method can be used in small and medium scales in GIS due to the high speed, relatively low cost and acceptable accuracy. However, automat methods for morphoclimatic classification have yet to be developed in Iran.

Keywords: Automat Classification, Morphoclimatic Zones, Cluster Analysis, Iso Cluster method, GIS, Kermanshah

GK-133:

# GEOCHEMISTRY OF A BIODEGRADED CRUDE OIL, BAZIAN AREA, SULAIMANI, KURDISTAN, NE IRAQ

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### ABSTRACT

A crude oil sample from a well in Bazian area, Sulaimani, Kurdistan Region was analyzed physically and geochemically and characterized in terms of source and its biomarker content. Physical properties of the sample indicate that this crude have high boiling point which mean absence of light ends and middle distillate (i.e. gases, naphtha, kerosene, diesel fuel, etc.) with specific gravity of 0.9572, and API equals to 16.32. Chemical analysis show the sulfur content about 1.7 as well as rich in Fe and Ca. GC/MS analysis indicate to absence of *n*-alkane biomarkers, this supported by the mass chromatogram of m/z85 which show no *n*-alkanes in the sample. Only a small portion of tricyclic terpanes (Cheilanthanes) are present. Mass chromatogram of m/z 217 shows some diasteranes, while other steranes are totally absent. No clear aromatic compounds were found in the studied sample.

Severe biodegradation was indicated by the shape of chromatogram, absence of *n*-alkanes, partial degradation of steranes, remaining of diasteranes. The process of water washing may be accompanied with biodegradation as the aromatic components are removed. The Kolosh Formation (Paleocene) probably is the source of this oil which is composed of marine deposits.

Key words: Biodegradation, Biomarkers, Kurdistan, Kolosh Formation.

GK-134:

# FLOOD RISK MAPPING IN SANANDAJ (KURDESTAN, IRAN)

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### ABSTRACT

Flood is one of the most important hazards that have been considered by mankind for many years. During the recent years by the increasing rate of population and urban expansion, the public attention to flood has also increased.

Gheshlagh is one of the most important rivers in Kurdestan province and is one of the main branches of Sirvan River. The Gheshlagh dam has been built on this river to provide supply water for Sanandaj. The very high slope and intense rain have caused many floods in this area. Because Gheshlagh River flows through the Sanandaj city and its floods has done a lot of damage to habitants.

The flood risk zonation map can provide effective tools to recognize the vulnerable regions and as a good guidance for managers to manage the risk.

The raining during 9-12 march 2005 in Kurdestan made floods in some parts of this province that was caused by melting of snow during rainfall. According to the report of Kurdestan road administration, this flood damaged more than five million US dollars and victimized several people. Therefore recognizing the flooding areas requires flood risk mapping. In this research to provide the potential runoff map we used the elevating surface runoff method (CN). Then to provide the risk flooding map of the area the conventional weighting procedure was used. The factors and their classes were given values between 0 to 9 based on professional experiences related to the subject and the area.

Based on the factors such as slope, aspect, annual means rain, CN, runoff, land capacity and by assuming the inverse relation between each

of these factors and phenomena and given suitable weight, the flooding map of the area was provided. After that to recognize that which factor has a stronger relationship with flooding, each layer was overlaid with flooding map.

The resulted flooding map of the area indicates that 36.09 percent of the basin falls in the mean risk, 22.52 percent in the low risk, and 19.13 percent in the high, 15.33 in the very low and 6.92 in the very high risk.

Key words: flood, risk, Kurdestan, Sanandaj

GK-135:

### DEVELOPING A NEW MODEL FOR ASSESSING VULNERABILITY OF IRANIAN CITIES AGAINST EARTHQUAKES (CASE STUDY: SANANDAJ CITY IN KURDISTAN PROVINCE IN IRAN)

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### ABSTRACT

Problem: One of the most important problems in Iranian cities is their vulnerability toward natural hazards, such as earthquakes and storms. This is particularly critical in the old part of cities due to the poor conditions of the physical structure of these areas, considering factors such as the quality of materials, lower permeability and a lack of renovation. Due to its geographic position, Iran is always under threat from earthquakes. According to official statistics, %6 of the human causalities in Iran have resulted from earthquakes during the past 25 years, and on average, an earthquake with magnitude of 6 on the Richter scale occurs every year, while an earthquake with a magnitude of 7 strikes the country every ten years. The most recent earthquake with 6.8 degree magnitude on the Richter scale hit the city of Bam in 2003 and caused large losses of human life. Such statics indicate the importance of appropriate planning to reduce the financial and human damage caused by earthquakes in Iran. Purpose :We aim to identify the most highly deteriorated areas within the old and new regions of the city of Sanandaj using GIS and relating techniques. We also attempt to recognize the main reasons causing these deterioration problems. Methods: To this end, we first conceptualize eleven physical-spatial factors. These factors are analyzed using fuzzy logic and IHPW (Inverse Hierarchy Process Weight) within GIS. Results and conclusions : The results of the model as applied to the structures of the city of Sanandaj illustrate that a fuzzy approach is a basic tool that can be used to identify vulnerability. Its application to the problem assists in unifying relevant theories and practices. It also generates maps of vulnerable points that may be more adaptable to changes and can greatly assist planners and policy makers in decision making.

Kay word: multiple criteria evaluation, vulnerability, fuzzy logic, earthquake, old urban fabrics, GIS

GK-136:

# LANDSLIDE HAZARD OF ROCK SLOPES AROUND SHAQLAWA CITY, KURDISTAN REGION,NE IRAQ, WITH MODEFIED CLASSIFICATION OF HAZARDS ON ROADS AND PROPOSING REMEDIAL MEASURMENTS

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#### ABSTRACT

The results of rock slopes analyses around Shaqlawa area showed that Landslide Possibility Index (LPI) values ranges between Low (LPI) for rock slopes of Tanjero, Kolosh and (marl and siltstone) of Gercus formations, Moderate (LPI) for rock slopes of Shiranish, Gercus (sandstone and dolomitic limestone) and Pila Spi formations, and High (LPI) for rock slopes of the dolomitic limestone of Pila Spi Formation at the gorge north of Shaqlawa city(at the left side of Shaqlawa - Harir main road).

Two landslides hazard maps have been prepared for Shaqlawa area:

A- The first Hazard map (based on LPI values) shows three hazard areas; (1) Area of Low Hazards(for Tanjero and Kolosh formations). (2) Areas of Moderate Hazards (for Shiranish, Gercus and Pila Spi formations) and (3) Area of High Hazard (for the dolomitic limestone beds of Pila Spi Formation) west of Shaqlawa - Harir main road.

B- The second Hazard map (based on the effect of landslide on the roads), also shows three hazard areas but different from the first map. It shows; (1) Area of Low Hazard (it includes slopes of Tanjero, Kolosh and Gercus formations) because of the wide distance of the failing slopes and the road, (2) Area of Moderate Hazard (in the slopes of Shiranish Formation) because of closeness from the road and poor protection works, and (3) Area of High Hazard (at Pila Spi dolomitic limestone slopes at the left side of Shaqlawa - Harir main road) due to its high

steepness and height, and closeness to the road in addition to poor protection works.

Some methods of landslides treatment are suggested, for slope stabilization and road protection.

Key words; Landslides, Shaqlawa area, Rock slopes, Hazard, Safin, Gird Sur, Shiranish.

GK-137:

# PETROGRAPHICAL CHARACTERESTICS OF BENAVI IRONSTONE IN KURDISTAN REGION- NORTHERN IRAQ

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### ABSTRACT

Benavi Ironstone is hosted in highly fractured carbonate beds and located about 20 kilometers N-NW of Amadiya District in Duhok Governorate – Kurdistan Region north of Iraq. The outcrop of BI extends about 2 kilometers with thickness up to 13 meters and occurs within Jurassic - Cretaceous sequence. Forty eight samples were collected from ten sections that represent this elongated body. Petrographical study showed that BI is related to algal-bioclastic-packstone host rocks (this classification based on point counting method); this facies suffered from processes many diagenetic such as iron oxides replacement, neomorphism, pyritization, dolomitization. silicification and phosphatization. Depending upon iron rich sediments textural classification, BI was classified as iron-packstone. Iron oxides have replaced partially and completely the calcareous structures, consequently, deposits with unusual iron oxides contents, were produced. Chamosite was mostly observed around impregnation fossils by iron oxides. Ore microscopy and Back Scattered Electron images (BSE) study showed that most ore textures of BI formed by replacement processes which are: rim, zonal, inclusions, vein and idiomorphic. Porous texture due to dehydration of goethite is common, oolitic texture is present as well as boxwork texture of microplaty hematite grains. Euhedral magnetite crystals were observed in many samples. Pyrite is unevenly distributed throughout this body, which occurs in two patterns: euhedral massive and framboidal forms. The euhedral pyrite crystals are a result of evolution of framboidal pyrite texture, where the main steps of this evolution were recognized. Pseudomorph goethite and magnetite framboids formed by oxidation of pyrite framboids are also common. Rhombic crystals shape of arsenopyrite reveal its authigenic origin, these crystals were found restricted at the lower part of BI.

Keywords: ironstone, Îraq, Kurdistan, Benavi, iron-packstone

GK-138:

# PETROGRAPHY AND MINERALOGY OF ULTRAMAFIC ROCKS IN MAWAT OPIOLITE COMPLEX, KURDISTAN REGION NORTHERN IRAQ

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### ABSTRACT

Mawat ophiolitic complex is situated in northeast Iraq. Covering an area of 250km, this area belongs to the Iraqi Zagros Thrust Zone which can be followed in a south-east direction in Iran. It is composed of ultrmafic, basic (massive and layered gabbro), overlain by marine sediments, and characterized by a typical ophiolitic sequences. The studied samples were composed of peridotite that can be divided in to Iherzolite and olivine websterite and of clinopyroxenite; all samples show variable degrees of alteration, mineralogical composing of olivine and orthopyroxene (enstatite) and clinopyroxene (diopside), accessory minerals are like plagioclase, chlorite, uralite, serpentine, Chromite, magnetite and corundum. While clinopyroxenite is composing mainly of diopside. Textures of these rocke are ruled by pressure and temperature changing and can be divided in to equigranular, porphiritic and poikilotopic textures; the alteration product of these rocke are serpentinite compsed of antigorite, clinochrysotile and lizerdite, while their textures is mesh textures; Mawat was affected by dynamohermal metamorphism in the emplacement of the nappe within Walash - Naopardan sequence indicated by deformation textures.

GK-139:

### ((Depositional Environment of Bai Hassan Formation in Damir Dagh anticline northern Iraq))

### Wrood yusif

Grain size analysis was conducted on (30) sandy samples representing three sections, of Bai – Hassan Formation (Pliocene – Pleistocene) in Damir Dagh anticline, west of Erbil city.

The results of these studies indicate there are three main types of texture sandy mud, muddy sand and mud with a few sandy silt, all of them inter bedded with gravels which belong to four periodical cycles of deposition within braided stream environment.

\* رئيس جيولوجيين اقدم
هيأة المسح الجيولوجي العراقية

GK-140:

### GEOTECHNICAL EVALUATION OF BAKTIARI HILL KURDISTAN DISTRICT/ IRAQ

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### ABSTRACT

A comprehensive geotechnical study was carried out in North eastern part of Iraq for a site in Sulaimaniya Governorate which is located about (4) km. from city center where a grand hotel is constructed of twenty eight floors.

The site is a longitudinal hill representing a double plunging anticline, which itself is the southeastern plunge of pera magroon anticline, regionally the area is highly affected by tectonic movements which led to folding, faulting, jointing, shearing,...etc.

The site is evaluated by studying the core of (9) boreholes with (200)m length. Three engineering parameters, Rock Quality Designation (RQD), Fissuration factor (C-Factor), Number of fractures per meter (F/m) and two laboratory tests, Unconfined compressive strength (oc) and Porosity (Po), each of them classify the rock mass in to five ranks from very weak to excellent with rank value from one to five were adopted to gain final evaluation of the rock mass. Each borehole was divided into engineering horizons according to the similarity of the engineering parameters values, weathering state, color, bedding, etc.

Subsurface correlation chart were drawn depending upon the evaluation of each horizon which was gained by matching the rank values of each parameter to get the final rank values of it from weak to excellent which is used for the first time by the authors.

#### GK-141:

#### EVALUTION PROCEDURE TO QUANTITATIVE INTERPRIATION EMPLOYING

#### NATURAL ELECTRICAL SOURCE METHOD

#### (SELF POTENTIAL)

#### APPLIED IN BERZANIK-MARSES MOUNTAIN S

#### ZAKHO-IRAQ

#### SABAH O, ABDUL QADIR

Self potential method is spontaneous ground exploration where mineralization potential have usually heen the main interest specially with the sulfides of the metal and sometimes metal oxides where create measurable potential difference, the result of survey is display as a set of profiles or possibly a contour map of equipotential lines.

Usually self potential interpretation is qualitative where the shape of anomaly and its extent are indicated by the contour map, self potential has played minor role in geophysics exploration due to difficulty in making significant interpretation.

The idea of this research is new hypotheses to an attempt to applied quantitative interpretation depending on the theoretical formula by (M, K, PAUL, 1965) to calculate the center of location and depth of ore hody. This formula had been applied on real field data executed by GEOSURV. During 1990, two experimental mountain areas Berzanik and Marses north of Iraq / Zakho were examined with this test. The final result compared with geological information by (Macarthy, 1954), using bore hole as lithologic indication.

Good satisfaction in result had been obtained between the two methods, so recommendation to dominate this work procedure on field data for future mineral investigation.

 CHIEF SENIOR GEOPHI / IRAQ GEOLOGICAL SURVEY (GEOSURV) 2012, GEOPHSICAL DIVISION GK-142:

### MINERALOGY OF PALYGORSKITE-RICH CLAYSTONE IN GERCUS FORMATION IN DOHUKGOVERNORATE, KURDISTAN REGION- NORTHERN IRAQ

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### ABSTRACT

This study is concerned with the mineralogy of palygorskite- rich claystones of the Gercuse Formation at the east of the Dohuk city. To perform this purpose, seventeen geological sections were studied in the Gercus Formation with sampling for allpalygorskite- rich claystonebeds in addition to selected samples from carbonate beds .The thickness of these beds ranging between few centimeters to three meters. Carbonate samples were studied microscopically as thin sections. Fine dolomite is the dominate mineral in the carbonate samples.Forty eight of claystone samples were analysed by X-ray diffraction, also five of these samples were examined by transmission electronic microscopy. Mineralogically, claystones are consisting basically of palygorskite, montmorillonite and dolomite with few amounts of kaolinite, quartz, chlorite, calcite and feldspar. For the first time in Iraq, this study succeeds to separate the palygorskite from the other associated minerals in the claystones by adding several new steps to the procedure which is applied by Al-Ajeelet al., (2008) for the purification the clay minerals of Digma Formation. In the present study, eight samples were purified to separate the palygorskite by using a developed purification procedure, the percentage of the palygorskite in the separated samples ranging between (90-100 %). The separated palygorskite have been studied minerlogically by X-ray diffraction, thermogravemetric analysis and Infra red. Palygorskite have well crystalline and included several forms of water and loosed all water when heated to above 900 C°. Palygorskite appears elongated authigenic fibers aggregated forming weak band, each band includes (2-12) fibers or more. The lengths of the fibers mostly less than 8 µm and the width are about 0.1 µm and mainly have straight edges and euhedral shape. The source rocks of the formation were derived from nearby older rocks including; metamorphic, igneous and carbonate rocks which were deposited in the restricted marine environment (evaporitic) under basic conditions associated with Mg- enrichment which led to the formation of the palygorskite from montmorillonite in situ beside the formation of palygorskite by the direct alteration of the basic minerals such as serpentine. This transformation associated with dolomitization of the limestone. Montmorillonite and kaolinite are detrital type origin; also the montmorillonite is calcium- type.

Key words: Palygorskite, Claystone, Gercus Formation, Iraq, Kurdistan

GK-143:

### STRUCTURAL AND TECTONIC ANALYSIS OF THE WESTERN PART OF CHIA GARA ANTICLINE-NORTHERN IRAQ

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### ABSTRACT

Chia Gara anticline is a doubly plunged fold, E-W extending for about (80) km long and (12) km width parallel to the Taurus mountains, and located within the high folded zone of northern Iraq. of. Its hinge bifurcates westerly into two minor plunges. The exposed rocks range in age from Late Triassic to Late Miocene. Structural analysis of the anticline performed through five traverses transverse to the general fold trend from western plunge zone (1st traverse) towards the east. Geometrical analysis of fold elements showed that Chia Gara anticline is asymmetrical towards north in both first and third traverses whereas it is symmetrical in the second traverse. Meanwhile results of Fourier analysis demonstrated that the fold form is more developed in the northern limb of the anticline than in the southern limb, in the first and third traverses. Nevertheless, in the second one, the fold form seems more developed in the southern limb compared with the northern limb. The northern vergency of the anticline and its advance development in northern limb in the first and third traverses may reflect the presence of a hinterland verged reversely slipped listric fault beneath the anticline. However, the obscure of such listric fault in the second traverse may be due to the affect of a sinistral (BF1) and a dextral (BF2) strike slip faults transverse to the trend of Chia Gara anticline on either side of second traverse. The traces of such faults as well as others like Zewa and Deralok (Dextral) interpreted from satellite image of the area. The southward pushing of the wedge between (BF1) and (BF2) had opposed the northward reverse displacement of the proposed listric fault beneath second traverse. The effects of these strike slip faults (BF1) and (BF2) are evident also in anticlockwise deflection of both axial plane and fold axis attitudes from

first to the second traverse, and vice versa from second to the third traverse. Computation of shortening percentage and depth of detachment in Chia Gara anticline revealed higher shortening percentage (30%-58%) than previously estimated in northern Iraq. This discrepancy might be attributed to the technique used in the present investigation which is characterized for locally use. Meanwhile, using the same technique the depth of detachment estimated to be (5.4, 7.6, and 9.3) km in the first, second, and third traverses respectively. The figures might refer that the listric fault beneath the third traverse is deeper than that beneath the first and second traverses. The reverse displacement of these listric faults might be have accommodated by a transverse strike slip with a considerable component of dip slip. Thickness increasing of (Gercus, Pila Spi, and Fat'ha) formations in the northern limb of the anticline compared with the southern limb increases the possibility of reversely displaced suture verged listric fault beneath the anticline. Partitioning of fold elements vertically (throughout stratigraphic units) has not proved the progressive folding of the anticline. Joint analysis in the study area showed the prevalence of hko>b, hko>a and ac systems and sets upon others (bc, hol and okl). Such a prevalence grade as well as the wide rough dihedral angle of hko>b compared to hko>a joint system, might indicates a relatively stronger intensity of relaxation period than compressive period of the tectonic pulses responsible for the deformation of the area. The pulsating manner of tectonics has deduced because of inconsistent chronological relationship among joint sets and systems in the study area. Dynamic analysis of joints, veins, stylolites, tension gashes and few striated faults surfaces revealed the general correspondence in the direction of both maximum and minimum horizontal stress axes deduced from these structures with those responsible for folding in the area. This denotes that these syntheses have been formed comparatively with folding.

Key words: Chia Gara, listric, strike slip, joints, stylolites, tension gashes.

GK-144:

# USING SURFACE GEOCHEMICAL TECHNIQUES TO ASSIST HYDROCARBON PROSPECTING, GARMIAN-KURDAMIR REGION, NORTHERN IRAQ

### **Graham Banks**

R. Aziz

Western Zagros Resources Ltd. ("Western Zagros")

**P. Harrington** W.L. Gore & Associates, Inc. ("Gore")

### ABSTRACT

Western Zagros Resources Ltd. is engaged in the exploration and production of crude oil and natural gas, in the Kurdish Autonomous Region of northern Iraq. Western Zagros holds two Production Sharing Contracts with the Kurdistan Regional Government: the Garmian and Kurdamir license blocks. Four exploration wells have been drilled on these PSC blocks and all have made significant oil discoveries, including the Kurdamir giant oil discovery.

There are numerous prospects yet to be drilled in these PSC blocks. They need to be risked and ranked to prioritise the order of upcoming wildcat wells. Traditional methods to increase chance of exploration success and decrease risk and cost (e.g. seismic interpretation, probabilistic volumetric assessments, etc) can be augmented by the use of surface geochemical analysis techniques to indicate areas with increased probability of sub-surface oil or gas pools. Compared to traditional surface geochemical techniques, amplified geochemical imaging incorporates the combined advantages of innovative sampler design, high sensitivity, and multivariate statistical interpretation. Additionally the technique has the advantage of low cost.

A surface geochemistry "mapping" study has been undertaken by Western Zagros and Gore across the parts of the Garmian and Kurdamir blocks. The study objective was to geochemically discern, in conjuction with WZ"s other surface and sub-surface datasets, whether undrilled prospects display oil-like or gas-like signatures, and attempt to identify the aerial extents of hydrocarbon discoveries may be. Gore Modules, sensitive tools for detecting 80 sub-surface hydrocarbons spanning C2-C20 molecule size, were placed at 134 pre-selected localities (classed as a small and widely spaced dataset) and left for 17 days to absorb any hydrocarbons microseeping from potential hydrocarbon pools in the sub-surface.

Preliminary results are encouraging for the technique and support the attractiveness of the hydrocarbon prospectivity of these PSC blocks. Preliminary interpretation suggests oil signatures detected above known oil-bearing anticlinal traps and positive indications of hydrocarbon pools associated with undrilled prospects. Detailed analysis has just commenced and we look forward to integrating the results with other datasets to give a clearer picture of hydrocarbon pools. GK-145:

# SEQUENCE STRATIGRAPHIC ANALYSES OF MIRGA MIR FORMATION (EARLY TRIASSIC), NAZDUR AREA, NORTHERN THRUST ZONE, KURDISTAN REGION

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### ABSTRACT

A sequence stratigraphic analysis for Early Triassic Mirga Mir succession in Nazdur area, Northern Thrust Zone, Kurdistan region was constructed based on surface lithologic and thin section analyses. Lithologically the formation consists of thin to medium occasionally thick bedded yellowish-grey limestones, sandy, dolomitic and argillaceous limestones alternating with thin to thick bedded grey shale/marl. Thin laminated siltistones, fine and cores grained sandstones seen in the lower to middle parts of the formation. The petrographic studies of carbonates with microfacies analysis of limestones were based on 67 thin sections. The petrographic study showed that, the majority of limestones are: Lithified carbonate mud (micrite). The skeletal grains consist principally of thin shelled pelagic pelecypods (Posidonia), serpulid worm tubes (Spiroribs), micro gastropods, ammonoids. calcispheres, brachiopods, dasyclad green algae, miliolids, ostracods and conodonts. Non skeletal grains include ooids, peloids, intraclasts and extraclasts.

Based on detailed microfacies analysis of limestones, eighteen litho facies types are distinguished in the studied section of Mirga Mir Formation. These facies were subdivided according to their environmental interpretation, into four basic types of facies associations: Offshoal/ basinal, Foreshoal/ slope, Shoal, Back shoal/ lagoon. Two third-order depositional sequences can be identified, that comprises the Mirga Mir succession, were separated by sequence boundary (SB) of type 2. Each third-order sequence is subdivided into a TST and HST. This reflects episodes of transgression and stillstands of the relative sea level. No LSTs was recorded within the Mirga Mir succession, this indicate no considerable falling of sea level were happened during the Lower Triassic in Northern Thrust Zone. The comparison of these interpreted sequences with the eustatic sea level curve of Haq et al. (1988) reflects the global effect of sea level on the deposition of Lower Triassic Mirga Mir rocks in Northern Thrust Zone of Iraq.

Key Words: Sequence Stratigraphy, Early Triassic, Mirga Mir Formation, TST, HST.

GK-146:

# THE SEDIMENTOLOGY OF BEDUH FORMATION (LOWER TRIASSIC), THE NORTHERN THRUST ZONE, KURDISTAN REGION-IRAQ

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### ABSTRACT

Sedimentological study of Beduh Formation (Lower Triassic) was carried out through three outcrop sections (Beduhe, Sararu and Nazdur). These sections are located within the Northern Thrust Zone of Iraq. Lithologically, the Formation is composed from alternating reddish purple, reddish brown and greenish grey shale with wavy rippled and featureless sandstone beds, in addition to some thin siltstone streaks.

The XRD analysis shows that the shale are composed mainly from clay minerals like illite in a major proportion with kaolinite, chlorite, smectite and mixed layer in a minor proportions. In addition to clay minerals, the non-clay minerals are represented by quartz and calcite are present in major proportions with minor proportions of feldspar and The contains glass shards. foraminifera hematite. shale and conodont.Petrographically the sandstone beds are composed essentially from quartz with little proportions of rock fragments, feldspar and mica, in addition to some fossil fragments.

Beduh Formation is divided into three facies; shale, sandstone and siltstone. These facies can be divided into sub-facies on the basis of colour, composition, texture and sedimentary structures. Due to presence of marine fauna within the shale and sandstone beds of Beduh Formation, in addition to some related marine sedimentary structures, the deposits were considered to have deposited in marine environment. Depending on the huge thickness, reddish colour, fossil contents and mineralogy of the shale; as well as on the less thickness, sedimentary structures, fossil fragments, mineralogy and maturity of the sandstone, the oxidizing offshore and shoreface zones are the expected depositional environment of Beduh Formation.

GK-147:

# THE MIDDLE TO LATE EOCENE TECTONIC IMPRINTS IN THE LITHOSTRATIGRAPHIC VARIATION WITHIN KURDISTAN FORELAND BASIN, KURDISTAN REGION

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### ABSTRACT

The Middle to late Eocene (Lutetian –Priabonian) stratigraphy of the Zagros Fold-Thrust Zone of Kurdistan region, shows both remarkable lateral and vertical lithofacies changes, therefore they have been revised in the light of recent investigations, and sequence stratigraphic concepts. In the Imbricated Zagros zone, this time span manifested by the thick (about 600m) conglomeritic Red Molasses of the Swiss group. The penecontempereneous lithofacies in the High Folded Thrust zone, mostly represent by the retrograded Red continental clastic of the Gercus Formation (Lutetian -Bartonian) shows variations vertically to the lagoon carbonates of the Pila Spi Formation (Priabonian) and horizontally to Carbontes - Evaprites lithofacies of the new proposed unit as Sagerma Formation. Mostly combined by the disappearances of the whole Oligocene depositional sequences, and acts boundary between Tectonic mega sequence TMS.10 and TMS. 11. The remarkable lateral thickness reduction of the Gercus Formation, along the major NW-SE zagros trend from 2000 m (in Dhouk and -Erbil area), to 250m then to 40 m Sequence Boundary Type One conglomerates, almost appears as between Early and late Eocene., especially towards Drabandikhan and Bamo areas(close to Iranian border).On the Kurdistan foreland depocenetr trends, the diagnostic lithofacies changes across the Zagros High and Low folded thrust zones associated by the variations from Gercus formation(M-Eocene) to carbonate- evaporites of Sagerma unit ,which in turn change to Avanah Formation(late Eocene-Bartonian), associated by the appearances of the Oligocene strata (Kirkuk Group). The new Middle Eocene Sagerma Unit, exposed on south western Limb of Bamo, Darabadikhan, Qaradagh, Sagerma and Basra anticlines (For about 100km, along Major Zagros trend) This unit consist mainly of
dolostone, occasionally fossiliferous yellowish gray limestone. Stromatolitic dolostone, and evaporites, argillaceous limestone and green marl, range in thickness from 60-120m. Sagerma Unit overlain unconformably by the Avanah Formation (Late Eceocne) and underlain unconformably by the Sinjar Formation (E. Eocene - Ypresian) characterized by the hard ground surface, superimposed by the mass extinctions of the early Eocene macro and micro fossils on both boundaries. Those lithofacies variations are mostly associated by volcanic activities within the Volcano sedimentary facies of Middle Eceocne age (Walash -Naouperdan units) within the Iranian plates .The tectonic imprints of those lithofacies variations may have influence on the appearance of local decolloments surface between pre and post middle Eocene (Lutetian), as well as it may also acts as seals for Pre -Middle Eocene sequence in term of petroleum system. More over than that, the Middle to Late Eocene lithofacies changes almost manifest the initial continent-continents collisions between Arabian and Iranian plates, and reactivation of the blind cretaceous faults at the base of Kurdistan Foreland basin,

Key words: Kurdistan foreland Basin. Tectonic imprints, Sagerma Formation. Eocene

GK-148:

# PRE-FEASIBILITY STUDY OF CHROMITE ORE PROCESSING PLANT DESIGN IN KURDISTAN, NORTH IRAQ

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### ABSTRACT

Supply of world chromite (chrome ore) has come under severe pressure over the past year driven by strong demand for ferrochrome used in ferroalloy production for making stainless steel. Chromite ore deposit can be classified as siliceous type (silica rich) and ferruginous type (iron rich). Major associated gangue minerals are talc, quartz, hematite, goethite, limonite, gabbro, serpentine, anorthosite, dunite, and pyroxinite. Beneficiation practices depend on the mineral characteristics of the ore deposits, gangue mineral assemblage and thedegree of dissemination of constituent minerals. The feed preparation unit incorporates screening of the ROM ore to 75 mm from 220 mm followed by two stages crushing (primary and secondary crusher) and screening to produce less than 3 mm size fraction. This fraction isfurther ground to less than 1 mm and then upgraded utilizing conventional gravity techniques like spiral concentrator and shakingtable in the concentration section. Though gravity techniques are well established and widely accepted for the concentration of chromite ore.

The ultimate goal of this study discusses Technical & Economical feasibility established guidelines for chromite processing plant in North Iraq. This article reviews the major process flow sheets in practice for the recovery of chromite values from various types of ores and critical issues related to chromite ore beneficiation.

Keyword: Chromite, Peridotite, Kurdistan

### بەخێرھاتن

#### بەناوى خواى گەورەو ميھرەبان

ميوانه بەرپنزەكان...

بەشداربووانى يەكەمين كۆنفرانسى جيولۆجى كوردستان ( <mark>جيۆكوردستان 2012</mark>)... بەيانىتان باش...

بهناوی لیژنهی ئامادهکاریی کوّنفرانس و ههریهك له ریّکخراوی جیوّلوّجیانی کوردستان و بهشی جیوّلوّجی له زانکوّی سلیّمانی, بهگهرمی بهخیّرهاتنتان دهکهم و هیوادارم کاتیّکی پر سوود و خوّشی لهشاری سلیّمانی بهسهر ببهن و ئهم کوّبوونهوهیهشمان سهرهتایهکی بیّ کوّتایی بیّت بوّ پیّشخستن و برهو دان به زهویناسی له کوردستان. هاوریّیانی ئازیز...

پاسته زەويناسى لەكوردستان لەپووى چەندىّتىيەوە جياوازىيەكى گەورەى ھەيە لە چاو سالأنى پىّشوودا، بەلأم تا ئىّستا لەپووى جۆرىتىيەوە گۆپانگارى گەورەى بەخۆوە نەدىوە و تازەبەتازە خەرىكىن لەقالبى ناوخۆيى دەرىچىن و كارەزەويناسىيەكانمان سنوورى كوردستان بەجى بهيّلىّت. ھەللبەت يەكيّك لەھۆكارە سەرەكىيەكانى گەشەنەكردن و مانەوەى زەويناسى لەقالبى ھەرىّمىدا نەبوونى ئەم كۆبوونەوە جيولۆجيانەيە كە تىيدا پسپۆپو شارەزايانى بوارى زەويناسى ناوخۆو دەرەوەى ولأت پىكەرە بىرو پاى خۆيان بخەنە پوو و گفتوگۆى زانستىيانە سەبارەت بە دياردە جيورۆر شارەزايانى بوارى ئەم ولاتە

1-پێشكەشكردن وگفتوگۆكردن لەسەر توێژينەوە زەويناسىيەكانى كەلەلايەن شارەزايانى بوارى زەويناسى كوردستان دەخرێتەپوو

-بەئاگابوون و ئاشنابوونى پسىپۆرانى شارەزاى جيۆلۈجياى كوردستان لەشوينى جياوازەكانەوە

3- پلاندانان بۆكارى ھاوبەش و نوى

4-دیاری کردنی کهموکورتییهکانی بواری زهویناسی لهکوردستان

ئەوەى ئاواتمانە ئەم كۆنفرانسە بېێتە نەريتێكى سالأنەو ھەرسالەى لە شارێكى كوردستان سازبكرێت و بەرێوە بچێت و لەكۆتايى ئەم كۆنفرانسەدا شوێنى سالى داھاتوو ديارى بكەين واتە شوێنى <mark>جيۆكوردستان 2014</mark>.

سەركەوتنى ئەم كۆنفرانسە پەيوەستە بەو توێژينەوانەى كە بەرێزتان پێشكەشى دەكەن و گفتوگۆى دەربارە دەكەن و بېرو راى نوێ دەخەنەروو. خۆشحال دەبين كە رەخنە و بيروبۆچوونەكانتان لە فيدباكى كۆتايى كۆنفرانسەكە دا بۆمان بنووسن. جێگەى خۆيەتى بەگەرمى سوپاسى سپوٽسەرە بەرێزەكانى ئەم كۆنفرانسە بكەين كە ئەوانيش ھەريەك لەكۆمپانياى ئاسيا سێل, زانكۆى دھۆك و دەستەى كوردستانى بۆ لێكۆڵينەوەى ستراتيجى بۆ توێژينەوەى زانستى و گروپى كۆمپانياكانى ھەلەبجەن كە دلسوزانە ھاوكاريى ماددى كۆنفرانسيان كرد, نموونەيان زۆربێت.

دووباره بەخێربێن و كاتێكى پر بەسوود بەسەر بەرن.

ئيبراھيم محەمەد جەزا محيّدين سەرۆكى ليژنەى ئامادەكاريى كۆنفرانس 14–11–2012 سليّمانى



# Looking forward to see you in

# **GEOKURDISTAN 2014**

# GeoKurdistan 2012

## FIELD GUIDE FOR THE POST CONFERENCE TRIP

November 16, 2012

Sulaimani, Kurdistan Region, Iraq

# Ideas of tectonic setting and related rocks signals of Chwarta and Mawat areas

Guides

Prof. Dr. Kamal H. Karim karimgeology@yahoo.com

Dr Yousif O. Mohammad

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### **Excursion Across Zagros**

Sulaimani-Azmir-Qalachwalan-Waraz

Time: 06:00-17:00

Cost: 60 000ID

Included: Transportation and lunch

Participants: Max 100

Booking deadline: 15 November 2012

#### Welcome

The post conference trip will be to one of the most important areas in Kurdistan and Iraq, which is Zagros Suture Zone. Along the very beautiful area and passing across the Cretaceous Carbonate and silisiclastic rock units you will reach the Mawat Ophiolite Complex with abundant igneous rocks.

Dr. Kamal H.Karim, will explain, in three stations, for you the sedimentary succession in the area and the depositional environments of them will be discussed. Then and with another three stations Dr.Yousif O. Mohammad will explain the main characteristics of Mawat Ophiolite Complex in Kurdistan.

The lunch will be at the Girgasha Restaurant which is locating on the side of Qalachwalan River. Our ambition from this trip is to think about many joint projects related to this important area. A detailed hand-out is prepared by the guides for the visitors.



Geological map of the area of the post conference field trip, with the location of stations.

# GEOKURDISTAN 2012 Sulaimani









