Abstract Volume







September 20-22nd, 2022 Sulaimani, Kurdistan Region, Iraq <u>https://geo2022.univsul.edu.iq/</u>

GeoKurdistan V -2022

The Fifth International Geological Conference of Kurdistan

Abstract Volume September 20-22nd, 2022 Sulaimani, Kurdistan Region, Iraq

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Sulaimani 20-22nd September 2022 The 5th International Geological Conference of Kurdistan

In the name of God

The geological meeting at GeoKurdistan Conference becomes a scientific gathering of various ideas and recent identifications of earth science studies that encourages the researchers for participating and attending the event which holds every two years. Since the first establishment of the conference in 2012, the meeting has continuously progressed and improved, and the submitted papers are enhanced in terms of quality and quantity. This conference is organized and held by the Department of Geology (University of Sulaimani) in cooperation with the Geological Society of Kurdistan /Sulaimani branch, focusing on the different aspects of the geology of Kurdistan and surrounding areas.

The conference has accepted **68** papers and **7** posters from the different fields of geosciences that have been conducted in Kurdistan and Iraq fields. The main topics include Structure Geology, Geophysics, Geochemistry, Mineralogy, Petrology, sedimentology, Industrial Rocks and Minerals, Ore Geology, Palaeontology, Geotectonics, Hydrogeology, Hydrology, Engineering, and Mining Geology, Stratigraphy, Petroleum Geology, Geomorphology, Remote Sensing and GIS, Environmental Geology, Geotourism, and Paleoclimate.

The main aim of the conference is to enhance geological problems, especially those related to Kurdistan and surrounding areas, discovering studies facilities and finding collaborations with new research plans and projects. In addition to develop geological investigations and and make new discoveries regarding mineral resources and economic geology, water resources, oil and gas exploration, and environmental problems.

The second goal of this conference is to implement the current and original geological ideas and information regarding raw material, water, and hydrocarbon resources and promote geologists, and support researches in Kurdistan This stage is designed to investigate researcher's problem for showing geological issues and address the challenges that postgraduate students might face when they start their research.

The scientific aim of the conference is to enhance geological problems, especially those related to Kurdistan and surrounding areas, and promote studies techniques and cooperation with future works and projects.

I would like to use this opportunity to pay our respects to the Peshmerga and brave soldiers, who were martyred in defending our country and as part of the international fight against

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terrorism. We will always remember them, and pray for those who have been injured in this war and wish them a speedy recovery.

I thank the organizing and scientific committee for giving us the platform to share our ideas and go through the different approaches of such great articles. I declare that the conference is open for further proceedings.

My appreciation extended to the president of the University of Sulaimani, Geological Society of Kurdistan/Sulaymaniyah branch, Dana Gas Company, Halabja Group Company, Kurdistan Institution for Strategic Studies and Scientific Research, University of Komar, Ashur Bricks Company, Rangala Tiles, for their sponsoring and supporting the conference activities.

I wish everyone all the best.

& Jake

Devan Othman Hussein Chairman of the Organizing Committee GeoKurdistan V 20-9-2022 Sulaimani Kurdistan

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Organizing committee



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Keynote Speakers Biography

Dr. Mark AItaweel

Reader in Near East Archaeology University College London

m.altaweel@ucl.ac.uk



Professor Dr. Mark Altaweel, Archeology, Vice-Dean Innovation, Enterprise and Knowledge Exchange, Near East Archaeology, Institute of Archaeology, 31-34 Gordon Square Institute of Archaeology, UCL University, WC1H 0PY UK London. 2004 Ph.D. University of Chicago USA, 2000 M.Sc. University of Chicago USA and 1997 University of Illinois B.Sc. USA

He has more than 20 years teaching experience. He has taught courses on Near Eastern history and archaeology, GIS, remote sensing methods, computational modelling, data science, social-ecological theory, introduction to archaeology, and on land use and environmental change. Associate Editor: Social Science Computer Review, Iraq (editorial board), he has 138 published articles, has (7) research grants and (7) worked in more than 9 positions.



Riyadh Rahmani

Director of RRC Petroleum Geology Consulting & Training Services <u>rahmani44@hotmail.com</u>

is a consulting petroleum geologist and President of *RRC Petroleum Geological Consulting*, a petroleum geology consultancy and training company based in Calgary, Alberta, Canada. Rahmani obtained a B.Sc. in geology from University of Baghdad, 1965 (Iraq), M.Sc. in sedimentology from University of British Columbia, 1968 (Vancouver, Canada) and a Ph.D. in sedimentology from the University of Alberta, 1973 (Edmonton, Canada). Dr. Rahmani has 48 years of worldwide experience with the petroleum industry (Canada, USA, North & East Africa, and the Middle East) and government geological surveys of Alberta and Canada.

Dr. Rahmani is an active member of the AAPG, Society for Sedimentary Geology (SEPM) and the International Association of Sedimentologists (IAS). He has taught sedimentology and sequence Stratigraphy of sandstone reservoirs since 1973 both as classroom workshops and as field seminars to his employers' staff and society conferences and meetings, in Canada and worldwide. As a consultant, for the past 17 years, he has taught these subjects both as public courses & private in-house seminars to petroleum professionals in Saudi Arabia, Iraq, Indonesia, Egypt, Tunis, Turkey, and Canada.

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Program of GeoKurdistan V

Day 1 Tuesday 20th September 2022

- 09:00-10:00 Registration
- 10:00-10:30 Welcome Speech
- 10:30-11:00 Keynote: "Iraq's Climate, the Rise of Complex Societies, and Lessons for the Future" Professor Dr. Mark Aitaweel, Archeology, Vice-Dean Innovation, Enterprise and Knowledge Exchange, SHS
- 11:00-11:15 Keynote: "Southeast Kurdistan Region: The Middle Miocene Fatha Formation (Lower Fars) A Main Drilling Challenge" Berivan SHERKO, MS.C In Engineering Geology, Drilling Operation Geologist at Crescent Petroleum
- 11:15-12:00 Coffee Break
- 12:00-13:00 Session 1
- 13:00-14:30 Lunch
- 14:30-16:10 Session 2

Day 2 Wednesday 21th September 2022

- 09:00-09:30 Keynote: "North Gondwana Upper Ordovician Glacial Reservoir Rocks and The Overlying Silurian Hot Shale Source and Seal Rocks: A Complete Petroleum System" Dr. Riyadh A. Rahmani, RRC Petroleum Geological Consulting, a petroleum geology consultancy and training company based in Calgary, Alberta, Canada.
- 09:30-11:10 Session 3
- 11:10-12:00 Coffee break and Poster session
- 12:00-13:00 Session 4
- 13:00-14:30 Lunch
- 14:30-16:30 Session 5
- 16:30-18:00 Closing session

Day 3 Thursday 22th September 2022 (Field Trip)

- 7:30 Departure from the Hotel by Bus
- 8:30 First stop Azmar Anticlinorium
- 09:30 Second Stop Dolarut syncline
- 10:30 Third Stop Surdash anticline
- 11:30 Fourth stop Sargelu Village
- 12:00 Fifth stop Kunamasi Village
- 12:45 Sixth Stop Shaxa Sur road
- 13:30 Lunch

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			ige, SHS	ARS) – A MAII eum		all 3	Secretary: N Al-Jaberi	alysis and Depo na Formation (E Southern Iraq. t, Maher M. M i	ossils on the pe Formation (U. C J, Southern Ira, nd Maher M. N	tudy of the Eup to Basrah, Iraq and Mohanad										
			the Future" se and Knowledge Exchar	A FORMATION (LOWER F) ologist at Crescent Petrole		Ĥ	Chair: Nisreen M.Aziz	GK5-1 Microfacies An Environment for Yamarr Valanginian), Rana T. Al-khaya	GK5-7 The effects of the f properties in the Mishrif I Rumaila oilfiel Muslim M. AI-Ali a	GK5-8 Sedimentological St from Babylon Mohammed L. Hussien ,										
	ssion		ocieties, and Lessons for Dean Innovation, Enterpri	E MIDDLE MIOCENE FATH (Y, Drilling Operation Gec	reak	all 2	Secretary: Rabeea Kh. Znad	idences in determining the le deflection within Bradost s fold-thrust belt-Kurdistan gion. Amir Omar	the Qara Chough South d from Structural and ications, Central Part of aq. , Lanja H. Abdullah and Abdulahad	ity Assessment for Selected ned Road \ Sulaimaniyah \ Northern Iraq. arrai ,Omar Gheni Aziz an Al-Hakari										
Quoning	Opening sessic		e, the Rise of Complex So weel, Archeology, Vice-E	KURDISTAN REGION: THE C In Engineering Geolog	Coffee bre	Hal	Chair: Ghafor Hamasur Hamasur	GK5-12 Using Joints as evide geometry and causes of the c anticlinal fold axis, Zagros fo regio Abdulla Am	GK5-121 The origin of Anticline as Deduce Geomorphological Ind In Varoujan K. Sissakian Iyda D. J	GK5-51 Rock Slope Stabil Sites at Imam Mohamn Governorate Thair Thamer Al-Sam Salim Hass	Lunch									
Registration		10:00-10:30 Welcome Speech	10:00-10:30 Welcome Speech	10:00-10:30 Welcome Speech	10:00-10:30 Welcome Speech	10:00-10:30 Welcome Speech	Welcome Speech	Welcome Speech	Welcome Speech	Welcome Speech	Welcome Speech	Keynote: " Iraq's Climat Professor Dr. Mark Aita	Keynote: " SOUTHEAST CHALLENGE" Berivan SHERKO, MS		1	Secretary: Younus I. Al- Saadya	tential Recharge Zones of using Remote Sensing and outhwestern Iraq. Almallah, Saher Almulla	k Intensity Mapping for ifer Using GIS Based System: n Sub-basin, Kirkuk, Iraq. ara Faeq Hamamin and ohammed Al-Hayali	nd Modelling of Fluid- Rock Dil Recovery in the Mishrif ya oil field, Misan sein Badr Ghalib, Adnan B. I A. Hamad Aisaadi	
09:00 - 10:00							10:30-11:00	11:00-11:15	11:15-12:00	На	Chair: Qusai Yaseen,AL- Kubaisi	GK5-10 Groundwater Po Wadi Al-Batin Alluvial Fan, GIS techniques, S Suaad Albhadili , Inass	GK5-15 Hazard and Ris Alluvium Intergranular Aqu A Case Study from Shwa Omer Sabah Ibrahim, C Hussein Dheyaa M	GK5-19 Water Chemistry a Interaction for Improve C Formation, Halfa Wasan S. Al- Qurnawi, Hus Al Hawash, Asaac						
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Hall 3	Chair: Maher M. Mahdi Assad Ali	GK5-13 Facies analysis and sequence stratigraphy of Late Cretaceous Successions, Northern Iraq. Nabil Yousif Al-Banna, Mohammed Ali Alrashedi	GK5-22 Depositional Environments of lower Sa'adi Formation, Southern Iraq. Adyan A. Myzban, Mohanad H. Al-Jaberi, Methaq K. Al Jafar and Harith A. Al-Saad	GK5-24 Biostratigraphy and Chronostratigraphy of Late Jurassic-Early Cretaceous in selected areas at Kurdistan Region, Northern Iraq. Mohammed W. Saeed, Majid M. Al-Mutwali Nabil Y. Al-Banna	GK5-32 Some New Ostracode Species of Genera Schneiderella, Sulcostocythere, Neomonoceratina, From Fat'ha Formation (Middle Miocene) in Takia Area, Darbandi Bazian Anticline, Sulaimaniya, Kurdistan Region, North-Eastern of Iraq. Nisreen M.Aziz and Zahida B. Kasim	 GKS-34 Late Oligocene-Early Miocene Benthic Foraminifera from the Darzila section, Sangaw area, Kurdistan Region, Iraq: Biostratigraphy and Paleoecological Significance. Imad M. Ghafor, Pshtiwan M. Ahmad, Araz O. AL.Khafaf.
Hall 2	Chair: Dler H. Baban Ahmed Abdullah	GK5-37 Utilizing Mud Log Gas Data to Identify Reservoir Fluid: A Case Study of the Zubair Oilfield in Southern Iraq. Hussein Saeed Almalikee, Ahmed Adnan Arab, Hayder K. Almayyahi	GK5-76 Origin of glaucony deposit in Kurdistan Foreland Basin: Insights from the Upper Cretaceous succession, Kurdistan-Iraq Ibrahim Q. Mohammed, Fadhil A. Lawa, Sherif Farouk, Mohammad Alsuwaidi, Sadoon Morad	GK5-20 Petrophysical properties of carbonate rocks of Sargelu formation in northern Iraq based on wireline log by using Tech-Log Software. Mahdi Khairi Aswad and Wrya Jihad Mamaseni	GK5-47 The Integration Core, Image Log and Conventional Logs to Understand Reservoir Rock Type of Mauddud Formation. Maher J. Ismail, Rafea Ahmed Abdullah, Ahmed Saadoon, Reyam H. Alameri, Inas A Sahi, Masra A. Ahmed	GK5-30 Direct Hydrocarbon Indicators (DHIs) as Seismic Tools to predict existing of Hydrocarbon in the Subtle Stratigraphic Trap, in Mishrif Formation at Dujaila oil field, SE of Iraq. Ahmed Muslim Attallah Khawaja, and Jassim Muhammad Thabit
Hall 1	Chair: Dara Faeq Hamam Qurnawi	GK5-28 Preparing of Isotopes Databases for Groundwater in Iraq and Relationship Study of It with Surface Water. Ali H.Falih, Amer A.Mohammed, Kamal B.Nada , Ali Al Maliki, Ali A.Jasm,Ansam A.Mahmood, and Zainab S. Abed	GKS-31 Climatically and hydrogeological study of Rabia sub-basin NW- Iraq. Qusai Yaseen,AL-Kubaisi and Mohammed Muwafaq Yahya Al-Taee	GK5-60 Rare earth elements compositions in fluvial sediments of the Lesser Zab River Basin, Northeastern Iraq. Younus I. AI-Saadya, Arsalan Ahmed Othman, and Yousif O. Mohammad	GK5-78 Hydrochemical Study of Some Groundwater Boreholes in Central Basin of Erbil city, Northern Iraq. Awaz Rasul, Rebwar Nasir Dara, Masoud Hussein Hamed, Sangar khalid	 GK5-21 Determination of impacts of the climate change in temperature and rainfall variations in some southern Iraqi Governate using GIS. Maitham A. Sultan Bassem M. Hashern Ahmed R. Hassan
	2 noiss92	14:30-14:50	01:21-05:41	0E:ST-OT:ST	0S:ST-0E:ST	01:91-05:51

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			Day 2 (21	1/9/2022)		
		Keynote: "North Gondw	ana Upper Ordovician Gla Botroloum Suctom"	acial Reservoir Rocks and	l The Overlying Silurian H	ot Shale Source and
	9:00-9:30	sear Kocks: A Complete I Dr. Riyadh A. F	retroieum system Rahmani, RRC Petroleum	Geological Consulting, a	petroleum geology consu	Itancy and training
		company based in Calgar	ry, Alberta, Canada.			
	Hai	1	На	2 E	На	ll 3
£ noiss92	Chair: Omer Sabah Ibrahim	Secretary: Suaad Albhadili	Chair: Ali M. Al-Rahim	Secretary :Huda Farhan Rafea	Chair: Imad M. Ghafo	Secretary: Irfan Sh. Asaad
05:60-08:60	GK5-80 The efficiency of Un Snyder unit hydrograph m flood discharge in pa Kurdistan R Fahmy Osman Mohamn	it Hydrograph, SCS-CN, and odels for determining peak rt of Lesser Zab Basin, tegion, Iraq. med, Diary Ali Almanmi	GK5-54 The relation of rec with geological forma ⁻ Salar S. Hasar	corded velocity behaviour itions thickness in Iraq. n Al Karadaghi	GK5-139 New Basement Str analyzing Magnetic Data in Phase Preserving Dynan Techi Hayder A. Al-Bahad	ructural Division map from Iraq Southern Desert, Using mic Range Compression nique ility, Ali M. Al-Rahim
01:01-05:60	GK5-88 Evaluation of seas groundwater quality by associated with water qua analytical Dr.Masoud H.Hamed, Di Shul	onal a spatial variation of / determining by factor lity using with multivariate methods. r. Erkan Disli, Mr Jawhar kur	GK5-63 Seismotectonic Ana at Part of Eastern Border I Sensing and G Alaa N. Hamdon, Rabeea Adeeb ,Abalr	Ilysis for the Seismic Activity Line of Iraq Using Remote SIS Techniques. a Kh. Znad, Hadeer Gh. M. ahman Qubaa	GK5-44 Microfacies and S Shuaiba Formation (lowe wells sout Maher M. Mahdi, Zainalak Han	edimentary model of the r Cretaceous), in selected thern Iraq. odeen A. Al-Shawi, Sany E. nina
10:10-10 : 30	GKS-100 Awareness of Primary and their preparedness an Sulaimaniyah City – Ku Jamila Jalal Tahir, Sarkhel Hau Ahn	School Children towards Flood d perceptions of its risks in urdistan Region of Iraq. <i>wr</i> e Mohammed , Ashna Jalal aed	GK5-64 A New Methodd Intrusion from Gravity D Appr Ahmed A. Al-Rahim	ology to Predict Basin or bata, A Machine Learning roach. a and Ali M. Al-Rahim	نورامنيفرا والاوسيراكودا 34-3K موار جنوب ال م راق نا عبد الستار كشيش العل ى	راسة بيئية وتصنيفيه لمستحثات الف لمناطق مختاره من أه سرى اسعد سليم البيريدة رشا
10:30-10:20	GK5-106 Utilizing and eva index for groundwater used in the Wanna distri Ghazwan Ghanem Al – Abdulqader,Hazim	iluating the water quality 3 for drinking and irrigation ct of northwest Iraq Aarajy, Omar Nabhan i Jumaa Mahmood	GK5-109 2D Resistivity Soil Contamination Zone North . Kaheen Bamerni, R	r Technique in Exploring es, Kwashe area, Duhok, of Iraq. tashied Mohammad	GK5-59 The role of salt teo Zubair subzone oilfields an both seismic section a Haider Mc	ctonics on developing the d neotectonic of area from and GIS, Southern Iraq. ousa Jaffar
01:11-05:01	GK5-107 Detection of physical water indices (NDWI, MNDV applying remote sensing and § (GIS) techniques for AI-Abbas (GIS) techniques for AI-Abbas govern Rusul H. AI-Hakeem and Qusai Musa AI-S	and chemical parameters using VI, NDMI, WRI and AWEI) by geographic information system ia River in Al-Najaf Al-Ashraf norate. Yaseen Al-Kubaisi and Hussain Shimmary	GK5-42 Crustal thicknes ratio of the Western Me detected from inversic Huda Farhan Rafea, Er Abdu	ss, Vp/Vs, and Poisson's esopotamian Plain Edge on of receiver function. mad Al-Heety, Wathiq ilnaby	GK5-71 Impact Spherules f first record from Duhok are of I Abdulrahman Bamerni, B Hamn	from the K-Pg boundary: A sa, Kurdistan Region, North raq. asim Al-Qayim, and Rund moudi
	11:10-12:00		Cof	ffee break and Poster ses	sion	

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Hair: Dr. Masoud	ll 1 Secretary: Fahmy Osman Mohammed	Ha Chair: Fouad M. Qader	II 2 Secretary: Rzger A. Abdula	Hal Chair: Abdulsalam M. Al-Tarif	II 3 Secretary: Adyan A. Myzban
GK5-114 Effect of site geo Cheragh-Veis Da Ali Uromeihy, Hasan Shaf i	ology on the groutability of m, Kurdistan, Iran. aet-talab, Amir Hafezquran	GK5-91 Shale Impact on the Jeribe Carbonate Reservoir Dler H. Baban, Sabir S. Ba	e Reservoir Properties of the in an Oilfield Northern Iraq. rzanji, Muhana M. Ahmed	GK5-82 Problems of the Zagr Rocks, Examples from Kurdi Kamal Ha	os Ophiolites and Volcc stan region, Northern Ir aji Karim
GK5-120 Rare earth elen nearby Sulaimani Steel Pla Kurdistan Roshna A. Hamarashid, že Mohi	ments distribution in soil int, Sulaimani Governorate, Region, Iraq ijka Fiket, and Ibrahim M.J. aldeen	GK5-94 Reservoir Charad Formation (Lower Mioce Kurdistan R Shadan M. Ahmed	cterization of Euphrates :ne) in the Garmian Area, tegion/ Iraq. i and Dler H. Baban	GK5-83 Mineralogy of Recordiver Basin East Missan Gordina River Basin East Missan Gordina, Ahmecond Ali Hassan Kadhim, Ahmecond Oma	ent Sediments of Al-Tee overnorate, Southeaster q. 1 Jawad Al-Naji, Mayso . r Ali
GK5-122 Spring Protectio study in the Rania Basin Ata Omer Salih, Diary Ali N	n Zone Delineation; a case , Kurdistan Region of Iraq. Aohammed Amin Al-Manmi	GK5-67 Biomarker geochem and Ain Zala crude oils, nor the Jurassic o Mohamed W. Alkhafaji Mola	nistry of Qaiyarah, Butmah, tthern Iraq: implications for source rocks. i, Kenneth Peters, Mike lowan	GK5-85 Clay mineral v Cretaceous/Paleogene (K/Pg area, Kurdistan Region/Ira chai Asaad I. Mustafa, Howri Ma Mohia	variations across the s) boundary from Sulairr q: implication for clima nge ansurbeg, and Ibrahim 1 ildeen
		Lunch			

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Hall 2	hair: Ibrahim M.Jaza Ali Ali	GK GK5-98 Soil Gas Survey and Cap Rock Evaluation for Garmian Area, Kurdistan Region / NE Iraq. Dler H. Baban and Shadan M. Ahmed	GK GK5-111 Seismicity and focal mechanism analysis of of the local earthquakes in the Iraqi Kurdistan region. Omar Qadir Ahmed	GK5-84 Quantitative Determination of Generated G Petroleum From The Naokelekan Formation In Ma Northern Iraq. tzger A. Abdula, Fawzi M. Albeyati, Aqeel Al-Zubaidi, Gullistan Khanamir, Gullzhin Qurtas Ima	GI GI arbonate reservatives analysis of Cretaceous Kometan arbonate reservoirs in the selected oil fields adjoining the boundary between High Folded Zone and Low Folded Zone NE Iraq. Fouad M. Qader, Danyar A. Salih	GK5-129 Source Rock Evaluation and Hydrocarbon Generation Potential of the Cretaceous (Dokan and Gulneri) formations in Bai Hassan-13 well section, Kurdistan, North of Iraq. Razawa H. Abdulrahman Sarraj	GK5-128 Flow Zone Indicators and Production Potentiality of the Lower Miocene Jeribe Reservoir from Selected Wells in the Hamrin Oilfield, Northern Iraq. Dler H. Baban and Muhamad B. Saeed	ssein Baban Secretary: Dr Salim Hassn Sula Discussion, Feedback and Certificati
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GK5-1

Microfacies Analysis and Depositional Environment for Yamama Formation (Berriasian- Valanginian), Southern Iraq

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Abstract

The deposits of two wells located at west Qurna oil field, Yamama Formation southern Iraq, have been studied, by preparing 200 thin sections, the studied microfacies have been divided into four microfacies, and seven sub- microfacies. Different skeletal components are present such as benthic foraminifera, corals, Calcisphonges, Ostracoda, Echinoderms, and sponge spicules. Benthic Foraminifera have been used as a tool that helps to predict the palaeogeographical environment for the sediment of Yamama Formation. The diagenesis affected the studied area like leached bioclasts, compaction, cementation, and micritization. The porosity was divided into primary and secondary porosity, the lower part of Yamama Formation for the studied wells has very little porosity downward to the prominent shell at the top of the underlying Sulaiy Formation and it is enhanced at the middle and upper part of Yamama Formation, the permeability increased at the grain stone and at mud-lean packstone microfacies, high energy environment located at the middle and upper part of formation which is a good indicator for the reservoir rocks. The depositional environment of these studied wells at the carbonate ramp is divided into six environments, proximal mid ramp, open marine restricted, shoal, lagoon, and peritidal environment.

Keywords: Yamama Formation; Cretaceous; Diagenesis; Microfacies; Iraq

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GK5-7

The Effects of the Fossils on the Petrophysical Properties in the Mishrif Formation (U. Cretaceous), Rumaila Oilfield, Southern Iraq

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Abstract

One of the biggest oil reservoirs in southern Iraq is the Mishrif Formation (M. Cenomanian -E. Turonian). It represents a carbonate platform ramp system with different environmental deposition, like shoal, lagoon and reef. Many types of fossils in the Mishrif Formation, therefore definition types of fossils that can be used as indicators to enhancing or reducing petrophysics properties (porosity and permeability), this process is valuable and supports the building of a geological model as well as making a distribution to the microfacies which can be rich with hydrocarbons and thus easy to choose the locations of drilling wells accurately in the oil reservoir. The study utilized various types of data from 21 wells in the North Rumaila oilfield which included: core data (conventional thin section, routine core analysis and special core analysis), cutting sample, wireline log data (conventional log and advance log) and final well report. Core data was used for petrography analysis and to study the impact of fossils on the petrophysics properties in the Mishrif Formation. Cutting samples are used to make picking the fossils, especially from the upper part of Mishrif Formation due to the core sample does not cover the upper part of Mishrif Formation. Thus, the fossils were distributed in each unit of the Mishrif Formation by statistical analysis. In the current study, the fossils divided into two groups, the first group as indicator to enhancing the petrophysics properties and the second group as indicator to reduce them, thus this is reflected on oil production and to confirm that by using the core data and wireline log data. Where it was explained how to impact each group on pore size distribution by NMR log, permeability distribution by routine core analysis and pore throat size by special core analysis.

Keywords: Mishrif Formation; Cenomanian; Rumaila oilfield; petrophysical properties; Southern Iraq.

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GK5-8

Sedimentological Study of the Euphrates River from Babylon to Basrah, Iraq

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Abstract

The Euphrates River is considered a famous one among the rivers in the world. The current study is an attempt to give information about the bed sediments from Hilla to Shatt Al-Arab at Basrah, through sedimentological investigations. Forty-two samples were subjected to grain size analysis, representing twelve core sampling sites. The sand fractions (fine-very fine) decrease from Hilla to Basrah cities, beside the interval depths from top to bottom, whereas the silt fractions increase in the same direction and the depth interval, because the water current decline. The light minerals are examined by a polarized transmitted microscope as well as SEM and EDS techniques. The light minerals consist of 95.7%, and the heavy minerals of 4.3% of the total counted grains. The rock fragments, particularly carbonate and chert are the predominant constituents and increase from Hilla to Basrah cities, followed by quartz reduced in the same pattern. In addition, the lowest abundance of feldspar minerals where recognize in lower values also decreases to the southern orientation. Monocrystalline quartz is higher than polycrystalline. However, plagioclase is lesser in proportion than potash feldspar (orthoclase and microcline). The river bed sands are litharenite classification, and petrogenically, are transition recycled to transition referring to orogenic recycled arc derivation.

Keywords: Grain size; Heavy minerals; Basrah, Sub mature; Monocrystalline; Microscope







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GK5-10

Groundwater Potential Recharge Zones of Wadi Al-Batin Alluvial Fan, Using Remote Sensing and GIS Techniques, Southwestern Iraq

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Abstract

Groundwater potential recharge zones (GWPR) is an important process in managing water resources. Six thematic layers were used to produce groundwater potential recharge zones for Wadi Al-Batin alluvial fan, southwestern Iraq with GIS environment and Analytical Hierarchical Process (AHP), including geology, lineaments density, slope, drainage density, soil, and aspect. Based on the importance, the thematic layers are ranked which control the GWPR. drainage density, lineament density, aspect and slope map area classified into five classes, whereas, geology and soil classified into six classes. The classes weighted based on the magnitude of groundwater recharge potential. The AHP technique divide the entire into three zones based on GWPR values: high, moderate, and low. The final GWPR results map demonstrated that the west and northwestern parts of the alluvial fan have greater groundwater recharge potentials with 70% of the total area due to increasing the infiltration rates because of the gravely and sandy soils besides the agricultural land used of the present areas. But the other part of the fan ranged between moderate to low with 25% and 5% of the total area, indicated suitable zones for groundwater artificial recharge processes.

Keywords: Groundwater potential recharge (GWPR); Analytical Hierarchy Process (AHP); GIS and RS; Al-Batin alluvial fan; Iraq.







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GK5-12

Using Joints as Evidences in Determining the Geometry and Causes of the Deflection Within Bradost Anticlinal Fold Axis, Zagros Fold-Thrust Belt-Kurdistan Region

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Abstract

Most of the folds in the Zagros belt are characterized by northwest-southeast trends, while some abnormal trends appear in some cases, but the deflection of the same fold axis is rare that can be seen in the Bradost anticlinal structure. The Bradost fold axis trend in the northwestern segment is 308° while the southeastern segment trend is 148°, which means there are 20° rotation happening in the fold axis trend. The structural evidence such as 1- the comparison between the trends of the Bradost fold axes in two segments with surrounding fold axes anticlines 2- joint analysis of hko acute about (a) system in two segments, indicates that the southeastern segment rotated 20° clockwise relative to the northwestern segment. The tectonic reason for this rotation in this huge anticline is due to transecting this anticline by Hadar-Bekhma transversal major fault. This fault creates two tectonic environment situations, the first one appears in the location of the intersecting of the fault with the northeastern limb, forming an extensional tectonic environment causing the appearance of opening structural features such as okl acute about (c) joint system accommodated with normal faults. While the intersection of this fault with southwestern limb characterized by predominate of the okl acute about (b) joint system accompanied with reverse fault. Due to the happening of these two tectonic environments within a single Bradost fold the southeastern segment of this anticline is rotated 20° clockwise with respect to the northwest segment.

Keywords: Fold axis; Deflection, Joints; Faults; Tectonic Environment







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GK5-13

Facies Analysis and Sequence Stratigraphy of Late Cretaceous Successions, Northern Iraq.

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Abstract

Aqra Formation is a shallow marine deposit of the late – Cretaceous sedimentary cycle, according to the field lithological description, the two studied sections of Aqra Formation are subdivided into three units. Based on sedimentological characteristics and fossils assemblage eleven facies have been recognized in both studied sections, their alternated association point to a wide range of depositional environment extended from tidal flat, back reef, reef, to the fore- reef. Based on the fossil's appearance, the studied sections comprise two fossils biozone (Orbitoides media zone (part) and Liftusia morgani zone), it is age determined to be late Campanian-Early Maastrictian in both studied sections. Sequence stratigraphic analysis, as calibrated by sedimentary facies and biostratigraphy delineated one sequence (Aqra sequence1) of 2nd order, their MFI correlation result with MFS studies in Arabian platform indicated to maximum flooding stage dominated on the Arabian plate at Latest Campanian.

Keywords: Sequence stratigraphy; Aqra Formation; Maastrichtian; Late Campanian.







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GK5-15

Hazard and Risk Intensity Mapping for Alluvium Intergranular Aquifer Using GIS Based System: A Case Study from Shwan Sub-basin, Kirkuk, Iraq

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Abstract

Groundwater from alluvium intergranular aquifer (AIA) is considered as one of the most important sources of potable water need for the agricultural, industrial and domestic activities within the Kirkuk governorate. The current article aims at the assessment of the water reserve within the AIA quantitatively, and to provide suitable suggestion for the protection of the groundwater from pollution using comprehensive approach based on the European COST Action 620 by combining the vulnerability, hazard and risk intensity mapping. The groundwater vulnerability map was constructed using DRASTIC system. The components of unclassified and classified hazard maps were constructed by taking the product the ranking factor (Q_n), weighted hazard value (H₁) and the reduction factor (R_f). Thirteen types of hazard feature (polygons and points) were used. The risk map was formed based on the superimposing the previous maps, vulnerability and hazard maps, and it shows that risk levels divided into the classes (1, 2 and 3) and ranged between "very low - moderate" zoning classes. The range of the zone was as follows; very low risk zone represents 85%, low risk zone (13%), while moderate zone represents (2%) from total area of the sub-basin. Fortunately, there is no high and very high-risk zones within the area of interest.

Keywords: Alluvium Intergranular Aquifer; DRASTIC Model; Hazard Index; Risk Assessment.

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GK5-19

Water Chemistry and Modeling of Fluid- Rock Interaction for Improve Oil Recovery in the Mishrif Formation, Halfaya oil field, Misan

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Abstract

The Upper Cretaceous Mishrif Formation is the most important reservoir in the Middle East, which is developed widely and has been highlighted for a long time in Iraq. The importance and success of water injection are therefore highlighted by the example of the Mishrif (carbonate) reservoir saw water injections start in 2010. In this study, taking the Halfaya Oil Field as an example, geochemical characterization and mixing of oil reservoir formation water and sources of water are important in the study of the impact on the petrophysics properties. A total of 12 formation water samples were collected from oil wells in Halfaya oilfields producing from the Mishrif Formations. Three surface water samples from Tigris River and two samples from producing water formation were also collected. Geochemical parameters on-site and in the laboratory were investigated. The composition of the Mishrif formation water was characterized by a high average of TDS (201,084mg/l). The contribution of cations as epm% were Na (82.17), Ca (11.41), K (3. 27), and Mg (3.18), while anions contribute as Cl (99.60), CO3 (0.25), HCO3 (0.08), and SO4 (0.005). The water type of Mishrif brines were of Na–Ca– chloride type. The SO4 ion is depleted due to biodegradation. The biological examination showed that the water of Tigris River was Polluted by sulfate-reducing bacteria (1400







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CFU/mL), but it was absent in producing water. The water quality indexes (Langelier, Ryznar, and Puckorius) indicate that the formation waters in Mishrif are "scale forming but noncorrosive" and lightly saturated for calcite and dolomite. High mineral dissolution through the field is a result of the flushing of the producer formation due to oil production operations, Na– Ca exchange, and dissolution–precipitation of ions and salts from the formation rock. The results suggested that high salinities in Mishrif formation waters resulted at least partly from halite dissolution, and were subsequently modified by diagenetic reactions. Relationships among the chemical compositions of formation waters, the mineralogical compositions of their host rocks, and depth suggested that dissolved cation concentrations in the formation waters are controlled predominantly by dissolution and recrystallization of calcite, as well as by leaching or dissolution of clay minerals.

Keywords: Mishrif Formation; Halfaya Oilfield; Geochemical Modeling; Brine water; Carbonate reservoirs, Scaling, Iraq.







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GK5-20

Petrophysical Properties of Carbonate Rocks of Sargelu Formation in Northern Iraq Based on Wireline Log by Using Tech-Log Software

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Abstract

Northern Iraq is a new finding of hydrocarbon onshore. This research belongs to the Zagros fold and thrust belt. The current research focuses on the identification of petrophysical properties which are shale volume, porosity, lithology, and fracture analysis of the carbonate rocks of the Sargelu Formation based on conventional Wireline log in Erbil/ Harrier block oil field/ Mirawa well-1. Conventional open hole wireline log included: Gamma-ray, Calliper, bit size, Neutron porosity, Bulk Density, three sonic types, three Resistivity, photoelectric, uranium, thorium, and potassium. Wireline log shows that Sargelu Formation is divided into five units which are lime shale, shale lime, shale, dolomitic limestone, and lime dolomitic. These different units were derived from different cross plots. Sargelu has the potential for reservoir and source rocks. Shale volume is calculated by different methods to understand the rock properties of Sargelu and the percentage of the shale for each zone. Wireline log shows that the average shale volume is between 0.20 to 0.60 % for shale zones and it is between 0.0 to 0.20 for clean zones. Fractural analysis calculated by subtracting the sonic porosity from Neutron –Density is low due to heterogeneities. Wireline log shows that average porosity ranges between 8-10%, average fracture porosity is 6%, formation water resistivity is 0.03 and Mud filtration resistivity is 0.17.

Keywords: Reservoir properties; Sargelu Formation; Tech-Log Software; Zagros fold belt; Northern Iraq.







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GK5-21

Determination of impacts of the climate change in temperature and rainfall variations in some southern Iraqi Governate using GIS

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Abstract

The concept of temperature change is closely related to climate change. Global warming is one of its most prominent manifestations, and the effects of this will be significant on the climate. It will lead to an increase in the intensity of the air cycle, the encroachment of climatic regions towards the poles, an increase in the frequency of extreme weather phenomena, a change in the distribution of heat and rain in different cities of the world, and a rise in sea levels and the threat of most coastal areas. The research aims to determining the variation in temperature, the amount of rain, and its distribution system in the (Basra, Dhi Qar, Missan) during the period (1998-2020), and diagnosis changes in temperature, rain amount and their cause, as well as its distribution system by analyzing the trend of change in the annual averages of temperature and annual rainfall amounts for the same study period The results of spatial analysis using GIS for monthly temperature average data for the same period indicated that the general trend of temperature distribution in all study stations is high, and the peaks during the months (June, July, August, and September), where we notice a large and clear increase, especially in recent years, if compared with rates in previous years. As for the rain data analysis in Iraq, the study found that it was limited to five months (Nov., Dec., Jan., March, April), and October month, which represents the beginning of the rainy season in most monitoring stations, and the month of March, which represents its end, did not record any amount of rain, and this means that the depressions which Iraq exposed to during these two months are unable to produce heavy amounts of the rain because of their shallowness, from the spatial distribution of the amount of rain in the study area that the rainfall rates are reduced to the highest level and its irregular distribution, and therefore reflected in the decrease in water resources in the areas under study. The depressions responsible for the highest amounts of rain in Iraq are sometimes characterized by their short duration of stay, also the southern Europe depressions and Sudanese depression effect, this makes Iraq's rains few, and this led to many repercussions on the climate state on one hand, and on the environment, man and his various activities on the other.

Keywords: Climate change; Southern Iraq; Spatial analysis and GIS.







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GK5-22

Depositional Environments of lower Sa'adi Formation, Southern Iraq

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Abstract

The Sa'adi Formation is a part of the late Cretaceous period in the Santonian-Campanian stage that represents a potential hydrocarbon-bearing reservoir across many oilfields in the Mesopotamian Basin, South of Iraq. The Formation was divided into two main parts as a stratigraphy sequence. It consists of chalky limestone with argillaceous limestone in the upper part and limestone with marly limestone in the lower part. The lower part is considered an important stratigraphic unit marked by petroleum shows. Thus, current research constructs the depositional environment, evaluates the reservoir, and predicts the best zones with good reservoir quality. The microfacies analysis was carried out on thirty-five thin sections to reveal the primary depositional environment, and well logs data were used to evaluate the petrophysical properties of the lower Sa'adi Formation. Four microfacies appeared related to the carbonate ramp, which identified the depositional system track from mid to inner ramp. These are; mudstone, wackestone, packstone, and grainstone. Twelve submicrofacies were identified and interpreted in the lower Sa'adi Formation. These are pelagic lime mudstone to benthic foraminiferal-argillaceous wackestone in middle ramp experienced burial diagenesis and syngenetic diagenesis with intra-fossil pores. The results characterize the bioclast echinoderms, bivalves, and algae packstone to grainstone in inner ramp (open marine and shoal environments) experienced marine pore-water diagenesis, meteoric freshwater dissolution, and burial diagenesis. Shoal facies with open marine facies are the best favorable microfacies in the lower Sa'adi Formation. Diagenesis processes were represented by dissolution that improved the porosity and permeability with higher reservoir quality in the inner ramp; besides that, it recognized that cementation and micritization reduced the reservoir quality in the middle ramp.

Keywords: Sa'adi Formation; microfacies; ramp; Diagenesis processes.







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GK5-24

Biostratigraphy and Chronostratigraphy of Late Jurassic-Early Cretaceous in Selected Areas at Kurdistan Region, Northern Iraq

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Abstract

The Biostratigraphy and Chronostratigraphy of Late Jurassic-Early Cretaceous (Tithonian -Aptian) successions at three outcrops in Kurdistan Region, Northern, and northeastern Iraq (Amadia, Gara and Barsarin sections) are studied depending on their Ammonite, planktic and benthic foraminiferal contents. The studied formations: Chia Gara, Sarmord, and Qamchuqa, are recorded in all studied localities, while Garagu and Balambo formations are exposed at some studied localities. Age determination of Chia Gara Formation has relied on the Ammonite fauna. The studied ammonites represent the main assemblage fauna of Durangites Zone which had been corresponding late Tithonian age. The detailed planktic foraminiferal investigation in Balambo Formation permits the recognition of five well defined zones, these are Favusella hoterivica Interval Zone, Hedbergella sigali Interval Zone, Globigerinelloides Ferreolensis Interval Zone, Globigerinelloides Blowi Interval zone, and Globigerinelloides Algeriana Taxon range Zone (part), which reveal a Late Valanginian to Late Aptian age. The stratigraphic distribution of the benthic foraminifera shows three zones, these are: Everticyclammina Kelleri Assemblage Zone, Pseudocyclammina Lituus assemblage zone and Palorbitolina Lenticularis taxon range zone, the 1st and 2nd zones were recognized in the Sarmord Formation at Amadia section, which extend in age from late Valanginian to Hauterivian. While the 3rd zone is recorded from Qamchuqa Formation at Gara section representing early Aptian age.

Keywords: Biostratigraphy; Chronostratigraphy; Kurdistan Region and Northern Iraq.







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GK5-28

Preparing of Isotopes Databases for Groundwater in Iraq and Relationship Study of it with Surface Water

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Abstract

This study is prepared to constitute an isotopic database of Deuterium (δ^2 H) (and Oxygen18) $(\delta^{18}O)$ for groundwater and its relationship with the isotopic footprint of rainwater and Tigris . Euphrates and Divala rivers in Iraq. The 311 samples were collected between 2013-2021 and analyzed using a Liquid-Water Isotope Analyzer (LWIA). The study covered different regions of Iraq vincluding the Western region Northern region (Samarra Shirqat Khanaqin vand Kirkuk) (central region (Baghdad (Karbala (Najaf (Diyala)) (and the Southern region (Samawah 'Nasiriya 'Diwaniyah 'Basra). The isotopic measurements showed a linear relationship between the two stable isotopes (δ^{18} O $\cdot\delta^{2}$ H) with a slope of 7.38 and excessive deuterium reach to (-9.4597) compared with the excessive value of the domestic rain line of (14.15). It is defined according to the local meteoric water line equation (LMWL $\delta^2 H = 7.7035$ * $\delta 180 + 14.158$), which characterized a fingerprint of groundwater and showed the impact of the climate on it. The study showed a significant interaction between groundwater and surface water of Tigris and Euphrates Rivers in the Southern region of Iraq, due to the aquifers in these areas are close to the surface with depth ranges between (6-40 m) and high porosity that is simulative of the sedimentary plain characterization. The samples of these areas calculated the highest and the lowest value for δ^2 H of (‰0 12.04) and (-36.14‰0) respectively. A similar result was found in the western regain. this region recorded the highest value of $\delta^2 H$ (-4.42‰) and the lowest value (-42.2%) 'The depth of the wells has ranged between (2-22 m) 'which explains the relationship between the groundwater and the rainwater and Euphrates River. However the study indicated that the wells in Divala Governorate have depth ranges between (10-70 m) and were not affected by rainwater or Diyala River with the highest and lowest value for δ^2 H of (4.66‰) (-38.54‰) (respectively. On the other hand (the highest and lowest values of δ^2 H were recorded in Khanagin area with a value of (-13.48‰) and (-32.67‰) respectively.

Keywords: Stable isotopes; Groundwater; Deuterium isotope; Oxygen isotope; Climate change.







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GK5-30

Direct Hydrocarbon Indicators (DHIs) as Seismic Tools to Predict Existing of Hydrocarbon in the Subtle Stratigraphic Trap, in Mishrif Formation at Dujaila Oil Field, SE of Iraq

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Abstract

The aim of the current study is utilizing the Direct Hydrocarbon Indicators (DHIs) technique to identify the presence of hydrocarbons in the Carbonaceous Mishrif Formation (Late Cretaceous) from the 3D-post-stack seismic data integrated with available information of two wells (Du-1 and Du-2). The 3D-seismic survey was carried out in 2010, covering 617.31 km2, at the Dujaila oil field in Maysan Governorate, SE of Iraq. Distinct seismic features for hydrocarbon presence indicators were diagnosed and clearly identified on both sections of seismic amplitude and instantaneous phase, such as dim spots, flat spots, and phase polarity reversals. They helped in directly detection of the presence of hydrocarbon accumulation in the stratigraphic trap, in the region around well Du-1 at upper part of Mishrif Formation, which is located at a time extending from -1730 ms in the top Mishrif to underneath at a time -1775 ms that corresponded with depth 2825 m to 2887.5 m, respectively. Furthermore, based on the well-defined of the position of flat spot, which represents oil/water contact; it helped to determine the length of the oil column was about 56.8 m in the vicinity of productive well Du-1. It is closer to the actual length of the oil column measured in the well was 49 m. This may provide a reasonable explanation for the increased length of the pay zone column compared with the reservoir structure volume that is due to the existence of a reefal subtle stratigraphic trap.

Keywords: Direct Hydrocarbon Indicators (DHIs); 3D-seimic survey; Mishrif Formation; Oil column; Stratigraphic trap; Flat spots; Dim spots; Polarity reversals.







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GK5-31

Climatically and Hydrogeological Study of Rabia Sub-basin NW- Iraq

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Abstract

Depending on climatic parameters, the climatic of the study area is arid. The water surplus was observed in the study area during the period of the 30-year approximately period was 12.4% of the total rainfall. The value of groundwater recharge was 16.7 mm/year with a rate of 5.37% which represents the percentage of groundwater recharge from the total rainfall. The water table levels in the study area ranged from (321 to 409 m) above sea level, the main direction of flow net from west to east, while the values of saturated thickness (b) for the Rabia sub-basin ranged between (73 and 127 m).Depending on the results of pumping test analysis from eight wells, the hydraulic conductivity values (K) of the Rabia sub-basin aquifer ranged between (2.91 to 5.55) m/day. The Transmissivity (T) values ranged from (235.3 to 704.2) m²/day, while the storage coefficient (Sc) values ranged between (1.16 x 10^{-4} to 3.98×10^{-4}). This value indicates that the aquifer is confined.

Keywords: Groundwater; Pumping test; Storage coefficient; Transmissivity.







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GK5-32

Some New Ostracode Species of Genera Schneiderella, Sulcostocythere, Neomonoceratina, From Fat'ha Formation (Middle Miocene) in Takia Area, Darbandi Bazian Anticline, Sulaimaniya, Kurdistan Region, North-Eastern of Iraq.

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Abstract

Five new Ostracode species belonging to Three genera from Fat'ha Formation (Middle Miocene) in Takia area, Darbandi Bazian anticline, and Sulaymaniyah, North Eastern of Iraq. These species are *Schneiderella Takensis sp.nov., Schneiderella Bazensis sp.nov., Sulcostocythere Takensis sp.nov., Sulcostocythere Bazeansis sp.nov.,* and *Neomonoceratina Takensis sp.nov.*

Keywords: Ostracodes; Middle Miocene; Fat'ha Formation; North Iraq.







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GK5-34

Late Oligocene-Early Miocene Benthic Foraminifera from the Darzila Section, Sangaw area, Kurdistan Region, Iraq: Biostratigraphy and Paleoecological Significance

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Abstract

Biostratigraphy and paleoecology of the Anah Formation are investigated for the first time in the Sangaw area, Sulaymaniyah Governorate, Northeastern Iraq. Forty species of larger foraminifera and skeletal fragments of coral, echinoid spine, pelecypods and gastropods, are described in seven samples collected from the Darzila section. Based on the distribution of the larger benthic foraminifera and other skeletal grains, two assemblage biozones of Late Oligocene-early Chattian age have been recognized. The carbonate deposits of the Anah Formation in the studied section are mostly composed of coralline and large flat benthic foraminifera. The biotic associations identified in this study suggest that the carbonate sedimentation of the Anah Formation thrived in tropical to subtropical waters under oligotrophic to mesotrophic middle ramp environment with normal seawater salinity to a higher salinity inner ramp setting and at water depths that ranged from 40 to 80 m.

Keywords: Benthic Foraminifera; Late Oligocene;Early Miocene; Biostratigraphy; Paleoecology; Kurdistan Region; Iraq.







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GK5-37

Utilizing Mud Log Gas Data to Identify Reservoir Fluid: A Case Study of the Zubair Oilfield in Southern Iraq

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Abstract

Real-time reservoir fluid identification is important for optimizing the formation evaluation program and adjusting the planned well program, especially when combined with wireline logs interpretation to improve future logging and well-testing. Characterization of reservoir fluids during drilling involves evaluating light gases delivered by drilling mud which are produced by formation rocks being penetrated. In this study, collecting and analyzed mud log gas data collected from the Zubair reservoir section and gas chromatograph (GC) during drilling. from five wells (A, B, C, D, and E) in the Zubair oilfield. The gases tested included methane (C1) through pentane (C5), which were identified in real-time by the gas chromatograph in the mudlogging units. The C1-C5 gas ratios were used to compute the Wetness ratio (Wh) and the Hydrocarbon Balance (Bh) in the 3rd and 4th pay reservoirs. Compared to the actual well test, the results provided reasonable indicators of fluid type and discrimination between heavy and light hydrocarbons in the reservoir section where it shows that the lower sandstone member in Zubair Formation had gas potential, while the upper member is an oil-bearing zone, also the Pixler diagram describes the variation of gas concentrations between the northern and southern part of Zubair oilfield and increases towards the crest far from the flanks.

Keywords: Mud log; Fluid evaluation; Light gas; Zubair oilfield.







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GK5-38

Petrophysical Properties and its Reservoir Quality of The Early Miocene Carbonate: A Case Study of Jeribe Formation (North of Iraq).

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Abstract

Heterogeneity in rock texture and petrophysical properties distribution in carbonate rocks is derived from the entire geological history for initial deposition through compaction, stress history, cementation, and dolomitization diagenetic modifications which alter the rock characteristics especially the porosity and permeability extension, and consequently reservoir quality. In this research, the porosity and permeability distribution of the Eocene, Jeribe Formation which forms the key Tertiary reservoir in the Kirkuk embayment zone rock six fields, two licensed blocks, and one outcrop structure were studied. Helium porosity, helium Klinkenbergcorrected permeability, Nuclear Magnetic Resonance (NMR), Mercury Injection Capillary Pressure (MICP), Scanning Electronic Microscopy (SEM), photomicrography of thin sections, and wireline log data have been used to examine the petrophysical properties variations and identify the factors of reservoir heterogeneity. The results show that the Jeribe Formation has porosities ranging from 0.6 \pm 0.5% to 37.7 \pm 0.5%, with an arithmetic mean of $24.16 \pm 0.5\%$ and permeabilities from 105 ± 0.08 nD to 172 ± 0.2 mD. Five types of pore systems have been identified based on pore origin, pore structure and subsequent diagenesis, dolomitization and micro scale fracturing: (i) nano-intercrystalline pores between calcite crystals, (ii) micro-intercrystalline pores between dolomite crystals and (iii) meso-macro moldic pores resulting from dissolving of fossils chambers (iv) mesomacro vuggy pores derived from dissolved intercrystalline pores and pre-existing dissolution of moldic pore products and (v) tectonic micro fracture pores. Throughout the north and north-eastern parts of the Kirkuk embayment fields and outcrop sections interconnected nano-intercrystalline pores were found that correspond to highly cemented and compacted rock units with pore throat diameters less than 0.1 µm were identified these were interpreted as tight reservoir quality. By contrast, in the south and south-western fields of the Kirkuk embayment zone fields, the micro - intercrystalline, meso-macro moldic, and vuggy pores which are connected via pore throats







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greater than 5 μ m derived from dolomitization and dissolution are interpreted as having a good reservoir quality throughout. Furthermore, the tectonic fracture distribution enhanced the reservoir pore connectivity and the reservoir quality where it occurred.

Keywords; Porosity; Permeability; Pore type; Pore size; Carbonate reservoir; Jeribe Formation.






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GK5-42

Crustal thickness, Vp/Vs, and Poisson's Ratio of the Western Mesopotamian Plain Edge Detected from Inversion of Receiver Function

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Abstract

The crustal thickness, Vp/Vs, and Poisson's ratios are important parameters that are used to understand the crustal structure, composition, deformation and evolution. The inversion of receiver function technique was employed to determine the crustal thickness, Vp/Vs, and Poisson's ratios (σ). The Computer Programs in Seismology were used to analyze the receiver functions of the selected earthquakes recorded at the two seismic stations in Anbar (ANB1) and Karbala (KAR2) (CPS). Results of inversion of the receiver functions show that the crustal thickness in the western edge of the Mesopotamian plain ranges from 44 to 46 km. The obtained crustal thickness value is consistent with that reported in the platform regions. The crustal Vp/Vs of the study area is 1.79. This value is typical for the platform region and andesitic rocks. An intermediate value (0.27) of the crustal Poisson's ratio was reported. It indicates that there is little difference in the felsic and mafic contents of the crust.

Keywords: Crustal thickness; Vp/Vs ratio; Poisson's ratio; Receiver function; Mesopotamian Plain.







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GK5-44

Microfacies and Sedimentary Model of the Shuaiba Formation (Lower Cretaceous), in Selected Wells Southern Iraq

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Abstract

The Shuaiba Formation (Aptian age) is an important formation in Iraq because of its deposition at significant period in the geological history of the Arabian plate. The study focused on several wells, these are: ZB-290, WQ1-353, RU-358, R-624, R-5 from several selected fields, southern Iraq, namely Zubair, Rumaila and west Qurna oilfields. The purpose of the study is to determine the sedimentary and paleontological components of Shuaiba Formation. The lithology of Shuaiba Formation consists of very fine crystalline massive limestone and gradually convert to chalky limestone with large percentage of dolomites. The thickness of studied formation is about 50 - 110 meters. Microfacies of the studied area are classified into two main types: carbonate and dolomite. The carbonate subdivided into five secondary types, Burrowed bioclastic lime mudstone, Planktonic Foraminiferal lime mudstone, larger Foraminifera wackestone, algal wackestone and mixed planktonic and benthonic Foraminifera wackestone, on addition to dolostone microfacies. The effect of the diagenesis in the present formation was distinguished, most of these processes were destructive such as dissolution and stylolite. The first depositional stage of the investigated area began with sea level rise following the deposition of the Zubair Formation from still stand. Shuaiba Formation deposited within the ramp setting as the water level rose. During the late Aptian, tectonic and sea level were the active factors controlled in the deposition of studied formation. Shuaiba Formation had more than depositional environments, these are from the shallowest: restricted, open marine (inner ramp), mid ramp and finally outer ramp, according to data collected from microfacies and diagenesis processes. Generally, the formation reflects deep deposits then started to less deep until to be shallow basin (Nahr Umr).

Keywords: Shuaiba Formation; Lower Cretaceous; Microfacies; Southern Iraq.







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GK5-45

دراسة بيئية وتصنيفيها لمستحثات الفور امنيفرا والاوستر اكودا لمناطق مختاره من أهوار جنوب العراق

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المستخلص

بنيت هذه الدراسة المستحاثية للنماذج الرسوبية اهم الحشود الحياتية الموجودة في الجزء الجنوبي من حوض وادي الرافدين والمتضمن كل من اهوار شمال البصره (اهوار الرميله واهوار المصب واهوار حدود الناصرية) .وتعد الدراسة الباليونتولوجية والرسوبية من الدراسات المهمة فيها لتحديد البيئات الرسوبية وذلك بالاعتماد على انواع معينة من المستحاثات اللافقرية ولقد لقي علم الباليونتولوجي في تحديد البيئات اهمية كبيرة في الاعمار الجيلوجية المختلفة.

Keywords: foraminifera; ostracod; Southern Iraq.







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GK5-47

The Integration Core, Image Log and Conventional Logs to Understand Reservoir Rock Type of Mauddud Formation

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Abstract

Inner ramp carbonates with dolomitic limestone make up the Late Albian Mauddud reservoir in Iraq. The age of the Mauddud Formation is Albian-Early Cenomanian, and it overlies the Nahr-Umr Formation and the Ahmadi Formation. The depositional environments range from subtidal to lagoon and shoal environments. The main goal of this study is to integrate all the available information to recognize different rock types within Mauddud reservoir. Due to the limited core available in Mauddud reservoir, the rock types have been identified mainly based on the full-bore formation micro imager tool. The formation micro imager readings were compared and calibrated by available core data and conventional well logs (Density Neutron). This study concludes that there are three rock types recognized within Mauddud reservoir: the first is cemented wackestone and packstone which is characterized by having low porosity and permeability ($\Phi < 10\%$, perm<0.1 md). The image reflection of cemented wackestone and packstone is almost like a massive image reflection. This rock type usually reflects the intertidal environment. The second rock type is wackestone to packstone with a porosity value of between 10% and 15% and a permeability range of 0.1–1 mD. This rock-type image reflection generally shows mixed laminated and fine mottled size image facies that is shown in the lagoon environment. Finally, the third rock type is grainstone, which is characterized by having relatively higher porosity and permeability than rock types one and two (porosity is more than 15 pu and permeability is more than 1 mD).

Keywords: Reservoir Rock type; Lithofacies; Image facies; Mottled.







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GK5-51

Rock Slope Stability Assessment for Selected Sites at Imam Mohammed Road \ Sulaymaniyah Governorate \ Northern Iraq

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Abstract

A detailed engineering geological study was made for rock slope stability for several selected sites at Imam Mohammed Road that connects Sulaymaniyah City and Darbandikhan Town, the study included four sites in which a comprehensive survey was made for the rock slopes, the rocks forming them, and discontinuities affecting in them. The assessment of rock slope stability of the sites was made through the stereographic projection, to determine the status of the slopes and discontinuities, field measurements revealed many occurred and probable failure types represented by the rock fall and sliding. The rock slopes were also classified based on Al-Saadi (1981), and the rocks forming the slopes were geometrically described based on Anon (1974), and Hawkins (1986). The risk of each site was also assessed depending on the Landslide Possibility Index (LPI) suggested by Bejerman (1998), which showed that the first site lies within the (moderate hazard) category whereas the others lie within (High hazard) category. Finally, some treatment strategies are proposed to stabilize the slopes and decrease the danger of their collapse on the road.

Keywords: Slope Stability; Landslide Possibility Index; Stereographic Projection; Discontinuities.







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GK5-54

The Relation of Recorded Velocity Behavior with Geological Formations Thickness in Iraq

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Abstract

This research includes the mechanism of velocity analyses from the available data of Iraq wells velocity surveys and comparison with geological formations thicknesses within the sedimentary basins, as well the comparison with the Bouguer gravity map, which depends mainly on the lithological densities differences along to sedimentary formations, showed completely corresponded with a depositional basin of Mesopotamia region in the mid of Cretaceous period Formations, another side with the sedimentary basin of Al-Rutba region within the Western Desert in the Palaeozoic era. This comparison aims to reach the relationship of the depositional thickness and its distribution with Lateral variability of velocity behaviors that followed regionally with sedimentary basin areas across Cretaceous and Tertiary formations, on the other hand, the seismic stack-velocity importance and their application to a selected area within the Nineveh patch, that showed implicitly the faults systems and regionally the structural shape. The research recommended that the optimal output of the seismic velocity within the picked reflector can give a sedimentary and compositional visualization of areas, that have not been drilled or where well velocity survey data is not available, especially in the western desert regions of Iraq.

Keywords: Check-shot; Bouguer; Behaviors; Stack-velocity; Nineveh.







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The Role of Salt Tectonics on Developing the Zubair Subzone Oilfields and Neotectonic of Area from Both Seismic Section and GIS, Southern Iraq

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Abstract

Zubair sub-zone in southern Iraq contains most of the giant productive oil fields in Iraq. This study aims to reveal the uncertainty of the effect of salt tectonics in creating the oilfields in the Zubair subzone area, many researchers studied the effect of salt in this area from gravity data and surface evidence; this approach added a new tool to prove the presence of salt tectonics from seismic sections. Three structures were taken including Rumaila, Zubair, and Jabal Sanam structures to fulfill this study. The seismic section interpretation of these structures proves that a non-piercement salt plug existed in all Rumaila and Zubair oil fields and reached the surface only in Jabal Sanam structure. Neotectonics within the area concluded from DEM and satellite images, can be seen in faults within the Al-Batin active alluvial fan which covered nearly most of Rumaila oilfield. The change in Euphrates River in Qurna City is due to the uplift from the west Qurna dome beneath the river. A Suggested structural model of Rumaila, Zubair anticlines, and Jabal Sanam dome shows the effect of Hurmoz salt on developing these structures was created based on information retrieved from geophysical data.

Keywords: Neotectonic; Salt dome; Zubair sub zone; Rumaila oilfield; GIS.







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GK5-60

Rare Earth Elements Compositions in Fluvial Sediments of The Lesser Zab River Basin, Northeastern Iraq

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Abstract

In the last decades, rare earth elements (REEs) have gained enormous attention in geochemical studies worldwide as a result of their important role in modern advanced industrial improvement. REEs of river sediment have been widely used for provenance determination, and in geochemical studies of continental crust, rock and sediments environments, and anthropogenic pollution. In total, we collected twenty-three samples of fluvial sediments from the Lesser Zab River Basin (LZRB) (i.e., eight from the main river course of the Lesser Zab River (LZR) and fifteen from its active sub-basins) during rainy or high flow season. All samples were analyzed to identify their composition from REEs. A fraction of fewer than two millimeters of river sediments were used to carry out the geochemical analysis. Our results show that within the LZRB, the REEs concentrations of the LZR and sub-basin samples in the upper part are generally higher than those of the lower part. Hence, the types of the sediments and rocks are the major factors controlling the concentration of the REEs compared to the other factors. The concentration of the REEs of almost all the studied samples is lower than North American Shale Composite (NASC) and Upper Continental Crust (UCC), except for Sub basin sediment Sbs2, which is higher than those references. Also, the river sediment sample of Zrs4 is slightly higher than NASC. Light rare earth elements (LREEs) display enrichment relative to heavy rare earth elements (HREEs) with a range between 7.15 μ g/g and 12.37 μ g/g for LZR samples and between 5.95 μ g/g and 13.03 μ g/g for the sub basin samples.

Keywords: Rare earth elements; Lesser Zab River Basin; Fluvial sediments; ICP-MS.







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Seismotectonic Analysis for the Seismic Activity at Part of Eastern Border Line of Iraq Using Remote Sensing and GIS Techniques

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Abstract

The northern-east and east areas of Iraq consider as one of the most important areas geologically, because these areas have different geological structures with very complicated morphology and situated near to Zagros Suture Zone (the collision zone between the Arabian and Eurasian plates). Therefore, these areas are very active seismically and tectonically, from this point this study has been focused on the geological interpretation and seismic activity analysis of the seismic events of the last 30 years on the eastern side of Iraq. The purpose of this study is to explain the sources and reasons of this seismic activity and to demonstrate the seismic activity scenario in that area. This study refers to Mountain Front Fault (MFF) as a fault plane for this seismic activity, because this fault considers as one of the most effective faults in Lorestan promontory within Zagros zone. Moreover, the study refers to the continuity of the seismic activity regularly in this area. Remote sensing data, USGS data, Geo Forschungs Zentrum (GFZ) data, and other data of the international seismological institutions have been used as database in this study to locate the intensity of the seismic activity in this area and to prepare a hazard maps and disaster risk reduction plan for that area to avoid any fatal loss and to reduce the damage in the infrastructure. As a final result a disaster risk reduction model has been produced to demonstrate the risky zone of the seismic activity in the area and to help in updating the seismic code of the area.

Keywords: Disaster risk; Lorestan; Remote sensing; Seismic activity; Zagros; GIS.







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GK5-64

A New Methodology to Predict Basin or Intrusion from Gravity Data, A Machine Learning Approach

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Abstract

Basin and Intrusion structures are very important features in defining and assessing the evolution of tectonic geo-structures. The gravity effects for basin and intrusion structures are similar in form, shape, and value. Attempts to characterize these structures from gravity data are done depending on derivation methods such as second horizontal and absolute second horizontal derivative methods. The task of the discriminator is to determine whether the data presented is refer to a Basin or Intrusion. Hence, it's just a binary classifier giving the output as 0 (for Basin) or 1 (for Intrusion). Classification is a task that requires the use of machine learning algorithms that learn from data sets how to assign a category label to examples from the problem domain. An easy-to-understand example would be classifying gravity data as "Basin, 0" or "Intrusion, 1". To learn the machine, how to classify the given data into 0 or 1, big data for training is needed. Later on, the learned machine can predict any given test data to the state of (0, 1). Therefore, the procedure is simply to prepare a huge synthetic data set (from 2D gravity modeling) for the Basin and Intrusion case. Then, dividing the data sets to 80% data for training and 20% for tests. Label this 80% data set with 0 for Basin and 1 for Intrusion. Next, training these 80% data sets using some algorithms that are specifically designed for binary classification and do not natively support more than two classes. These include Logistic Regression and Support Vector Machines. A confusion matrix is used to evaluate the accuracy of learning. The following step is to let the learned machine predict a label for the 20% data set. Python code programming is usually used for this type of analysis. Orange program for visual programming and data mining is used in this study for training and predicting. The result of the prediction is perfect for the tested data. A field data for some cases from the Bougure gravity data of Iraq is tested with the learned machine and give similar results to that used absolute second horizontal derivative. The saved model of the learned machine can be used for the prediction of basin or intrusion case study for any future work.

Keywords: Basin or Intrusion; Machine Learning; Logistic Regression; Support Vector Machine.







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GK5-67

Biomarker geochemistry of Qaiyarah, Butmah, and Ain Zala Crude Oils, Northern Iraq: Implications for the Jurassic Source Rocks

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Abstract

Triassic successions are generally considered the main source rocks that charged the oilfields in northwestern Iraq, such as Butmah and Ain Zala. In this study, fifteen crude oils from the Qaiyarah, Butmah, and Ain Zala fields were investigated using organic geochemistry to test this hypothesis and to infer organic matter maturity, depositional environment conditions, and lithology of the corresponding source rocks. For this purpose, sulfur content and stable carbon isotope ratios were measured for all samples, and saturated and aromatic biomarkers were analyzed by gas chromatography and gas chromatography-mass spectrometry (GCMS). Low pristane/phytane (0.68-0.82) and high C35S/C34S (1.03-1.66) and homohopane indices (0.14-0.24) indicate source rocks deposited under anoxic or euxinic conditions. In addition, sulfur content, C30 norhopane/C30 hopane, C31R/C30 hopane, C27 diasteranes/regular steranes, and Ts/Tm suggest carbonate source rocks with variable clay content containing type II or type II-S kerogen. Moretane/hopane, hopane, and sterane isomerization ratios suggest generation from early mature organic matter. Hierarchical cluster analysis of 20 source-related parameters identified three families generated from carbonate source rocks with variable clay content and maturity. Oil-source rock correlation and age-related biomarkers suggest that the Qaiyarah oils were generated from the Sargelu Formation and the Ain Zala and Butmah oils were generated from Jurassic source rocks outside the Ain Zala area but within the neighboring area northeast of Butmah and Ain Zala.

Keywords: Qaiyarah; Butmah; Ain Zala; Biomarker; Chemometric analysis.







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GK5-71

Impact Spherules from the K-Pg boundary: A first Record from Duhok Area, Kurdistan Region, North of Iraq

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Abstract

The impact spherule deposits, commonly known as ejecta from the Chicxulub impact at Yucatan, Mexico, exist in many K-Pg (Cretaceous-Paleogene) sections as thin impact spherule layer frequently cited as proof for the impact global theory. We evaluated this claim in K-Pg boundary sequence of Bade section in the Duhok area based on high-resolution biostratigraphy of planktonic foraminifera and mineralogical analysis of the spherule deposits. The contact zone is represented lithostratigraphically by the upper part of the Shiranish Formation (Late Maastrichtian) with the overlying Aaliji Formation (Danian), positioned in a continuous pelagic marlstone that exhibits a change in color from pale blue of the Cretaceous (Shiranish Formation) to light brown at the base of the Paleogene (Aaliji Formation). The biostratigraphic investigations across the studied succession reveal three Upper Cretaceous zones namely: Pseudoguembelina hariaensis p.p. (CF3) interval zone, Pseudoguembelina palpebra (CF2) interval zone, Plummerita hantkeninoides (CF1) total range zone, and four main zones and three subzones of the Danian namely Guembelitria cretacea (P0) partial range zone, Parvularugoglobigerina eugubina (Pa) total range zone, Parasubbotina pseudobulloides (P1) partial range zone (Globoanomalina archaeocompressa (P1a) partial range subzone, Subbotina triloculinoides (P1b) interval subzone, Globanomalina compressa/Praemurica inconstans (P1c) Interval Subzone), and Praemurica uncinata p.p. (P2) interval zone. The mineralogy of the spherule deposits from ~ 4 mm thin, yellowish red laminar show distinct types of impact spherules that identified as dominantly composed of Goethite (a-FeOOH), and Coesite (SiO₂) minerals. This study indicates a complete distal type of the K-Pg transition with no hiatus at Bade section of the Duhok area, with the presence of impact spherules laminar precisely at the K-Pg contact support the globally recognized proof of the Chicxulub impact as the cause of the K-Pg mass event.

Keywords: K-Pg; Spherules; Duhok; Iraq.







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GK5-76

Origin of glaucony deposit in Kurdistan Foreland Basin: Insights from the Upper Cretaceous succession, Kurdistan-Iraq

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Abstract

Three upper Cretaceous glaucony-rich intervals (10-40 cm thick), Dokan area, Kurdistan Region of Iraq; are horizontal to cross-laminated glaucony with packstone to grainstone or glaucarenite texture in which glaucony grains content varies from 75 to 90%, other glauconitic beds (1-1.5 m thick) include glauconitic-planktonic wackestones/packstone to mudstone textures, with a glaucony range of 5 to 75 %. Glaucony-rich intervals, found at the base of the Early Turonian Gulneri, Late Turonian - Early Campanian Kometan and Late Campanian -Maastrichtian Shiranish formations, low to high bioturbated beds, locally rich in Thalassinoides burrows, overlie erosional hiatuses between the late Cenomanian/early Turonian, early/late Turonian and early/late Campanian boundaries. Glaucony grain types are ovoidal and elliptical peloids, intraclasts, calcisphers, planktic foraminifera, and glauconitized phosphate clasts. Thin section petrography and XRD indicated that in addition to glauconite, the samples contain calcite, clay minerals, pyrite, and apatite, which further indicate formation during marine transgression. The separated glaucony grains exhibit glauconite-rich glauconite/smectite mixed-layer dark green colors, indicating well-ordered glauconite. The active syn-tectonic depositional setting, physical and biogenic sedimentary structures, and whole rock mineralogy suggest that Fe, K, Si contents, and clay minerals essential for glauconite authigenic were supplied by chemical weathering of the exposed Zagros overthrust and ophiolite. The glaucony-rich condensed sediments were formed due to early marine transgression within an offshore zone, reworking, winnowing, and finally redeposition, most likely within a distal offshore transition zone.

Keywords: Foreland basin; Glaucony; upper Cretaceous.







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GK5-78

Hydrochemical Study of Some Groundwater Boreholes in Central Basin of Erbil City, Northern Iraq.

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Abstract

The present effort is expected at considering the groundwater quality of the central Erbil Basin. Cations and anions of groundwater are used during the wet and dry seasons (May 2020 and October 2021) to estimate the characteristics and origin of groundwater. The following three classes of significant goals of this study were identified: 1) quality assessment of groundwater as a special usage (drinking and irrigation); 2) to identify the sources of water quality variation and pollution; 3) determination of groundwater types. According to the hydrochemistry diagrams, the main groundwater type is Ca- Mg- HCO₃. The mean richness of major cations are $Ca^{+2} > Mg^{+2} > Na^{+} > K^{+}$, whereas the major anions are $HCO_3^- > SO_4^{-2} > NO_3^- > Cl^-$. The quality of water was evaluated using SAR, sodium (%), PI, TH, MH, PS, and WQI. The chemical and physical parameters compared with public health WHO and Iraqi standards IQS for drinking water, the groundwater of the study area is within the limit and suitable for all drinking and domestic purposes in some wells, except for three wells surpass the maximum permissible limit of NO₃⁻ which are Newroz, Rizgari, and Birayaty, HCO₃⁻ is showed a maximum in Newroz and total hardness TH doesn't lie with recommended standards in Rizgari well. Furthermore, the groundwater samples were classified using the Piper diagram and the origin of ions was estimated using the Gibbs and Chadah diagram, and the classifications based on the Piper diagram showed that the type of the groundwater is $Ca^{+2} - HCO_3^{-1}$ type for were the dominant form for the groundwater classified for both seasons only one well (Zanko) was $Ca^{+2} - HCO_3 - Cl^{-}$ type for the dry season type. And, estimating dominance type using the Gibbs diagram revealed that the origin of anion and cation in groundwater is due to rock dominance., and the estimation of origin of anions using the Chadha diagram showed that most of the ionic species originated from alkaline earths metals contained in the soil. The agent that controls the geochemistry of groundwater in the study area according to Gibbs diagram is rock ascendance.

Keywords: Erbil Basin; Groundwater quality assessment; Hydrochemistry; Piper Diagram; Water Quality Index.







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GK5-79

Assessment of Groundwater Quality Using Heavy Metal Pollution Indices in Lailan sub basin, Southeast Kirkuk Governorate, Iraq

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Abstract

The study aims to assess groundwater pollution with heavy metals in Lailan sub-basin using pollution indices according to the WHO standards. The study area is situated in the southeast part of Kirkuk governorate, north of Iraq. Quaternary deposits and Bai-Hassan formation are forming the main aquifer units in the area. To get the extent of groundwater pollution, 22 samples from tube wells were collected and analyzed for 8 heavy metals which are Iron, Copper, Cadmium, Manganese, Lead, Zinc, and Chromium. The obtained data were subjected to the heavy metal pollution Index (HPI) and contamination index (Cd). The results showed that the HPI values were found to be below the critical pollution index level of (100) except samples W1 and W2 were above the critical limit. Similarly, the computed contamination index (Cd) values showed that the groundwater samples were within low pollution levels except for the samples (W1, W2, W3, and W4) which showed a high pollution index (Cd > 3). In both methods, the highest pollution value was recorded in sample W2 while sample W11 recorded the lowest pollution value.

Keywords: Groundwater quality; Heavy metals; Pollution index; WHO standards.







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GK5-80

The efficiency of Unit Hydrograph, SCS-CN, and Snyder Unit Hydrograph Models for Determining Peak Flood Discharge in Part of Lesser Zab Basin, Kurdistan Region, Iraq

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Abstract

The unit hydrograph (UN) and soil conservation service curve number (SCS-CN) are prevalent methods for estimating peak flow and peak time concentration within the hydrological basins. Different types of data, such as gauging data, morphometric analysis, and Land Use-Land Cover (LULC), are used to derive Unit hydrographs (UH) for the Kanarwe River basin (KRB). Furthermore, different hydrograph models, including HEC-1, TR55, HEC-HMS, Rational method, and Snyder unit hydrograph, have been applied and correlated with gauging data for the studied basin. Metrological data, geological setting, and land cover is used and integrated into the Geographic Information Systems (GIS), environment, and Watershed Modelling System (WMS). The peak time (TP) and peak flow (QP) were estimated based on the five applied models. The results for models are (Qp=739.93m³/sec, TP=20hr), (Qp 181.4m³/sec, (OP=800 m³/sec, TP=12hurs), (QP = 341.13 m³/sec, TP =11.65hr), TP=14hr) (QP =443m³/sec, TP=19.9hurs), (QP=243 m³/sec) for HEC-1, TR55, HEC-HMS, Rational Method, Synder Unit Hydrograph, and Observed data respectively. The outcome had the most direct agreement for the parameters of peak time and peak flow of direct runoff based on TR55, Snyder, and Rational models. The study's results confirm that the geomorphoclimatic unit hydrograph (Snyder) is highly efficient for estimating peak time and peak flow of direct runoff based on the actual observed data of gaging stations close to an outlet.

Keywords: Peak flood analysis; IGUH; SCS-CN model; Unit Hydrograph; Lesser Zab.







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GK5-82

Problems of the Zagros Ophiolites and Volcanic Rocks, Examples from Kurdistan region, Northern Iraq

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Abstract

In the Iraqi Zagros, there are ten ophiolites and basaltic bodies, the famous ones are Penjween, Mawat, Bulfat, and Peshashan ophiolite complexes in addition to basaltic bodies such as Kata Rash, Avroman, Gercus, Chalki, and Hamrin basaltic bodies. The present study describes more than 12 significant problems concerning these bodies. These problems are observable in the field, laboratory, and in most literature that opposes the previous magmatic origin of these bodies. Our study explicated all aspects of each problem and clarified how the problem contradicts magmatic crystallization and aids the sedimentary origin of these claimed igneous bodies. Finally, the interpretations of all the problems were collected as conjugate pieces of evidence for appraisal of the new origin of all igneous bodies in northern Iraq. The outcomes consider the ophiolitic and basaltic rocks either volcaniclastic sandstones (greywackes) or their metamorphosed equivalents. The igneous rocks (present sedimentary rocks), as fresh or metamorphosed greywackes, belong to stratigraphic units of Paleocene-Eocene Walash Formation and Kata Rash conglomerate (as proximal facies). These sediments grade southwestward (along paleodip) to Kolosh and Aliji Formations (as distal facies) in the Zagros Foreland Basin.

Keywords: Zagros ophiolite; Zagros basalt; greywackes; volcaniclastic sediments; Urumieh-Dokhtar magmatic arc.







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GK5-83

Mineralogy of Recent Sediments of Al-Teeb River Basin East Missan Governorate, Southeastern Iraq

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Abstract

This research aims to define the mineralogical composition of recent sediments that were deposited around the AL-Teeb River basin in the east Missan Governorate and try to determine the provenance or the source of these sediments. The study area represents the southeastern edge of the Mesopotamian Plain and is part of it. 15 samples were collected from eight stations of recent sediment that was deposited around the Al-Teeb River; two field works are covered (December 2019 and August 2021). Mineralogical study of the sediment after separating the light and heavy minerals by heavy liquid Bromoform to determine the mineralogical composition of the studied samples by using the petrographic microscope, samples of sediments' light mineral fraction composed (95.5%) of the total mineralogy. The light components of these sediments consist mainly of quartz 25.31%, feldspars (potash and plagioclase feldspar) 9.53%, sedimentary rock fragments (carbonate rock fragments up 33.39%, chert rock fragments 7.65%, evaporates fragments, 7.31%), (igneous rock fragments, and metamorphic rock fragments6.94%). The major component of the heavy minerals residue is opaque minerals with a range of 36.76% and non-opaque minerals with a range of 63.24%. The non-opaque mineral sediments are mainly of chlorite 7.42%, pyroxenes composed of both orthopyroxene and clinopyroxene 6.37%, amphiboles composed of hornblende, glaucophane, and tremolite 7.02%, (mica: biotite and muscovite) 9.81%, zircon 7.54%, tournaline 5.1%, epidote group 5.91%, rutile 4.5%, kyanite 2.2%. The sediments have two types of groups: moderately stable and ultra-stable in the ternary plot. The mineralogical composition shows that these are major sources for the areas of study in the river terraces and flood plain of the river in the Mesopotamian Plain, another source of these sediments is the aeolian deposits that separated from sand dune fields in the studied area, and outcrops of sedimentary formation in the southeastern of Iraq as specified by the incidence of the carbonate rock fragments.

Keywords: Al-Teeb River; heavy minerals, sand dunes; Mesopotamian Plain.







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GK5-84

Quantitative Determination of Generated Petroleum from The Naokelekan Formation in Northern Iraq

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Abstract

For calculating the quantity of petroleum produced from Naokelekan Formation., the samples from exposures and oil wells are utilized. The geographic expansion, thickness, density, and mass of Naokelekan Formation are deduced by applying basic equations and utilizing GIS software. The quantity of petroleum expelled from this upper Jurassic unit is 2.638×10^{13} kg.

Keywords: Naokelekan; petroleum; generation; quantitative determination; Iraq.







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GK5-85

Clay Mineral Variations Across the Cretaceous/Paleogene (K/Pg) Boundary from Sulaimani Area, Kurdistan Region/Iraq: Implication for Climate Change

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Abstract

The boundary between Tanjero and Kolosh formations around Sulaimani City coincides with the global K/Pg boundary. These two units are both flysch deposits of Zagros Foreland Basin. Clay fraction from different lithologies across K/Pg boundary was studied by XRD analysis and SEM images. Samples were taken from different lithologies in the interlayer between marlstone, argillaceous limestone, and sandstone. Obtained results elucidate that the clay mineralogy is not varied across the boundary. Corrensite (regularly interstratified Chlorite/Smectite) is the major clay constituent with discrete chlorite and smectite, from XRD pattern existence of corrensite/chlorite mixed layer can be also observed with some traces of illite. The XRD analysis suggests that corrensite is the diagenetic product of smectite as it is an intermediate stage of smectite chloritization. Using smectite as a precursor mineral for corrensite, paleoclimate, and depositional environment beyond smectite enrichment can be illustrated. The low intensity of weathering in arid and seasonal climate cause immature clay mineral assemblage, and the small size of detrital smectite in comparison with other clay mineral is behind its enrichment in the deep marine basin.

Keywords: Corrensite; Chloritization; Mixed layer clays; Paleoclimate; Depositional environment.







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GK5-87

Microfacies and Depositional Environment of Shiranish Formation (Upper Cretaceous), in the Susnawa Village, Berat Anticline, High Folded Zone, Kurdistan Region, Iraq

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Abstract

This study concerns microfacies and environmental analysis of Shiranish Formation (Upper Cretaceous) in Susnawa section, Berat anticline, northern Kurdistan Region, Iraq. Lithologically, it is composed of 26 m of thin to medium and medium to thick fractured bedded grey to yellow weathered color and yellow to blue fresh color, marly limestone interbedded with thick beds of yellow marl and thin beds of yellow bluish marl in lower and upper part respectively which partly bearing pyrite molds and rare nodules of chert. The petrographic investigations of limestone with microfacies analysis of limestones were based on (12) thin sections. The petrographic study shows that the majority of limestones are carbonate mud (micrite) with occasional recrystallized microspar. Skeletal grains show a variety of pelagic marine fauna which are planktonic foraminifera (Globigerinelliodes, Heterohelix, Globotruncana, Rugoglobigerina, Garsserina, Hedbergella, and Oligostegina), benthonic foraminifera (Planoglobulina and Rotalia), Calcispheres, Ostracods, Sponge spicules, Bioclasts, and rare Gastropods. Depending on field observations and petrographic analysis, two different litho units were recognized in the Shiranish Formation in Susnawa section. They are in ascending order: a- Bedded marly limestone interbedded with thick beds of marl unit. b-Bedded marly limestone interbedded with thin beds of marl unit. Based on a detailed microfacies analysis of limestones, three main microfacies and 10 submicrofacies are distinguished in the studied section of Shiranish Formation. From the sum of all petrographic, facies, and textural analyses, it is here concluded that Shiranish Formation in Susnawa section, deposited at basinal (open marine) environment with quiet and semi-reducing conditions.

Keywords: Upper Cretaceous; Shiranish Formation; Microfacies; Depositional Environment; Susnawa; Kurdistan Region-Iraq.







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GK5-88

Evaluation of Seasonal and Spatial Variation of Groundwater Quality by Determining the Factors Associated with Water Quality combined with Multivariate Analytical Methods

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Abstract

Thirty water samples (27 samples of groundwater wells) and (3 samples of wastewater channels) were collected during May (Water surplus period) and September (Water deficit period) 2020 in Erbil central sub-basin and analyzed. Physical analyses include temperature (ToC), hydrogen ion concentration (pH), electrical conductivity (EC), total dissolved solids (TDS), biological oxygen demand (BOD5), chemical oxygen demand (COD), dissolved oxygen (DO), and total suspension sediments (TSS). Furthermore, major, minor, and trace elements were analyzed. This paper aims to find the pollution in groundwater of Erbil central sub-basin due to different kinds of wastewater. The samples were collected from different locations and sources, deep wells, wastewater, and wells in the cemetery. The data obtained from water quality labs, all parameters chemical, physical, and trace elements are presented in this paper, the pollution has been founded in the study area due to wastewater by Kahrez (old groundwater distribution in Erbil basin), cesspools, and septic tanks.

Keywords: Groundwater; Wells; Hydrogeochemistry; Water quality; Wastewater contamination; Erbil Central sub- basin.







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GK5-89

The Tectonic Evolution of North Eastern Parts of the Nubia- Arabian Plate throughout Albian-Early Eocene

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Abstract

The Albain -Early Eocene tectonic evolution of Zagros foreland basin of a high folded zone in the Iraqi Kurdistan Region has been studied based on the recent foreland basin system concept. This study showed that during the cretaceous (Albian –Cenomanian) there was a geodynamic shift from a passive margin to a foreland basin system phase, not to an active margin phase as mentioned in the previous studies. The advance of the continental margin of Nubia -Arabian Plate (NAP) toward the subduction zone imposed a tectonic load leading to the form of a flexural wave. The consequences of the last tectonic event were reflected by the continuous deposition of the Balambo Formation. in a foredeep depozone. This happened concomitant with a flexural emergence of the continental shelf further to the west forming a forebulge depozone represented by the deposition of reefal facies of the Qamchuqa Formation. These geodynamic changes are considered here to represent the Megasequence boundary between the Tectonic Megasequence (TMS) of AP8 and AP9. The last sequence of the passive margin was Qamchuga Formation Which is called here the Pre-Orogenic Carbonate Platform and was separated from Bekhme Formation by regional unconformity (Megasequence boundary). The latter is represented by the Lower Sequence of the foreland basin system, which is called the Syn-Orogenic Carbonate Platform (SCP). During the Middle Campanian, the Zagros foreland basin has been started with the underfilled stage, and it was entirely clear by the end of the Cretaceous comprising a broad threefold subdivision of depositional realms that translated into three stratigraphic units known as trinity underfilled units of foreland basin system. The lower carbonate unit, the pelagic and hemipelagic unit, and the upper flysch clastic unit are represented by Bekhme, Shiranish, and Tanjero Formations respectively. All of these units were superimposed during basin depocenter migration and become younger toward the southwest in front of progressing the orogenic wedge toward the Arabian Craton. During the late Maastrichtian to Paleocene- Early Eocene, the Zagros foreland basin underwent a transition from underfilld to filled the stage. Deep exhumation of orogenic wedge and ophiolite assemblage had supplied the clastic sediment of the Kolosh Formation into the basin covering the foredeep and most of the forebulge and back bulge depozones.

Keywords: Foreland; Forebulge; Zagros; Depozone; Qamchuqa; Tanjero.







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GK5-91

Shale Impact on the Reservoir Properties of the Jeribe Carbonate Reservoir in an Oilfield Northern Iraq

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Abstract

The shale content and their modes of distribution with their impact on the reservoir properties of the Jeribe Formation investigated using the available data of the wireline logs for the formation in the two selected wells of Ajeel-10 (Aj-10) and Ajeel-12 (Aj-12) of Ajeel Oilfield/Northern Iraq. The dominant dolomite and dolomitic limestone lithology of the formation is containing different ratios of shale content being highest near the middle part of the formation. Horizons of 70 to 99% shale content were identified in the formation but the general ratios are ranging between 10% and 50%. The data of Spectral Gamma ray log revealed that the shale content of the formation is mostly composed of low Potassium minerals such as Chlorite and Montimorlinite, but appreciable percentages of Illite. The low Th/U ratios along the formation indicated clearly to reduce condition of deposition except for about 2-3m of the upper part of the formation in the well Aj-10 which looks to be precipitated in a more natural depositional environment. Dispersed, Laminar, and Structural modes of shale distribution are co- existed within the lithology of the Jeribe Formation in both studied wells. As the different modes of shale distribution have different impact on porosity and permeability of the reservoir rocks, therefore, the decrease and increase in the shale content did not correspond perfectly by an opposite fluctuation in the porosity values of the studied Jeribe Formation. As an average, the shale content in the formation has an impact on the porosity calculation by overestimating it to about 4-5% and subsequently underestimating the water saturation by 10% in the well Aj-10 and 9% in the well Aj-12.

Keywords: Jeribe Formation; Ajeel Field; Shale content; Effective porosity; reservoir property.







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GK5-94

Reservoir Characterization of Euphrates Formation (Lower Miocene) in the Garmian Area, Kurdistan Region/ Iraq

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Abstract

Reservoir characteristics of the Lower Miocene Euphrates Formation has been studied from the selected wells of Shakal-2 (SK-2) and Taza-2 (Tz-2) of the Shakal and Taza fields respectively in Garmian Area/ Kurdistan Region of Iraq. Data of the available wireline logs are used for evaluating the formation from reservoir potentiality point of view. The dominant limestone and dolomitic limestone lithologies recognized using Neutron-Density crossplot. The shale content, as calculated from the Gamma-ray log, are higher at the upper most part of the formation in both studied wells and at the lower part of the formation in SK-2 well (> 35%). The calculated porosity from the porosity logs showed that the formation is of good porosity (15% as average) in SK-2 well and of poor porosity (6% as average) in Tz-2 well. The whole Euphrates Formation in SK-2 well is of poor to fair permeability, as measured through Nuclear Magnetic Resonance (NMR) log with an average about 1.18 mD, while permeability was obtained for the formation in Tz-2 well through the available core test data using Multiple Regression Analysis Method and appeared to be of moderate permeability (average 23.47 mD). Four distinctive reservoir units identified in Euphrates Formation depending on the variations of shale contents, porosity, and permeability. The reservoir units of RU-3 in the SK-2 well and RU-2 in both studied wells are of the best reservoir properties among the identified reservoir units. Euphrates Formation contains higher percentage of water saturation in Tz-2 well (60% as an average) as compared to SK-2 well (47.6% as an average). Residual and movable hydrocarbons are exist within Euphrates Formation in different ratios, being hydrocarbon saturations generally lower in Tz-2 well. The majority of the hydrocarbons within Euphrates Formation in SK-2 well are of movable types, whereas most of the hydrocarbons in the Tz-2 well are of residual type. Production from Euphrates Formation may associated with various amounts of water. The reservoir units RU-2 and RU-3 in Tz-2 well are considered as zones of hydrocarbon production with fewer quantity of water, while all the rest of the identified reservoir units in both studied wells are characterized by hydrocarbon production associated with noticeable amount of water.

Keywords: Euphrates Formation; Taza and Shakal Oilfields; Reservoir Characteristics; Kurdistan Region.







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GK5-98

Soil Gas Survey and Cap Rock Evaluation for Garmian Area, Kurdistan Region / NE Iraq

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Abstract

The analysis of more than 3230 adsorbed soil gas samples done by Western Zagros Oil Company in Garmian Area / southeast Kirkuk City revealed different concentrations of light gaseous hydrocarbons (as part per billion, ppb) including Methane (C1H4), Ethane (C2H6), Propane (C₃H₈), and Butane (C₄H₁₀). The ratios of C1/C2, (C3/C1) x1000, and C1/ΣCn helped in predicting the type of the subsurface reservoired hydrocarbons. The soil gas samples from the southern part of the surveyed area looked to be migrated upward from oil or gas condensate reservoirs, whereas the soil gas samples from the northern part of the area are mostly sourced from gas or gas condensate reservoirs. The area between Chia Surkh Field and Kurdamir Field to the north looked most promising as the analysis of the soil gas samples of this area indicates an oil accumulation at the subsurface from which mostly wet gases migrate upward to the surface. The lower concentration of both Methane and Butane gases within the analyzed soil gas samples of the southern part of the surveyed area is mostly due to the great thickness of the cap rocks which exceeded 1800m for the total package of the Lower Fars and the overlaid younger formations. Although the capillary pressure values obtained from the burial history simulation of the Lower Fars Formation showed a high seal capacity, still the calculated S1/TOC values for the selected samples from the well Sq-1 show the existence of nonindigenous hydrocarbons within the formation which most probably sourced from the underlined accumulated oil in the Jeribe reservoir.

Keywords: Soil gas; Cap rock; Seal capacity; Garmian area; Kurdistan.







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GK5-99

Biostratigraphy and Microfacies Analysis of Mauddud Formation (Late Albian - Early Cenomanian) in Musaiyib Well No. 1, Central Iraq

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Abstract

Upper Albian and Lower Cenomanian biostratigraphy and microfacies types of Mauddud Formation from Musaivib well No.1, Central Iraq are described and examined which are consist of thick to medium bedded limestone, marly limestone rich in argillaceous material, green shale and dolomitic limestone beds. Thirty-six species from twenty-two genera of benthic foraminifera in addition to non-foraminifera fossils such as calcareous algae, coral, bivalves, gastropods; rudist fragments; brachiopods, bryozoan and echinoid fragments, are recognized from the Mauddud Formation of the studied well. Based on the recognized benthic foraminifera, it is subdivided into three biozones: Mesorbitolina texana - Orbitolina gatarica Concurrent Range zone Orbitolina sefini-Total R. Zone and Orbitolina concava Total R. Zone. Both suggest Late Albian Early Cenomanian age. The recognized biozones were correlated with comparatively well-known biozones from other parts of the Tethys region which showed a good comparison between the biostratigraphic zones established in this study with the other studies. Based on the petrographical analyses, four major microfacies (mudstone, wackestone, wackestone to packstone and packstone), and eight submicrofacies were identified. Mauddud Formation was formed in a marine environment that is composed of the following three sub environments: the inner ramp and the middle to outer ramp.

Keywords: Biostratigraphy; Mauddud Formation; Late Albian- Early Cenomanian; Microfacies; Depositional environments; Central Iraq.







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GK5-100

Awareness of Primary School Children Towards Flood and Their Preparedness and Perceptions of its Risks in Sulaymaniyah City – Kurdistan Region of Iraq

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Abstract

As youngsters are a crucial section of society, their perspectives on all aspects of life are also important. Understanding the perceptions of children is significant in the interpretation of their awareness and preparedness toward floods as a risk. Recently Kurdistan region of Iraq has faced several occasional floods. Unfortunately, the floods not only caused structural damage but also resulted in losing lives including children. This exploratory study is to determine whether primary school kids know about floods. Moreover, the study examines that the school children feel the flood risk as a hazard. However, most of them could not predict the future likelihood of a flood. The personal flood experience of some of them changes their perspectives on the flood hazard. Television and social media are crucial sources of receiving information on flood from the student's point of view, and, they claim that they are mostly helped by the government. The majority have not encountered any flood risk area and they also cannot find the right way to control flooding management. Thus, they would be ready for any future training on flood management. Some students do not act correctly during flooding. In this research, it is examined how flood experience shapes primary school children after last year's flood of Erbil (December 2021) as a comparative study, and the findings show that the student's perspectives and preparedness for flood hazards are improved. The surveyed students have ages of 11-145 years old. The selected schools are in Sulaymaniyah City from seven different schools. Due to the expected climate change processes, the findings will have a great role in a future catastrophic flood event. Therefore, children's awareness regarding flood risk will reduce its impacts.

Keywords: Flood awareness; Children; Risk perception; Preparedness; Flood Management.







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GK5-104

Distribution and Provenance of Minerals in Sediments from Diyala (Sirwan) River in the Center of Iraq

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Abstract

Quaternary sediments in the center of Iraq are weathered from the igneous-metamorphic complex in the north and northeast of Iraq, northwest of Iran, and southeast of Turkey. Different types of minerals and rock fragments from this complex are transported by rivers in these areas downstream. Many sediment samples were taken from Diyala river in Diyala and Baghdad governorates along the lower part of Diyala River sediments in the center of Iraq. The main focus of these samples was the change in mineralogical composition across this river in the studied area. Thus, this study focuses on the identification of the light and heavy mineral assemblages and their spatial distributions, maturity, and provenance in the collected samples. Examination of the heavy mineral content shows that most samples are dominated by opaque minerals (40.57% - 61.12%). In addition to this group, various percentages of heavy minerals such as pyroxenes, tremolite-actinolite, mica, and garnet, with a few amounts of zircon, tourmaline and rutile were presented in the studied samples. The light minerals are composed of quartz, feldspar, and rock fragments derived from sedimentary, igneous, and metamorphic rock fragments. A large amount of unstable heavy minerals compared to ultrastable minerals was referred to immature sediments, arid- semiarid climate, and mechanical weathering in the source area. These immature sediments found to contain quartz and feldspar together, compared with mature sediments, that were recognized in the south of the study area, were involved only quartz. Studying heavy minerals can suggest that Diyala River sediments were weathered from igneous- rocks from Iran with minor input from metamorphic rocks. Therefore, this study demonstrates that using light minerals in addition to heavy is a great benefit in provenance studies.

Keywords; Heavy minerals; light minerals; Sediments; Sirwan River; Iraq.







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GK5-106

Utilizing and Evaluating the Water Quality Index for Groundwater used for Drinking and Irrigation in the Wanna District of Northwest Iraq

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Abstract

This study aims to understand the groundwater quality in the Wanna area in northwest Iraq. Groundwater samples were collected from 18 wells in the dry season of October 2020 and the wet season of April 2021. The work utilized field and laboratory measurements, including electric conductivity (EC), total dissolved solids, pH, total hardness, and the concentrations of sodium, sulfate, nitrate, calcium, magnesium, potassium, phosphate, chloride, and bicarbonate. The results showed a wide range of water salinity varying from 715 to 4420 µmohs/cm. All the wells yielded very hard water due to the dissolution of the gypsum bedrock. The results calculated for the drinking water quality index (WQI) showed that wells drilled in Fatha Formation and wells with mixed water from both the Fatha Formation and Quaternary deposits yielded good drinking water. The irrigation water quality index showed that the wells in the Fatha Formation provide poor quality water for irrigation. The wells in the Quaternary deposits, or those that penetrate both aquifers (mixed waters), have a water quality ranging from excellent to acceptable for irrigation purposes.

Keywords: Water quality; Aquifer; Gypsum; Salinity; Groundwater.







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GK5-107

Detection of physical and chemical parameters using water indices (NDWI, MNDWI, NDMI, WRI and AWEI) by applying remote sensing and geographic information system (GIS) techniques for Al-Abbasia River in Al-Najaf Al-Ashraf governorate

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Abstract

This study was conducted by analyzing the data from the Landsat-8 satellite image and the geographic information system (GIS) to find the relationship between the water parameters that were analyzed in the laboratory and the water index obtained from the analysis of the satellite image of the study area. The main reason for conducting this research is to find a model for the chemical and physical variables of Al-Abbasia River in Al-Najaf Al-Ashraf Governorate. The water parameters that were used in this study are (PH, EC, TDS, TSS, Na, Mg, K, SO4, Cl, and NO3). 10 sampling stations were identified to take the samples and on the same day the satellite image was taken. Geographical information systems (GIS) were used in the process of projecting the coordinates of ten stations along Al-Abbasia River in the image of the satellite (Landsat-8) to then analyze the spectral reflections of the items and then treat the data obtained after the analysis process by using (SPSS) Software to find the correlation coefficient and regression equations. The strong correlations between water parameters and water index led to finding four regression models. These models can be used to predict the four water variables (EC, SO4, Cl, and NO3) at any point along Al-Abbasia River directly from the satellite image.

Keywords: Water Indices; Remote Sensing; GIS; Landsat-8 OLI; Al-Abbasia River.







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GK5-108

3D Electrical Resistivity Imaging, 2D Induced Polarization and Geotechnical Property Studies to Map Raw Material for Brick Industry

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Abstract

Electrical resistivity Imaging (ERI) and induced polarization (IP) were selected as nondestructive methods and provided a continuous image of the subsurface. Recently, the demand has been increased for obtaining raw materials representing a more suitable and economic quantity of clay mass for brick industries, this is due to unexpected expansion of the cites and more demand on the brick than other construction materials due to its excellent characteristics to resist earthquakes and prevent passing heat and cold to the building. The survey was conducted in three locations by using a new modern computerized static type resistivity meter known as the Syscal R1 Plus, and the Wenner-Schlumberger array was employed with electrode spacing equal to 5 meters. The Geotomo software that commercialized the new version of the RES2DINV program was utilized for the interpretation of data. The resistivity value of clay for the brick industry was revealed according to the 2D (ERI) model of the Aso Brick Quarry, and the suitability of this clay was assessed depending on geotechnical parameters, chemical composition, and mineralogical analysis. It was found that the resistivity values of clay ranging from 7 to 11 Ω .m and silty clay ranging from 11–13 Ω .m are suitable for the brick industry. It was also determined that the three locations are suitable for clay or silty clay, but locations (1 and 2) are economically acceptable because the clay or silty clay layer was exposed to the surface and there is an economic quantity in the three surveyed locations (1, 2 and 3), respectively estimated to be approximately 240000, 330000, and 160000 m³. The (IP) survey proved that it is the most suitable technique used with ERI to indicate the exact boundary of clay mass due to its high capability of electrical storage. The most optimal amount of the chargeability of suitable clay layers is detected equal to more than 5 mV/V and silty clay ranging from (0.9 to 5) mV/V. Eventually, we recommend selecting the (ERI and IP) methods instead of drilling core sample techniques to evaluate applicable quarries of raw materials for the brick industry because drilling only provides restricted information.

Keywords: Electrical Resistivity Imaging; Induced polarization; Raw material; Brick industry.







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GK5-109

2D Resistivity Technique in Exploring Soil Contamination Zones, Kwashe area, Duhok, North of Iraq

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Abstract

The impacts of leachate infiltration on soil were studied at the Kwashe dumpsite in northern part of Iraq. The 2D electrical resistivity methods are performed to determine the contamination zone. At the dumpsite, six resistivity profiles were acquired utilizing the Ohm Mapper device (G-858G) with the dipole-dipole arrangement. The system worked with mobile electrode cables namely Transmitter and Receiver instead of traditional electrodes. Different cables used with spacing ranged from 2.5,5,10, and 15 m. Res2dinvx32 software was utilized to process and invert the 2-D resistivity data obtained. The subsurface inversion model of the 2D resistivity data showed extremely low resistivity values below 10 ohm-meter and was assumed to be leachate. The high resistivity values revealed in the middle section are related to non-degradable waste materials, medical waste, and construction materials. The extent of leachate migration was more pronounced in the northern part of the dumpsite. The area has continuous contamination distributed to a maximum depth of 6 meters. The study concludes that people living near the area are more prone to health problems and air pollution as the amount of leachate increases over time. The area is vulnerable to groundwater impacts shortly if proper mitigation measures are not taken.

Keywords: Soil contamination; Ohm mapper; Dipole-dipole array; Inversion model; Kwashe dumpsite.







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GK5-111

Seismicity and Focal Mechanism Analysis of the Local Earthquakes in the Iraqi Kurdistan Region

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Abstract

During 2020, 2021, and the first months of 2022, the Iraqi Kurdistan region experienced several small to moderate size earthquakes. The earthquakes were recorded at SLY1 observatory, the UoS broadband seismic station. Waveform data was analyzed for seventy events to determine their source parameters which may contribute to the active tectonics in those areas. Moment tensor inversion is estimated for the detected local earthquakes by analysis of observed seismic waveforms in different selected areas. The seismic moment, depth, and the nature of the responsible fault that ruptured at the source are calculated by the waveform inversion. The inversion technique used is a grid search over the strike, dip, and rake angles for each depth from 0.5 to 40 km in increments of 1 km. Applying bandpass filters and a proper velocity model for Green's function, the observed and synthetic waveforms are correlated from waveform modeling. Furthermore, the mechanism for the best fit was determined and the regional stresses were characterized in the study area.

Keyword: Seismicity; Sulaimani; Inversion; Focal mechanism.







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GK5-112

Lithofacies and Microfacies study of Late Maastrichtian reefal limestones and comparison with the Aqra Formation, Northeast and Northern Kurdistan Region-Iraq

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Abstract

Maastrichtian agitated reefal limestone variously developed in the Northern and Northeastern Kurdistan Region-Iraq. The reefal Agra Formation formed large platforms in the Agra-Barzan area during the entire Maastrichtian period. As well as bars and lenses of reefal limestone arise in the upper part of the Tanjero Formation forming longitudinal submarine ridges in the Arabian-Eurasian Foreland basin. The current study focuses on the referral limestone of the Agra Formation, Soran, and Mawat locations in terms of lithofacies and microfacies to figure out whether or not the Maastrichtian referral limestone are belonging to the Aqra Formation. The first section selected in the type section of the Aqra Formation in the Aqra area. The formation is composed of thick reefal limestone about 700m thick, containing rudist with impregnated bitumen and partially dolomite. This reef is well developed and occupies above the Bekhme platform. The reefal expanded geographically starting from Bujel until Chia Gara anticlines. Four submicrofacies of this reefal are identified include Foraminifera wackestone, Milliolids packstone, Pelloidal grainstone, and bioclastic Foraminifera grainstone. In the Mawat area, the reefal limestone appears as thick reefal limestone associated with the marl and sandy claystone beds between them. The thickness of the sequence is about 30 meters above the flysch Tanjero Formation. This sequence is locally developed as a longitudinal form restricted in the Mawa-Qalachwalan area. Omphalocylus packstone and extra clastic packstone, Coralline framestone, and Echinodermata grainstone are the main submicrofacies type in this area. In the Soran section, the reefal limestone composed of thick and one body bar of reefal limestone that exceeds 50 meters thick sit directly above the Tanjero Formation restricted in the Dar-Alsalam area only. The submicrofacies type that occurs in the Soran section is Foraminifera packstone, Orbitolina packstone, and Coralline framestone. All the indicators of microfacies type explain that the Aqra Formation was deposited as a large platform in the inner and middle ramp setting. As well as the reefal limestone in Soran and Mawat area deposited as submerging Island among flysch marine of Tanjero Formation during the active Arabia-Eurasian Subduction. Depending on the depositional situation and microfacies we conclude the reefal limestone in Soran and Mawat areas are not part of the Agra Formation but they are most tends to be part of the Tanjero Formation.

Keywords: Maastrichtian; Aqra lenses; Kurdistan Region; Microfacies; Aqra Formation.







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GK5-114

Effect of Site Geology on the Groutability of Cheragh-Veis Dam, Kurdistan, Iran

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Abstract

Geological investigations are among many essential studies that should be carried out before deciding the location, type, and size of a dam. Without proper geological investigation, the sitting of the dam will cause serious hazards during the construction and commissioning of the dam. In this paper, the effect of site geology on the groutability of Cheragh-Veis Dam is evaluated. The dam is an embankment (rock-fill) type with crest length and height of 274 and 67 meters, respectively. The reservoir's volume is 88 million cube meters which are mainly used for supplying drinking water and agricultural irrigation. The dam is located to the southwest of Sagez City in Kurdistan Province, Iran. The geological setting of the dam site includes a sequence of igneous rock of diorite and metamorphic rocks of shiatsus type. The intrusion of hydrothermal solutions through the joint system of the rock mass has a great effect on the disintegration of the shiatsus' rock, especially on the left abutment. The disintegration of the rock mass is expanded up to 10 meters from the surface with a permeability of more than 10 Lugeon. Therefore, the strength of the rock mass beneath the dam's core was improved by establishing 14000 meters of consolidation grouting. Permeability of rock mass below 10 meters was less than 3 Lugeon, and 1400 meters' grout curtain was performed to ensure the stoppage of water leakage of the dam foundation and abutments.

Keywords: Cheragh-Veis Dam; Dam site grouting; Saqez River; Zarrineh-rood watershed.






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GK5-120

Rare Earth Elements Distribution in Soil Nearby Sulaimani Steel Plant, Sulaimani Governorate, Kurdistan Region, Iraq

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Abstract

The concentrations of rare earth elements (REEs) in thirty-three surface soil samples and three source rocks from different locations within and near the Sulaimani Steel Plant (SSP) in the Bazian area (north-eastern Iraq) were measured using an inductively coupled plasma mass spectrometer. In addition, the soils were analyzed for their particle size distribution as well as the organic matter content. The study aimed to assess the influence of SSP on the geochemical behavior of REEs in the surrounding soils. The total REEs content in the topsoil ranged from 5.96 to 232 mg kg⁻¹, and was higher than the local soil background value (86.0 mg kg⁻¹). Upper Continental Crust (UCC) normalized concentration ratios were calculated for selected elements, (La/Yb) _{UCC}, and (Gd/Yb) _{UCC}. A slightly negative Ce anomaly and a positive Eu anomaly were also found. The UCC-normalized REEs pattern in the soils showed that the MREEs were significantly enriched compared to the LREEs and HREEs, and the HREEs were enriched compared to the LREEs. The results of the statistical analysis indicate that the distribution of REEs in soils is influenced by the content of clay (3.18 –87.23%) and soil organic matter (0.34-9.28 %). The results also showed that the enrichment of REEs in soils with increasing distance from the SSP was enhanced by the sources of SSP and influenced by the prevailing wind.

Keywords: Rare earth elements; Steel plant; Soil geochemistry; Soil organic matter; Clay content.







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GK5-121

The Origin of the Qara Chough South Anticline as Deduced from Structural and Geomorphological Indications, Central Part of Iraq

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Abstract

The Qara Chough anticline is a part of Qara Chough Range, which consists of three parts, the middle one is in form of a small dome called Makhmour Dome, whereas the northern and southern parts are long and narrow anticlines and are called Qara Chough North and Qara Chough South anticlines. The general trend of the range is NW – SE. The Qara Chough South anticline is a double plunging with a steeper southwestern limb, its length and width are 22.9 km and 3.43 km, respectively. The anticline forms the right-hand en-echelon plunge with Qara Boutaq 1 anticline and the left-hand en-echelon plunge with the Qara Chough Middle anticline. The exposed rocks in the anticline are mainly of Oligocene formations, the Euphrates and Fatha formations, however, along with the outer parts of both limbs, rocks of the Injana, Mukdadiya, and Bai Hassan formations are exposed with different Quaternary sediments; among them, alluvial fan sediments are the most abundant. The origin of the Qara Chough South anticline, which is an inverted graben is deduced through studying and using ESRI World Imagery, Sentinel images, and geological maps of different scales to recognize the existing structural and geomorphological forms. We have also applied different measurements to indicate the type of the fold and was found to be a Detachment Fold. We also have interpreted different geomorphological forms such as abandoned alluvial fans, fork-shaped valleys, inclined valleys, and radial valleys, all are good indications for the lateral growth of the anticline.

Keywords: Detachment Fold; En-echelon plunge; Aspect Ratio; Fold Symmetry Index; Mountain Front Sinuosity Index; Qara Chough.







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GK5-122

Spring Protection Zone Delineation; a Case Study in the Rania Basin, Kurdistan Region of Iraq

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Abstract

Groundwater in the Rania Basin has been under an unbearable pressure in the last two decades in terms of quantity and quality alike and hence any attempt to protect the valuable resource has become an urgent need. Hydrochemical analyses of 60 water samples collected in both dry and wet seasons reveals that the chemical type of the water is calcium bicarbonate, it has a very good quality and it is valid for drinking according to the WHO and Iraqi standards. Saruchawa, Qulai Rania, and Qulai Kanimaran springs are the three largest springs among dozens of others in the Rania basin, Kurdistan Region of Iraq, that are heavily relied on as the sole or main source of water in the Rania basin. Protection zones are delineated for these springs through vulnerability assessment and recession curve analyses. The equivalent relationship between the protection factor produced by EPIK (Epikarst, Protective cover, infiltration condition, and karst network development) mapping method and the groundwater protection zone (S) was considered. Qulai Rania and Kanimaran springs were mapped to be in S2 while Saruchawa spring is located in S1. Using the recession curve analyses, vulnerability scenarios with an evaluation of the appropriate dimensions of the protection zones (immediate, inner and outer) concluded that all the three selected springs were given (D-type) vulnerability scenario and therefore, IMPZ zones are surrounded by the IPZ, and OPZ encompasses the whole remaining catchment area.

Keywords: Springs; Protection zone; Vulnerability; Groundwater; Rania Basin.







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GK5-126

Surface Water Management for Sulaymaniyah Governorate

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Abstract

Cities authorities around the world tried to reach cities to a sustainable level, absolutely in the water resources management which is considered a major factor. Today's evaluation of cities' development will be by comparing managements for their water resources. Although environmental protection is considered a great challenge facing cities, so protection of water resources from contamination is needed. Therefore, water resources management in the correct way is strongly required. It is a complex subject because it is include managing different resources. This study deals with surface water management only. However, in Sulaymaniyah, there are 63 rivers and streams, but sometimes they faced drought risks and are affected by activities of the different sectors. In past, contamination appears in the rivers, streams, and lakes, which are affected by the environment, tourism, investments, agriculture, and public services, also. After data collection processes about the subject from related directorates to the MMT & MAWS, this study depended on using GIS techniques to explain the results. Also, to decide (SWOT Analyses) components, depended on a questionnaire, through the participation of engineers from MMT & MAWS. Then analyzing both environments (internal & external) of the case study was done. The weaknesses were explained by the internal environment and the threats from the external environment. Moreover, the results were explained by using statistical software. Both environmental factors were weakness and threats aspects respectively. To develop and activate surface water management for Sulaymaniyah governorate, this study adopted a development plan, which covers goals, and objectives, in managing the surface water in Sulaymaniyah governorate.

Keywords: MMT & MAWS; GIS techniques; Sulaymaniyah governorate.







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GK5-128

Flow Zone Indicators and Production Potentiality of the Lower Miocene Jeribe Reservoir from Selected Wells in the Hamrin Oilfield, Northern Iraq

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Abstract

Reservoir Quality Index (RQI) and Normalized Porosity Index (Øz) are both depended on for recognizing the different Hydraulic Flow Units (HFU) within the carbonate lower Miocene Jeribe Reservoir from the three selected wells of Hr-49, Hr-50, and Hr-51 of Hamrin Oilfield. Consequently, four groups of Flow Zone Indicators (FZI) were identified in the studied Jeribe Reservoir depending on the variations in the capacity of the different hydraulic flow units. The range values of the identified FZI in the Jeribe Reservoir are 0.50 in the well Hr-49, range values of 0.2 in the well Hr-50, and range values of 0.40 in the well Hr-51. The reservoir unit RU-3 near the middle part of the formation showed the highest flow capacity among the identified four reservoir units in the Jeribe Formation. The techniques of the Archie method, Moveable Hydrocarbon Index (MHI), and the quick look method of logarithmic Movable Oil Plot (MOP) are all used to identify the best horizons for production within the studied sections. The highest calculated net to the gross productive ratio for the Jeribe reservoir is in the well Hr-51 (78.68%) and the lowest is in the well Hr-50 (25.98%), whereas the calculated ratio for the formation in the well Hr-49 is equal to 45.18%. The highest productive thickness in Jeribe Formation is in the well Hr-51 which is equal to 37m and the lowest hydrocarbon productive thickness is in the well Hr-50 which collectively is equal to 13.25m.

Keywords: Jeribe Formation; Hamrin Oilfield; Flow Zone Indicator; Hydrocarbon moveability.







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GK5-129

Source Rock Evaluation and Hydrocarbon Generation Potential of the Cretaceous (Dokan and Gulneri) formations in Bai Hassan-13 Well Section, Kurdistan, North of Iraq

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Abstract

Eleven cutting rock samples from both Dokan and Gulneri formations (Cretaceous) in one subsurface section of Bai Hassan-13 (BH-13) well in northern Iraq were studied by using two techniques for hydrocarbon generation potentiality. The geochemical technique included Rock -Eval Pyrolysis analysis, Optical technique achieved by studying palynological slides. The rock-Eval pyrolysis results showed that Dokan Formation has total organic carbon (TOC) wt.% ranging between 1.16 and 2.3 (good to very good), Gulneri Formation has high TOC 1.34 and 4.64 (good to excellent) quantity of organic matter. Pertaining to the quality of organic matter, both Dokan and Gulneri formations are composed of types I and II kerogen. The organic matter of Dokan Formation is not indigenous (migrated), one sample of the Gulneri Formation is indigenous the other one locates on the slanted line separating the indigenous from nonindigenous organic matter. Both formations are thermally immature source rock, Therefore, they cannot generate oil and gas. The palynological study revealed that amorphous organic matter is the predominant organic matter component in both formations with more than 89%, whereas phytoclasts and palynomorphs comprised only a few percentages. There is no great variation in the percentages of the mentioned organic matter components, except a slight increase in the percentage of phytoclasts and palynomorphs in the lower part of Dokan formation, therefore one primary palynofacies type can be recognized, and this primary palynofacies is divided into two secondary palynofacies. Through plotting the Tyson's Amorphous, phytoclasts, and palynomorphs (APP) diagram, it is clear that the two formations are deposited in a distal suboxic to anoxic basin.

Keywords: Dokan; Gulneri; Bai Hassan; Pyrolysis; Palynofacies.







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GK5-130

Fractures analysis of Cretaceous Kometan Carbonate Reservoirs in the Selected Oilfields Adjoining the Boundary Between High Folded Zone and Low Folded Zone NE Iraq

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Abstract

Carbonate reservoirs in Iraq have been targets of hydrocarbon exploration for about 100 years, and the fractures are widely distributed within the carbonate reservoirs and have a substantial influence on the reservoir characteristics because fractures provide high permeability and are known to have enhanced porosity. Therefore, knowledge of the fractured index, fracture type, and fracture orientation is important for hydrocarbon exploration. This research aims to evaluate and analyze fractures and vugs for limestone rocks in the Kometan Formation. For this study, three wells were selected in some newly explored fields adjoining the boundary between the high fold and low folded zone, the southwest belt of the Zagros. Well SH-2 and Sangaw north (SN-1) in Shewashan oilfield are located in the low folded zone, while Miran west (MW-2) is located in the high folded zone. The research is based on quantitative evaluation and analysis of fractures and their contribution to creating secondary porosity and improving porosity and permeability in such somewhat tight rocks. The research also aims to qualitatively analyze such fractures in terms of size, dip angles, and direction of fractures and their relationship to the tendency of layers. In this study, all of the Density log, Neutron, and conventional acoustic Logs were adopted in the three wells for the quantitative evaluation of secondary porosity and fracture index. Also, the advanced dipmeter log techniques and imaging logs were used for qualitative assessment of the fractures. Two groups of fractures were classified; fractures associated with the bedding plane; this group characterized by a low dip angle with the common direction of the NE. The second group is unassociated with the bedding plane, this group is characterized by a high dip angle with a common direction of NW.

Keywords: Fractures analysis; Carbonate reservoirs; secondary porosity.







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GK5-131

Optimal Agricultural Management Pattern Assessment using Water-Energy-Food Nexus Approach

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Abstract

Water is one of the most important factors in the growth and development of countries. The lack of drinking water on the one hand, and the increasing need for food, on the other hand, have faced a serious crisis in the available water resources. The studies show that the studies regarding water, food, and energy nexus index are very limited in the field of agriculture and at the level of basins. Therefore, the purpose of this research is to investigate and determine the value of water, food, and energy nexus index for irrigated and rainfed agricultural products, both farming and garden, in the area of Qorveh-Dehgolan irrigated basin in Kurdistan province in the last few years. In this study, two different scenarios including water, food, and energy nexus and without it, are investigated. In the first scenario, the existing cultivation pattern in the region, and the second scenario, the proposed cultivation pattern will be evaluated according to the maximum value of the water, food, and energy nexus index. This method was done to use the linear optimization method to maximize the water-food-energy nexus index for the evaluation of 6 cultivated crops including cucumber, rapeseed, potato, wheat, alfalfa, and barley. In the statistical period of 2010-2020, it was studied in the Chardoli plain of Kurdistan province. The results of the optimization model indicated that the current cultivation pattern in Chardoli region is not suitable for minimizing water and energy consumption and maximizing economic profit.

Keywords: Cropping pattern optimization; System dynamics; Water-food-energy nexus; Chardoli plain; Adaptive management.







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GK5-132

Determination of Surface Roughness of the Land Texture Using Remote Sensing Data and Geo-Informatic techniques

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Abstract

Surface roughness (SR) is a significant geomorphic factor that has been effectively applied to determine material characteristics, present and past processes, and the period pass by since development in the environmental and earth sciences. Thus, this type of studies is essential for analyzing SR and its importance. The research efforts to display a coherent evaluation on techniques and remote sensing data (DEMs) data were taken into account for quantifying the SR of landscape in different scales in selected areas which belong to Kurdistan region, north of Iraq. The various types of DEMs (ALOS PALSAR DEM (12.5m) SRTM DEM in (30m) and (90m) resolution) as remotely sensed data integrated with GIS techniques were used to calculate RS regarding different neighborhood size (51×51 and 100×100 cells moving window size (MWZ)) in the both selected areas. Study area one is mountainous region and characterized by anticlines and synclines which is located in High Folded zones (HFZ), while area two almost is a plain area which sited in Low Folded Zone (LFZ). It found that SR calculation in wide and mountainous areas can be efficiently analyzed in more detail by using coarse resolution DEMs from large MWZ such as 100×100 cells, whereas high resolution DEMs can be considered for studying SR in small, urban and plain areas to reach detail information regarding smaller MWZ. The results shown that the E and W segments of Safeen and western segment of Shakrok anticlines have highest SR values which indicate high incision at elevated and extremely eroded parts of area one, although Bani Bawi, Pirmam and Khatibian anticlines has moderate to low SR values due poorly incised. On the other hand, area two is mainly flat area and has the lowest values of SR that indicate very poorly dissected landscape except NW part of area two relatively has higher SR value.

Keywords: Surface roughness; DEM; Remote sensing and GIS; landforms; Moving window size.







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GK5-133

Geological Effects on the Urban Development of the Mosul City by using Remote Sensing Techniques and GIS

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Abstract

Geological structures have a significant impact on the geomorphological characteristics and topography of the Earth's surface. Land use is influenced by geological factors such as the distribution of different lithological types and geomorphological characteristics created by tectonic processes and weathering on rocks. Humans utilize the lands in certain places, which are separated into a huge number of sites. The objective of the study is to show how different lithological types, geological structures, and geotechnical characteristics affect civil and urban development in Mosul, both ancient and modern. The second objective is to provide the civil and urban planning departments of local governments with a thorough knowledge of how to design new neighborhoods, as well as industrial, commercial, and tourism locations. The results demonstrated the impact of faults on a wide range of surface manifestations, city construction, and residential neighborhood distribution. The tectonic activity, variation of lithology, and geotechnical characteristics of Fat'ha and Injana formations, influenced the varied forms of the surface of the earth, and their different uses. Based on spatial analysis, this study was carried out with the use of remote sensing dataset and GIS. The final results were compared to the master plan of the city, and the field survey showed that the information acquired was in agreement with the output of the study.

Keyword: Geological structures; GIS, Lineaments; Urban development; Mosul City.







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GK5-134

Lithofacies study of Bai Hassan Formation Sequence (Upper Pliocene) in Bekhair Anticline, Zakho Area Northern Iraq

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Abstract

The current study included Bai Hassan Formation (Upper Bakhtiari) in Zakho area of northern Iraq., depending on the grain size class, pedding, texture, degree of rounding, sorting, and some other detailed field observations, this formation was divided into eleven lithofacies are matrix-supported conglomerate, clast-supported conglomerate, laminated sandstone, sandy gravel, planar cross-bedded conglomerate, interbedded siltstone-mudstone, gravely sandstone, interbedded sandstone-conglomerate, lime matrix-supported conglomerate, and caliche lithofacies. These lithofacies are distributed into six coarsening-upward cycles consisting of complete and incomplete cycles, and these lithofacies include sedimentary structures such as imbrication, bedding plain, load cast, and gravely cross-bedding. The environment of Bai Hassan Formation represents conjunctive alluvial fan with internal lake environments sediments. As well as determining the origin of the sediments as sedimentary, igneous, and metamorphic rocks.

Keywords: Bai Hassan Formations; Lithofacies; Upper Pliocene; Bekhair anticline; Zakho area; Iraq.







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GK5-135

Using of Microfacies Study to Deducting Sub environments of Jeribe Formation (M.Miocene) at Zurbatiya Area, South-East of Iraq

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Abstract

The current study of Jeribe Formation (Middle Miocene) at Zurbatiya area, South-East of Iraq. which is structurally located in the low folded zone. The topic depends mainly on the study of microfacies under the microscope. One surface section in Zurbatiya area is represented by Wadi Al-numur. It is composed basically of dolomitic rocks. Petrography has provided a diversity of fauna such as benthic foraminifera are Miliolid, Borelis melo curdica, and Rotalia in addition to Ostracoda and Red algae, Borelis melo curdica considered an index fossil for the Jeribe Formation. The non-skeletal grains are Peloids and extraclasts. Sedimentary microfacies were classified into three main microfacies Dolomudstone, Dolowackestone, and Dolopackstone microfacies. The Jeribe Formation was affected by many diagenetic processes like dolomitization, neomorphism, cementation, dissolution, and compaction. The evidence from petrography and microfacies analysis support that the Jeribe Formation was deposited in Back reef and restricted-lagoon environments.

Keywords: Zurbatiya; Microfacies; Jeribe Formation; Middle Miocene; Iraq.







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GK5-136

Limitations of GIS-based groundwater potential mapping

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Abstract

In this discussion paper, we highlight misapplications of the spatial analysis of groundwater potential (GP) using geographical information systems, knowledge-driven, and data-driven models. Using this analysis, GP can be evaluated over a large area with simplified and easy-to-develop factors. The result is a map that can identify the most productive parts of an aquifer for better management. However, the GP analysis lacks realism due to the common reliance of analyses on surficial factors such as topography, exposed lithology, soil, and land use/land cover for mapping, which do not consider the nature of the aquifer. These factors only affect the renewable storage of the aquifer under study (i.e., the recharge rate), which generally is only a small part of the fixed or strategic aquifer storage, especially in arid and semi-arid regions. Most of the recent studies reviewed do not present a unified, detailed description of the aquifer has high strategic storage but the quality of water is poor, the GP analysis is not useful. The use of advanced statistical and machine learning algorithms is not required; rather, it is important to have a realistic understanding of the nature of the aquifer being analyzed and the factors affecting it.

Keywords: Groundwater potential; Data-driven models; Surficial factors; Hydrogeology.







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GK5-137

New Basement Structural Division map from analyzing Magnetic Data in Iraq Southern Desert, Using Phase Preserving Dynamic Range Compression Technique

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Abstract

The Iraq Southern Desert lies in southwest Iraq and tectonically occupies a position on the stable part of the Arabian Platform. The area is characterized by a considerable thickness of Phanerozoic sedimentary sequences, generally non-magnetic, that overlie a Precambrian and reworked Proterozoic basement. The magnetic field, therefore, represents the responses of basement rocks.

Several qualitative approaches are used for data enhancement of the potential field (gravity and magnetic) allowing for better qualitative interpretation. Some of these approaches are utilized in image processing techniques. Filters of first- and second-order derivatives are commonly applied to gridded data where their results are used for interpreting data qualitatively. The present work aims to analyze the magnetic and gravity datasets of the Southern Desert and interpret them in terms of structures in the postulated basement and the sedimentary cover. In the present study, the Phase Preserving Dynamic Range Compression technique, which produces a set of dynamic range compressed images at different scales, is utilized to analyze gravity and magnetic datasets of the Iraq Southern Desert. A free-download MATLAB code designed for this purpose is used to perform the required analyses. Large scale (long wavelengths) magnetic image, usually reflects deep sources, offers a possibility of structural interpretation of the Proterozoic basement into three blocks and sub-blocks; northwestern block, central block, and southeastern block. The blocks are separated by basement structural lows or grabens that are inferred from depth to basement maps. A small-scale wavelength image usually reflects magnetic sources at shallow basement depth, and displays different magnetic features mostly make up NE-SW lineaments. Analysis of gravity data at large- and small scales show gravity lows and lineament structures within the basement and the sedimentary cover, respectively.

Keywords: Basement Structures; Magnetic Interpretation; Gravity Interpretation; Potential Data Processing.







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GK5-5-Poster

Interactions Between Earthquakes And The Atmosphere

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ABSTRACT

The solid earth and the atmosphere are companion systems that do not function separately but rather are constantly attached to each other, so any change in one of them has an effect on the other. Earthquakes affect the atmosphere along common points between the earth's surface and the atmosphere. These effects may include electron movement, acoustic waves including audible sound, and electromagnetic waves including visible light and fields that may be detected by human sense. The very early versions of seismo-ionospheric coupling models were based on direct calculations of seismogenic electric field effect from the ground surface to the ionosphere (Krankowski et al., 2018). An earthquake of magnitude 4.8 occurred on April 29, 2020 near the region of Tasluja (known locally as Takya earthquake), located about 25 km west of Sulaimaniyah city. People living close to the epicenter of that earthquake noticed a light in the sky at the time of the earthquake. This light was also filmed by surveillance cameras. Earthquake lights are caused by the electrical properties of some rocks in specific places of the world. Some scientists of the United States Geological Survey (USGS) consider that the appearance of these lights means that an earthquake will strike in that region or its vicinity. It has also been suggested that the appearance of earthquake lights is related to the electric fields generated by the vibration of power lines. To investigate a possible relationship between earthquake occurrence and atmospheric pressure, we reviewed the meteorological station records near the source area of the Mw 7.3 Halabja earthquake which occurred on November 12, 2017. We noticed that the atmospheric pressure began to descend for several days before the earthquake occurrence time, and on the day of the event the atmospheric pressure suddenly rose, and then it began to descend for several consecutive days. We found a relationship between the number of earthquakes that occurred near Halabja in the past 5 years and the amounts of precipitation in those years. Specifically, the precipitation amounts increase with increasing number of earthquakes, an effect which could be related to lower atmospheric pressure in the earthquake region.

Keywords: atmosphere; earthquake; ionosphere; electromagnetic; Earthquake lights; pressure.







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GK5-41 Poster

Geochemical Assessment of Oligocene Limestone for Possible Use as Portland Cement in Ashdagh Mountain Sangaw Area - Kurdistan Region of Iraq

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Abstract

The sedimentary deposit of Oligocene rocks is outcropped in Ashdagh Mountain and characterized by highly calcareous limestone especially in the lower parts. Rocks of this age is composed of nine formations that are deposited during Oligocene. These formations grouped into three types included basinal, lagoonal and reefal according to depositional environment. The study based on XRF chemical composition analysis and loss on ignition for thirty-eight handpicked samples of the area and evaluation of major oxides as Portland cement raw material. The chemical results showed that the limestone samples are crystalline and dominantly composed of calcite. The analysis shows that the whole succession is consist of calcitic limestone, which contains CaO more than 49%, less than 1% MgO, Fe₂O₃ and Al₂O₃. The analysis show that the limestone is high-grade limestone, which is very suitable for Portland cement production. Geochemical results of samples indicated that the limestone from the Oligocene rocks in the area contains high LOI which range between (38.7% to 43.9%), and other major oxides are in suitable range while alkali metal oxides and SO₃ are present in traces. The Ratios of the silica modulus (SM), alumina modulus (AM), and lime saturation Factor (L.S.F) were also calculated. It was found that these ratios of most samples are compatible to Standards Specifications by adding silica, aluminium and iron oxides. The lime saturation factors (LSF) of studied samples have widely differing values, but most have values above the limits required for high quality cement. The results show that the Oligocene limestone could be use in cement industry.

Keywords: Sangaw area; Geochemistry; Oligocene limestone; Portland cement.







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GK5-49-Poster

Updating performance and upgrading proposal of the Kurdistan Iraq Seismological Network

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Abstract

Kurdistan Iraq is located at the leading edge of the Arabian plate where earthquakes occur daily along the Zagros continental collision deformation zone. During the last two- decades the Kurdistan Directorate of Meteorology and Seismology (KDMS) has developed an advanced seismographic network throughout the Kurdistan province. Starting in 2005 they deployed the North Iraq Seismological Network (NISN) consisting of 10 seismic stations equipped with STS-2 seismometers and 24-bit digitizers. At present only 8 of these stations are operational, but they are now installed in modern vaults and equipped with radio telemetry. In 2008, KDMS deployed the Kurdistan Iraq Research Station (KSIRS), an array that is equipped with STS-2 seismometers, 26-bits Q330HR digitizers, 16 GB Marmot field data acquisition units, and satellite and radio telemetry. The KSIRS array consists of five -elements arranged in a circular pattern with an approximate diameter of 0.5 kilometer away from central station. The data from the KISN stations and the KSIRS array are transmitted in real-time to Kurdistan Iraq Seismological Center (KISC) in Sulaimaniyah city. The center is equipped with several computers running the Linux CentOS or Ubuntu operating systems. KISC uses the Antelope software system to acquire and automatically process the data it receives in real-time from all the field stations. Antelope is also used by KISC staff to manually process the archived data and generate an on-line seismic bulletin. During the period 2006-2021 KISC processed over 20,999 earthquakes with magnitude range of 1.5-7.3 that occurred within the province and surrounding regions. The seismic data are being used to better understand the seismotectonic framework of the region, to delineate the local and regional seismic activity, and to establish reliable seismic hazard maps for engineering purposes. KDMS and KISC plan to expand KISN by adding new broadband stations to improve coverage of the province and by adding strong motion sensors at and around vital engineering and economic infrastructures, e.g., dams.

Keywords: Seismic Network; KISC; KDMS; NISN; KSIRS; KISN







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GK5-52-Poster

Seismotectonic Perspectives Of The 2017 Mw 7.3 Halabja (A.K.A. Sarpol Zahab) Earthquake

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Abstract

This study deals with the seismotectonic behavior of Halabja earthquake (Mw 7.3) and its aftershocks. The work shows that the magnitude of the majority of the aftershocks can be categorized into four classes, 2.5 - 3, 3 - 4, 4 - 5, and 5 - 6. The source area of the 2017 Halabja earthquake extends in a rectangular area of about 80 km in length and 50 km in width, clustering between Halabja, Khanaqin, and Sarpol Zahab. The seismotectonic behavior may reflect the Zagros seismic belt that represents the most active seismic region in the area. The focal mechanism of earthquake occurrences in the Zagros region often indicates reverse faulting. The predicted decay rate of the aftershocks of Halabja earthquake shows a good approximation with Omori-Utsu law.

Keywords: Seismotectonic; Halabja; earthquake; aftershocks.







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GK5-72-Poster

A Review of Historical Earthquakes of Iraq and Surrounding Areas

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Abstract

Present day Iraq is a country synonymous with the ancient Mesopotamia and the Fertile Crescent delineated by the Tigris and Euphrates rivers. Iraq has a long well-documented history of seismic activity. The seismicity pattern, in general, follows a well-defined tectonic framework related to the Zagros continental collision zone between the Arabian and Eurasian plates. Accordingly, the observed instrumentally recorded seismic activity is significantly higher in the north-northeast Kurdistan region than the south-southwest territory of Iraq. In this study, we review the historical seismicity described by Alsinawi and Ghalib (1975), where 89 events of major and/or minor effect on the community are documented for the period 1260 B.C. through 1900 A.D. We grouped those historical earthquakes according to their descriptive location and found that 28% occurred around Baghdad, 10% in Mesopotamia, 10% in Mosul, 11% in Wasit (Kut), and 5% in Basra. Al-heety (2007) reports that 37 of those earthquakes have magnitude and intensity information. We also examined the International Seismological Center (ISC) catalog and found 79 earthquakes between 1927 and 2005 with magnitudes ranging from 5.0 to 6.1. Using the earthquakes parameters from both catalogs, we estimate the a and b coefficients of the Gutenberg-Richter (GR) recurrence relationship. The (GR) relationship states that earthquake magnitudes are distributed exponentially, and these coefficients are essential for determining the probabilistic seismic hazard assessment (PSHA).

Keywords: Historical earthquakes; PSHA; KISC; Gutenberg Richter relationship; ISC.







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GK5-101-Poster

Determination of the ancient shoreline and anthropogenic sites in the southern Iraq using remote sensing techniques

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Abstract

The evolution of sea-level results from the interplay between several global factors such as climate, tectonics, and erosional activities. The humid climate, low tectonic activities, and active erosion has a direct relationship with the sea-level rising, and verse versa. Historically, from the peak of the last glaciation until about 18,000 years before present (yr BP), where the Arabian Gulf at that time was free of marine influence. The present shoreline was reached shortly before 6000 yr ago and exceeded as relative sea level rose about 3 m above its present level, inundating the lower parts of the Mesopotamia. This study aims (1) to determine the ancient shoreline of the Arabian Gulf and (2) to detect the ancient anthropogenic sites using remote sensing data. We used thirty-six scenes of DEM (SRTM V3), General Bathymetric Chart of the Oceans (GEBCO), two scenes of Landsat OLI, and sixty-three QuickBird scenes. For this study, we selected two study areas in the south part of Iraq. The first one is the Arabian Gulf and the second one is the area of 10,000 km² surrounding Al-Naseria town. Almost all of the anthropogenic sites of the major towns such as Uruk, Larsa, Tall Al l-laham, Tal Um-Al-aqareb, Girsu, Tal Chukh, and UR (which is always located in places higher than the surrounding area) have been detected using topographic positional index (TPI) with 5 m threshold. These towns were located close

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to the ancient shoreline of the Arabian Gulf. The ancient shoreline of the Arabian Gulf is located about 190 and 230 km northwest of the present-day shoreline. The results show that there is neotectonic activity (uplift) for the area located between Al-Amarah and Al-Majer area. Integration of digital remote sensing, GIS, and archaeological information are helpful to get more information about ancient life.

Keywords: ancient shoreline; anthropogenic sites; Arabian Gulf; remote sensing; GIS







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GK5-102-Poster

Shallow water depths estimation using remote sensing in Hor Al-Shewicha, Iraq: Comparison of different machine learning models

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Abstract

Bathymetric mapping feeds information about the water depth and estimation of water volume, which helps in water resources management. In the last decades, large parts of Iraq territories were suffered from a drought and water shortage that was followed by the flash flood phenomenon, which highlighted the necessity to activating and developing methods and mechanisms for water resources management. One of the catastrophic flash floods was happened in April 2019, which is flooded houses, lands, and roads and led to losses of lives and severe damages to private and public properties. The main goal of this research is to estimate the areas affected by flash flood and calculate the resulted increase in the volume of water within Hor Al-Shewicha (east of Iraq Iraq). We evaluated and compared quantile regression forests (QRF), random forest (RF), support vector machine (SVM), and artificial neural networks (ANN) approaches in combination with Sentinel 2 and ICESAT2 data to determine the water depth and then to calculate the volume of the water within Hor Al-Shewicha. The coefficient of determination (\mathbb{R}^2) r relationship between the depth obtained from the ICESAT2 and the estimated depth has been calculated to evaluate the accuracy of the results. The coefficient of determination for the QRF, RF, SVM, and ANN models are 0.956,

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0.953, 0.787, and 0.835, respectively. Where QRF and RF models are better than SVM and ANN methods. For shallow water, we argue that the use of adequate few handguards depth can estimate the water depth for water body using passive satellite imagery in other regions of the world.

Keywords: remote sensing; machine learning models; Bathymetric mapping.







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