Geology and Seismic Activity of Muqdadiya District and Its Impact on Locating Dams and Reservoirs Using Modern Technologies

Reham Mahdi Jouameer Al-shammari[1]
University of Baghdad College of Art/ Department of Geography
rehammahdi4@gmail.com

Prof. Dr Sadeea Akol Munkhi [2]
University of Baghdad College of Art/ Department of Geography
sadeea2013@coart.uobaghadad.edu.iq

[1]Corresponding author: Email: rehammahdi4@gmail.com

Abstract

The aim of the study is to identify the natural ingredients in the construction of the Muqdadiya dam, through the qualifications of the natural environment, geomorphological and morphometrics, and the processes that resulted from them. Size flow watery in which. Muqdadiya district adult area (1033 How many 2) And the reality between my circle an offer (34∘.00‾ - 33∘.45‾-) north and between linear Length (.15‾∘45-45∘.44‾) east, make up center Elimination Percentage (4.32 %) with regards province Diyala. Linear structures prevailed in the study area, and the structures with a northwestern direction were recorded. The percentage of linear structures for this direction was (11.4(% of the most frequent and long structures within this direction and the percentage of their length)22.7%). that Composition geologist to spend Muqdadiya Returns to me configurations Old in a squeeze out pseudo (third time) and appearance Region configure it Present within easy sedimentary Returns to me latest ages geological, It is prevalent in the region sediment easy The overflow has reached its area 489.26 km 2, as for seismic activity, the intensity of the earthquake ranged between 1.3-3.8, while the depth of 9 earthquakes ranged between (5-9 km), while 20 earthquakes ranged in depth between (10-19 km), and the center of the earthquakes depth In the Muqdadiyah region does not exceed the earth's crust.

Introduction

Prepare study shapes the floor affected by factors natural the foundation To learn the nature Area Studying and evaluating the possibility of constructing dams and reservoirs in them. so was exposed area to changes geology many of which drop ground in a some its parts and its height in a parts other, Because movements floor, gesticulate caused by about her From cracks and joints weaken rock and increase From Effect Processes Geomorphology In which, and to integrated the study area must From eat That factors Of which:

The Problem of the Study

Does geology and earthquake sites affect the location of dams and reservoirs.
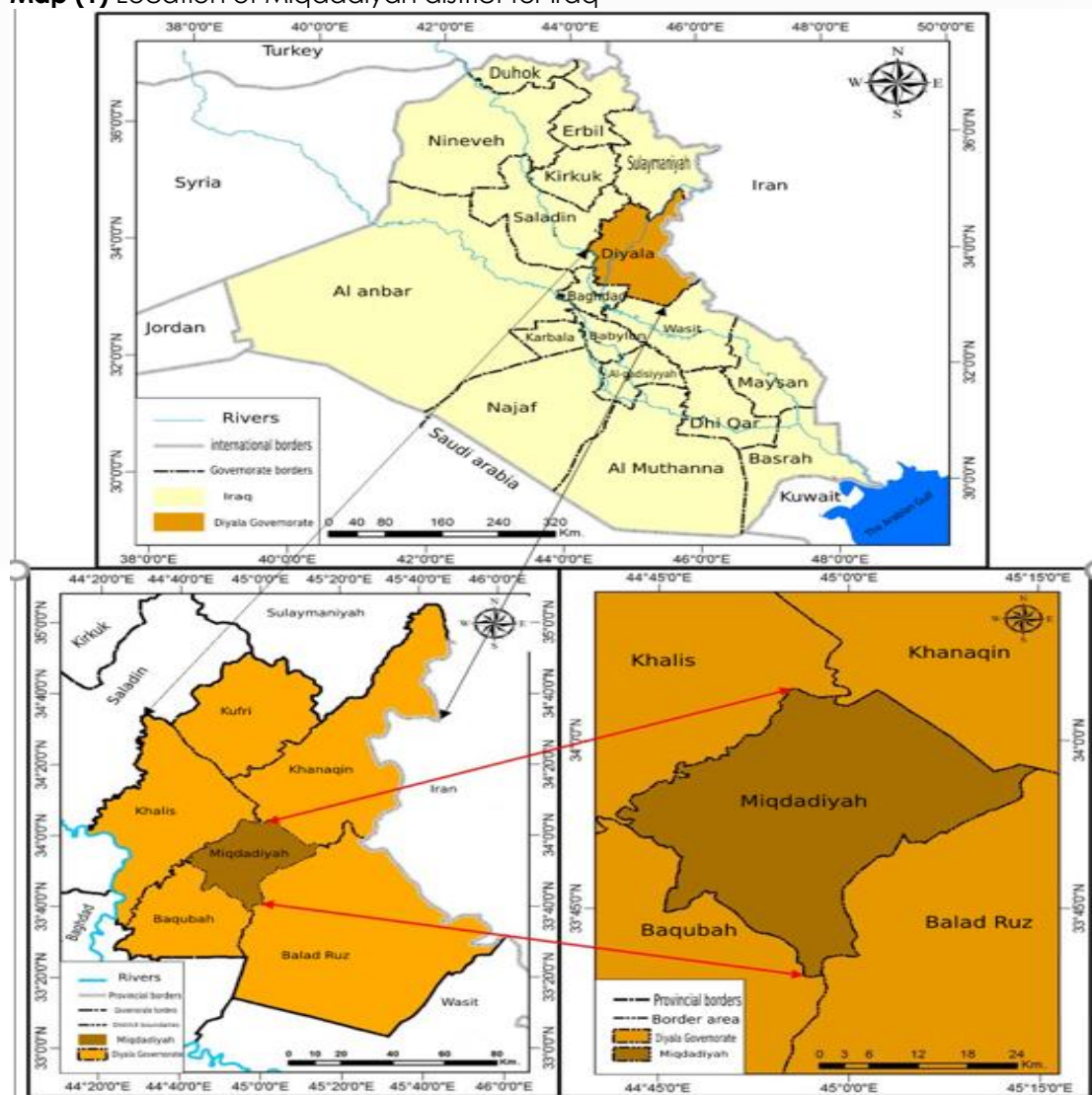
Study Hypotheses

Yes, geology and seismic sites affect the location of dams and reservoirs

Study Methodology

Descriptive approach, quantitative approach, Gis and remote

Map (1) Location of Miqdadiyah district for Iraq

Source: The General Authority for Survey, map of Iraq Administrative, Baghdad 2007, scale 1/1000000

The Aim of the Study

Identify the natural components in the construction of dams in meqdadiya district through natural qualifications, geomorphology and seismic activity

The Geology of the Area

for circumstances geological Effect Live in a Hydrology of the area so that operations Leak water to me inside Earth Depends picture main On Structure geological rocks so may be He is leakage From abundance in which Lead to me drop or lack discharge riverine sometimes as He adverb in a areas rocks calcareous) . and affect Structure geological in a contrast wasted leakage riverine according to for variety Ingredients rocky and its characteristics the public Which determined under amount permeability and medi Availability communication and cracks in a That Ingredients . I judge you That Properties seeping water inside Dandruff the floor and on though From that wasted That water seeping From Hungarian riverine But It in time Himself Source Important provide the river with water in a destinations which have level water subterranean In which equal level bottom the river or higher from him, What Works On stability and continuity flow and at a rate Moderate throughout general. as that to configure geologist trace in a continuity flow and the flood the ingredients sandy form Material self-permeability High Than Works On more leakage From waters rain in a inner Earth, As for clay and financial be less in a when nature rocky shallowness the soil and intensity regression increased From Effect waters rain and snow in a happening peaks High for expenses and floods, all of this controls the selection of the optimal location for the dam in the region(Al-Khafaji & Tattoush, 2003; al-Kubaisi, 2000; Al-Omari & Al-Nasiri). It includes:

Studying the Tectonic Region of the Linear Structures

Geologists differed among themselves in the tectonic division of Iraq, including the Muqdadiyah region by rating (Buday, 1987) Iraq, divided it into two main areas
1- Alpine regional concavity: which in turn is divided into two parts: the marginal basin (myogeo-syncline).
B - Sedimentary basin (eugiosyncline)
2- The Arab Nubian surface, which is divided into: a- unstable curved pavement b- stable curved pavement(Ali, 2005)

The unstable tortuous pavement was divided into the following: 1- High folds range 2- Low folds range 3- Alluvial plain range and through the previous division, we find that the Muqdadiyah area is located within the sedimentary plain, the Mesopotamian region (the flat area)(Al-Dulaimi, 2009). From the observation of map (2), we find that the sedimentary plain range occupies 1002.812 km how much by 97.06 % From the area of the region while occupied the low folds / Hamrin belt space 30.314 and by 2.93 %, as We note that there is a fold located to the south of Lake Hamrin, which is an asymmetrical bi-diving fold that extends in a northwesterly southeast direction. There is also a fault to the south of the study area, whose passage coincides geographically with the deflection of the Diyala River, which is From Type normal motion browser deep It arrives to me rocks Al-Qaeda and long extends last From north of Khanaqin Even the border Iraqi Saudi Arabia It is characterized move it vehicle first from movement lift simple for mass Which Located to me the South western From the fault The second is a sideways movement represented offset Bloc Which Located to me North oriental From the fault To the northwest, that The existence of this fault explains Lots of phenomena Geomorphology Unique and associated by stream River Diyala down where that deviation lateral for the course of the stream wide Domain sprains and more Degree skewness and not symmetry in distribution shoulders riverine and transmission Hungarian lateral Toward the bank right for this section all of which phenomena Could that be consoled to me the movement the others tangible But the influential for blocks the floor On side the fault distance its accumulation for a while long(Abdul-Amir, 2018; Al-Khafaji & Tattoush, 2003; Ali, 2005).

(2) Tectonic map of the study area
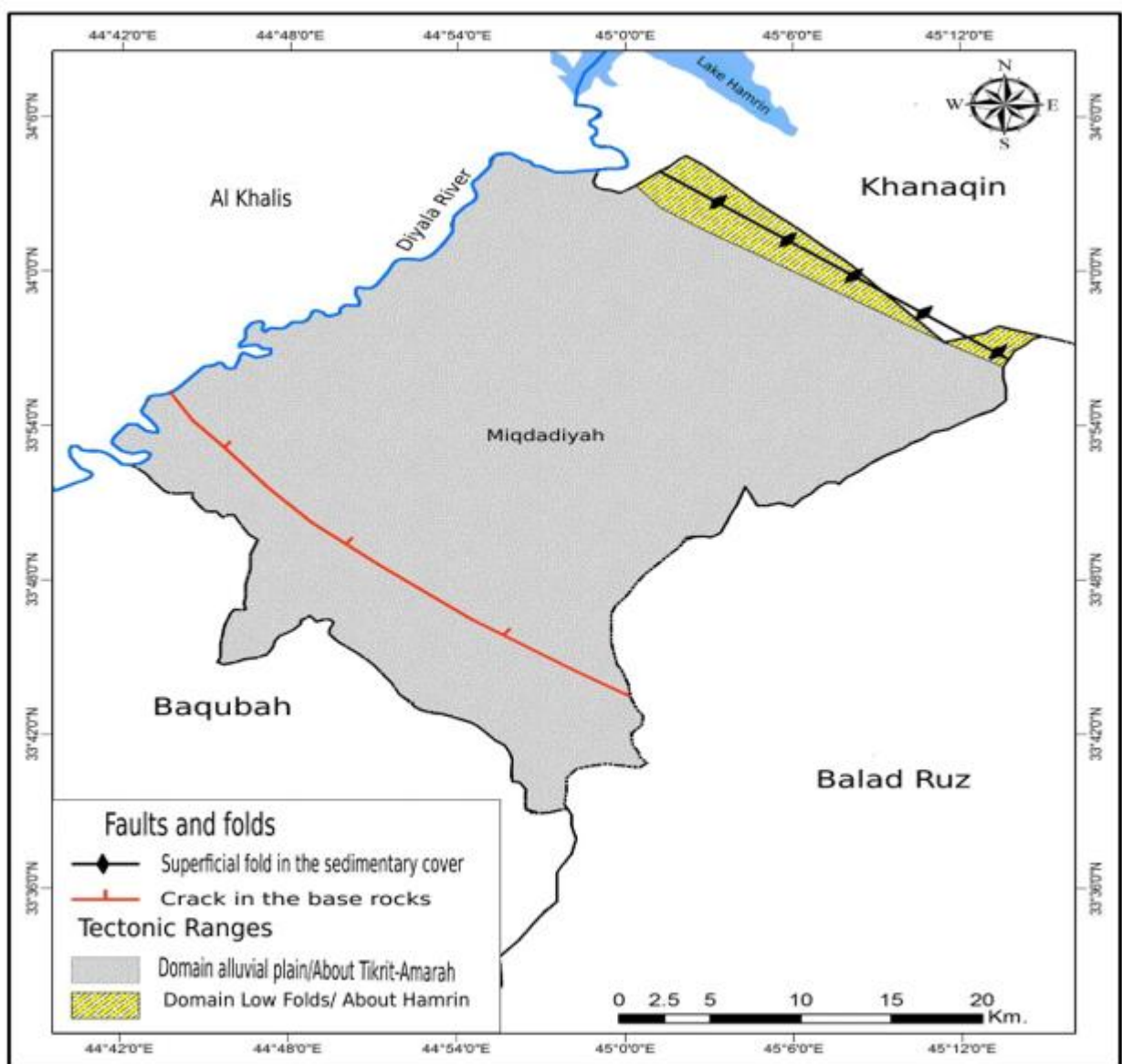
Source: From Action researcher by credit On Visible satellite for the moon industrial (Land sat 7) with a resolution of 30 square meters, for the year 2009, and processed using (Arc Map 10.3**).**

Table (1)
The area and proportions of the areas of the study area

The name	space	The ratio
Sedimentary Plain Range / Tikrit Belt Architecture	1002.812	97.06
Low fold range / Hamrin belt	30.314	2.93

The source is from the researcher's work based on the **map (2)**

Linear Structures

to get to know compositions sin as phenomena natural self Origin Geologist Could noticing it From Pictures air or visuals satellite On appearance lines straight Approximately . As you know Moreover On It represent expressions Geomorphology bi The dimension indicate to me Milestones line superficial , Different phenomena sin in a its lengths Which reflect Depth its extensions and extent Energy the movement the floor interior and according to So she classified to me(Kastens & Ishikawa, 2006) **:.**

Rounds

(Cook & Torrance, 1982) phenomena line wide Extension and prepare reflection superficial for combinations Under striae or cracks impressive On rocks Al-Qaeda , has stretch this is compositions incisive fish total for the crust the floor and up sometimes to me Section upper From front (mantel) can Discrimination between spurs and sins , The astrocytes Means phenomena sin the wide Extension if she was its distance ranging What between (10 - 100) How many and releases on her by streaks mega in a case transcend its extension (100) km , and embody reflection surfactant for compositions Under superficial or cracks influential On rocks Al-Qaeda and in combinations escort for cracks self Extension longitudinal rectum (Kaválek, 2015).

Sins

she is phenomena self extension Less From (10) How many , that for this compositions the influence direct On trends and extensions the valleys aquatic in a Region , so Lead that to me escalation Processes Even and hurt her in a several areas From Elimination , and thus directly affects the construction of dams and reservoirs, as well as dominate compositions striae On distribution and movement water subterranean in a Region From During density this is compositions and directions and its intersections so help all From cracks and the cracks And faults On Speed Leak water and penetrated in a inner earth, as in a map (Hao et al., 2012)(3). Sins are divided into three types:

A- Lines that are very short: which cannot be seen with the naked eye.
b- Short Lines: The ones that reach a maximum length of (2) km.
C- Long Lines: Their length ranges between (2-10) km.

Map (3) linear structures prevalent in the region
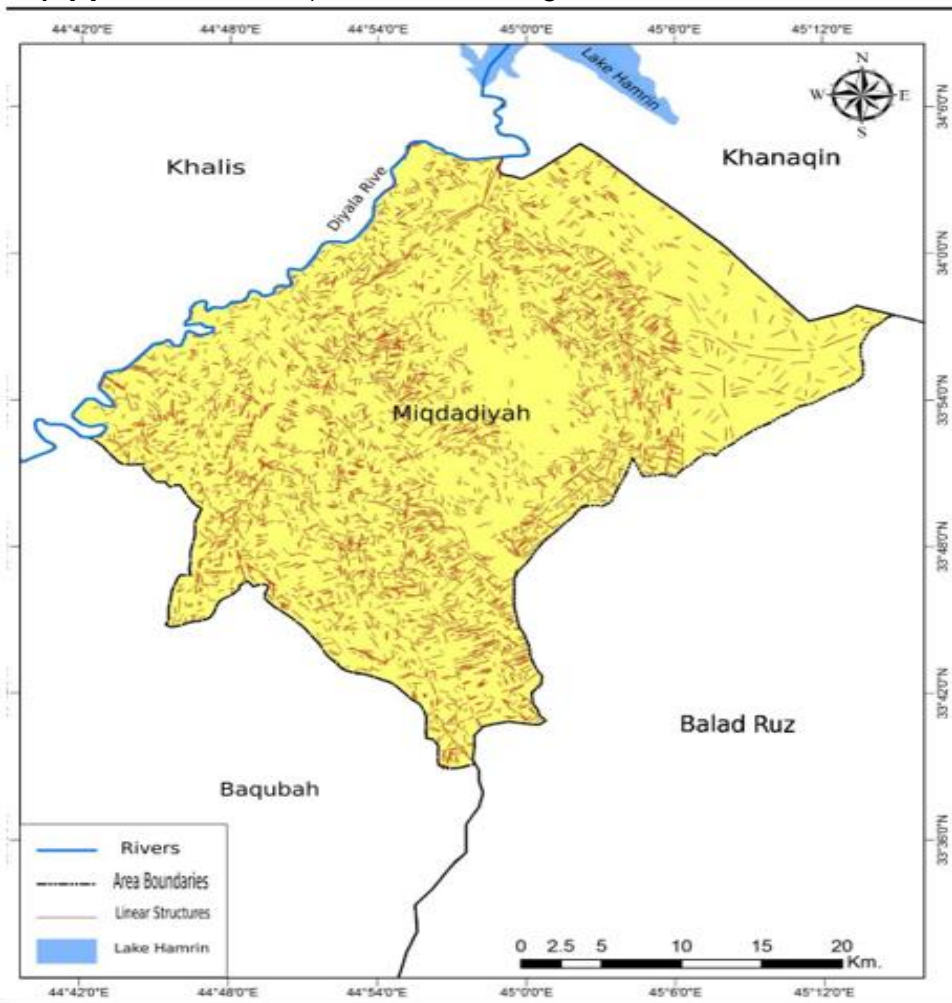
Source: From the researcher's work based on the satellite imagery (Land sat 7) with a resolution of

30 square meters, for the **year 2009, and processed using (Arc Map 10.3) (Fuxreiter, Tompa, & Simon, 2007).**

Table (2)
Trend, Sum and Ratios for Linear Structures

direction	Directional degree	Total lengths/km	The ratio %	Sum of lines by direction	The ratio %
North	22.5-337.5	2400	12.1	500	12.5
the South	157.7-202.5	1300	6.6	496	12.4
the East	67.5-112.5	1500	7.6	525	13.2
the West	247.5-292.5	3500	17.7	500	12.5
the Northeast	22.5-67.5	1700	8.6	525	13.2
North West	292.5-337.5	4500	22.7	470	11.4
southeast	112.5-157.5	2500	12.6	520	13
Southwest	202.5-247.5	2400	12.1	470	11.8
the total		19800	100	4006	100

Source: From the researcher's work based on Map 3

From the observation of map (3) and table (2), we find that
1-4-2-1: Linear structures with a direction (north):
The total number of linear structures (500) at a rate of (12.5%), and their total lengths reached (2400) km at a rate of (12.1%).

Linear structures with a direction (south)

It is considered the least directional linear structures in length, as the sum of the lengths (1300) km (6.6%) and the total lines (496) (12.4%).

Directional linear structures (oriental)

The highest percentage in the number of linear structures was recorded within the study area The number of repetitions of the compositions for this trend was (525) linear combination with rate (13.2%) of the total number of lines, and the sum of the longest ones was (1500) Km and Percentage (7.6) % From the ratio of the sum of the longest total structures.

linear structures with (Western) direction

The number of repetitions of the compositions for this trend was (525) linear combination with rate (12.5%) of the total number of repetitions, and the sum of the longest ones was (3500) Km and Percentage (17.7%) from the sum of the longest total structures.

Linear structures with a direction (northeast)

The proportion of linear structures for this trend (13.2) %, and the directional degree (22.5-67.5) the total lines reached (525) within this direction
, and their total length was (1700) km at a rate of (8.6%).

Linear structures with a direction (Northwest)

The proportion of linear structures for this trend (11.4%, and the directional degree (292.5-337.5) was the most frequent and longest for the structures within this direction, with a total of (470) lines and a total length of (4500) km at a rate of (22.7%).

Linear structures with a direction (southeast)

The total number of linear structures (520) linear structures (13%) and their total lengths reached (2,500) km (12.6)%.

Linear structures with a direction (southwest)

The total number of linear structures (470) linear structures at a rate of (11.8%), and their total lengths reached (2400) km at a rate of (12.1%). These linear structures affected the variation of the surface features in the study area, as the high blocks led to the formation of plateaus and rocky edges that were formed immediately after the cracking processes, while the descending blocks with parallel and straight faults led to the formation of many valleys and depressions that are often identical to the extension of Faults and linear structures in the region, and this compatibility between the extension of basins and faults has a direct impact on the activity of the underground processes in various regions, as the lateral and vertical processes are active if the extension of the valley is consistent with the extension of the fault, and the linear structures and their extensions affected the nature of the presence of groundwater and the distribution of water wells , as the interruptions taking place in it in different directions provide the groundwater an easy path for access and movement in the region, thus affecting the hydrology of the region.

Stratification

Prepare nature configurations geological system structure Layers From factors the mission in a formation Appearances Surface ground and its phenomena terrain so set Properties natural and chemical for rocks Degree affected factors weathering and stripping and possibility break it up and break it up or decompose it and melt it(Milkov & Sassen, 2002) . as set nature relay between Layers geological thick and few fish and nature its rocks fragile and solid and Mada her response for factors and operations Stripping different , that study relay stratified area the study SniffNS configurations phenomenon On Surface Just to know its thickness and properties its rocks, as wellNS for her role in a formation units the floor and its effect on permeability and quality water in a tank As well as on the appropriate areas for the establishment and safety The dam and looking at the, we find that Composition geologist to spend Muqdadiya Due to me configurations Old in a squeeze out pseudo (third time) and appearance Region configure it Present within easy sedimentary Returns to me latest ages geological, made up geology Area the study From Next:

Table (3)
Area and percentage of geological formations for the study area

The ratio %	space	configuration	age	time
1.8	20.9	Deposits filler for valleys		
52.7	489.26	sediment easy overflowing		
14.1	161.69	sediment dunes sandy		
0.2	1.94	residue cracks deep		Quadruple time configurations
0.6	7.01	sediment Activities Humanity		
4.2	48.41	sediment gypsum		
10.7	122.48	arsenals flow the sand and mud	hueLucin	

3.6	41.32	residue depressions shallow mud and sand		
1.6	17.95	arsenals fans placer	NSfor Pliocene	
1.6	18.01	residue depressions shallow /the bog		
3.9	44.54	sediment cliffs		
0.4	5.12	formation WL Hassan Bakhtiari the above		
4.7	54.37	formation Muqdadiya Bakhtiari lower	Pliocene	Triple time configurations
100%	1033.11	the total		

Source: From the researcher's work based on the satellite imagery (Land sat 7) with a resolution of 30 square meters, for the year 2009, and processed using (Arc Map 10.3).

The formations of the third time

Triple time configurations occupy space 59.49 km 2 from Muqdadiya district, and it is concentrated in the northeastern part of the region and includes formations of the Pliocene era

a Formation of Bey Hasan al-Bakhtiari al-A'la:

This formation unfolds in the eastern part of the study area and occupies only a few areas 5.12 km2 It is the second lowest percentage of 0.4% From crumbs floor ranging From size Celts to me admixtures Aljalamid and usually be pheasant in a size granules girly From lower to the top, so that Section the above He the most contain On admixtures coarse stone mud or the stone sandy. Is characterized by Layers This configuration by shift horizontal fast in a rocky and fish. Layers of compaction He is its thickness up to 5 meters and in Most likely crumbled or weak Bonding and pebbles in a This configuration similar when Existing in a formation Muqdadiya As for environment sedimentation It is an environment riverine, and be Layers stone mud placer and broken rich in roots and effects life For some Biology , As for stone sandy it will be fine to me rough granules weak bonding , and content lime average too Little , and applied to me lumpy With Presence application cross

Composition of the lower Muqdadiyah Bakhtiari:

Occupies a space of 54.37 km2, and its ratio is 4.7%, its components are sandstone, fine gravel at the base, siltstone and clay stone, pale brown to greenish, consisting of recycled courses that smooth upwards.. This formation is revealed in the northern, eastern and northeastern part of Muqdadiyah district(Jalut).

Quaternary time deposits(West, 1956):

Quaternary formations occupy 1089.38 km2 thus forming the largest area of the study area, and it

947

consists of Pleistocene and Holocene sediments. It is as follows:

A precipitation slopes

It is located in the east and north-east of the study area adjacent to the Muqdadiyah formation and along the slopes of little inclination, it occupies an area 44.54km 2, of the area of the region, while the percentage of3.9% ,And consists From Mixture not matching From to cut rocky big the size and precipitates sandy mud

sediment depressions shallow mud and sand

It is found in separate areas in the north, center and south of the region 41.32km 2, and the ratio is3.6 %, It generally consists of thin layers of fine sand and clay silt and is found in the form of dry depressions most of the year, except for the rainy periods, when they are filled with water and collect sediments transported by rivers and water courses.(Baas, Best, & Peakall, 2016).

sediments fans placer

Form sediment fans placer, in the east of Muqdadiyah district, adjacent to the slopes, which are few and scattered, occupy space 17.95km 2, from the area of the study area by 1.6 %, and made up this is Deposits From Sand mixed With Deposits pebble or On appearance lenses ranges its thickness (1 - 2) meter and share silt and mud alluvial With Sand to configure fans. As for the sedimentation environment, it is a river environment, that Maximum fish Reach mechanism this is Deposits ranges What between (10 - 15) meter, cover sediment fan placer NS (jikrite) Which He is On body lumps gypsum High School formed during time not the rain Which sad in an interval Pleistocene And who may be It arrives Fish up to (2) meter

depressions sediments Shallow smelter

These sediments are located in separate areas in the middle of the study area 18.01 km 2, and its ratio   1.6 % , These sediments consist of materials in which rains and torrents flow to depressions in flat sites resembling plaques, and they lie in them for a period that may be long or short. It consists of clay and alluvial materials carried by seasonal rivers with wind sedimentation(Peterson & Carpenter, 1986).

sediments flow the sand and mud

It is found in separate areas in the north-east adjacent to the highlands, as well as in the south-east and in the south it has reached an area 122.48   km 2 of the area of the study area, and the percentage 10.7% of the formations that make up the area

formations gypsum

It is spread in separate areas in the west and southwest of the study area.occupy space 48.41 km 2, and its area is 4.2 It is called gypsum soil because it contains more than 5% gypsum in the effective root zone., and be Matter the origin for this the soil rocks lime or residue gypsum Which few depth so ranges its thickness From several centimeters to me (20)poison And that Because Stripping wind , Is characterized by weave the soil rough it as tissue sandy mix spread In which vehicles Calcium in quantities big On Surface and rain few not enough to remove it and characterized down Percentage Materials Organic And salinity medium.

deposits human activities

Found in the southwest of the study area reached an area 7.01km2, the ratio of 0.6 %, these sediments accumulate as a result of various human activities, the most common of which is the sedimentation of the bodies of the old irrigation canals, hills and archaeological sites. Old irrigation canals may consist of local sediments, but then newer layers of coarse sediments (green-sand) are added to their side plugs, which are taken from the sediments of the canal itself by cleaning. Walkery, These fine deposits mixed with pottery pieces and old bricks, which gives an indication of the ancient environment during the past stages

deep fissure deposits

Be in a small area in the southwest of the study area, Faults are large fractures and cracks that are in the surface layers of rock. These cracks develop according to the type of rocks, usually accompanied by a slip in the layers that are located on its sides, so that the extension of these layers is interrupted, so the rock layers appear on one side at different levels than their levels on the other side.

sludge dunes sandy

are there this is dunes sandy in the middle Area The study occupies a space of 161.692 km in the district of Muqdadiya, and its ratio14.1 % ,Which phrase on sediment movable by doing wind to precipitate in a Regions low **.** Relies fish Deposits wind on shapes gathering boards Sand and rarely what will you be? your name From (1)NS except warehouses dunes sandy Lost Reach Sometimes fish Deposits wind In which to me (5)NS or More**.**

flood plain sedimentation

These deposits are the most prevalent in the study area, as they cover most of its parts from north to south and in the west occupy an area of 489.26 km2. 52.7%, most of the floodplain sediments consist of sand, silt, and clay of different sizes through the river sediment layers.) These sediments arose as a result of the recurring process of river floods and their tyranny over the lands periodically and continuously during different historical stages(Barwary, Said, & FS, 1992).

sediments filling the valleys

These sediments gather in the stomachs of the valleys, and they are sediments that differ in their morphological characteristics as well as differ in their sizes. They are located in the southeast of the study area. , These sediments arise as a result of the water erosion of the valleys.). These sediments are divided into two types (coarse sediments and fine sediments), the coarse sediments cover the stomachs of the deep valleys, and consist of pebbles, large boulders and clay materials, while the fine sediments consist of clay, sandy, and alluvial soft materials, with pebbles of small size and cover the wide flat areas of the valleys. These sediments are between (0.5-1.5) meters, and up to (2) meters in some cases(Industry & Minerals, 1995).

Seismic Activity

know earthquakes that it appears natural as Earth Always the movement not in a condition stability as it seems Our ostensibly the continents changed their locations via Date geologist the long , And this the movement naturally adverb produced necessarily on Presence energy inside Earth lie basically Down Dandruff external gesticulate lasted Dandruff external moving it if What Event change in a rates the speed up or if What Event change in a trends the movement Happen or occur Subsequently Clash blocks or panels tectonics some of them some generator vibrations fit in a its strength and intensity With Energy bump or petition between them ,

Table (4)
Seismic activity in the study area

date of occurrence tremor*	Latitude	longitude	local seismicity	Depth of ground focus in kilometers
18:27:49	33,880	45.100	2.6	10
11:15:13	34,090	45.290	2.5	8
16:33:41	34.100	44.870	2.5	12
16:12:36	33.910	45.010	3.1	14
16:34:06	34.120	44.900	3	12
01:39:10	33.750	45.250	3.2	8
06:27:47	33.820	45.170	2.6	7
21:39:52	34.190	45.050	1.9	5
08:13:33	34,054	45.145	2.9	6
07:05:20	34.212	45.050	3.3	12
00:02:31	34.008	45.133	3.2	8.5
15:34:32	34,080	45.220	2.1	15th
07:52:02	34.100	44.800	3	12
00:20:56	33.920	44.610	2.2	10
02:02:32	33.610	45.040	3.3	8
01:43:04	34.268	45.081	1.3	10
01:07:45	34.296	44.919	1.5	11
09:37:43	33.980	45.340	2.9	14.4
11:50:23	34.220	45.170	2.4	15th
02:26:58	33.820	44.730	2.6	5
02:17:07	33.900	45.340	1.7	10
15:13:16	34.014	44.925	3.7	14
19:37:06	34,056	45.304	3	8.2
16:26:35	34.014	44.998	4.4	15.3
18:09:42	34.114	44.814	3.1	13
10:29:56	34.088	45.032	3.8	18
05:18:32	33.877	45,291	2.5	14
13:32:00	34.200	45.100	3	7
07:54:32	34.082	45.025	2.6	18
17:15:55	33.820	45.210	2.1	19

Source: The researcher based on data obtained from the Iraqi Meteorological and Seismic Authority

That vibrations she Which we know it earthquakes Located Section North From Iraq, including the study area From side techno in an Area sensitive What between Shop moving in between the two units Tectonics (lonliness geoscline Old alpine for chains Zagros From Side and the plate Arabic From Side a second) . It is characterized north Iraq by its composition tectonic the seat reflection for stages Development geologist and tectonic the complex in which. process formation and evolution compositions tectonics modern still ongoing calendar continuation a movement plate Arabic towards North and the north oriental generator squeezing hard On compositions geological in a north Iraq, and increase This the pressure On Regions the weak Which pierce it belts From snails deep surface and buried In which, and intersecting and the manifold Than Increase From the pressure On areas intersection, bifurcation, deviation faults. So Located centers most points seismicity in a north Iraq in a Such as That Locations From likely that be earthquakes self the size Great discovered linked with movements Relativity for plates tectonics Eurasian and Arabic As the two plates slide against each other, generating great friction and pressure, this is in addition to the effect of dams, such as the Darbandikhan Dam, causing landslides. , it will be movement on extension faults deep in a Regions impulsive and creeping as He adverb in a break Zagros Which He separates Area folds high on Region creeping and impulsive, So van Such as That tremors the weak repeat continuously in a north Iraq , Nor Sima On extension the network riverine Which match almost With Network snails , And from Worthy mentioning Located Most earthquakes in a sites Cross rivers (Cross Zab the above With Degla river Cross River Khazar With River komel in a easy Aqrah old) , or in a sites detour sewers rivers , Such as turns River Tigris in a north city Mosul , and river Zab lower , and in the valleys deep Which take place In which rivers River Zab the above River Khabour , River ruby Shin and others).

From the observation of Table (4) and find that: The intensity of the earthquake ranged between 1.3-3.8, while the depth of 9 earthquakes ranged between (5-9 km) and 20 earthquakes ranged in depth between (10-19 km), noting that the average thickness of the earth's crust in northern Iraq ranges between (62-62). 63 km) This means that the depth of the earthquakes in the Miqdadiyah region does not exceed the earth's crust.

Conclusions

1- ranged The intensity of the earthquake ranged between 1.3-3.8, while the depth of 9 earthquakes ranged between (5-9 km) and 20 earthquakes ranged in depth between (10-19 km), noting that the average thickness of the crust in northern Iraq ranges between (62-63). How many) this means that the depth of the earthquakes in the Muqdadiyah region does not exceed the earth's crust

2- That Surface spend Muqdadiya in   the   form   ofgeneral he is bit from easy sedimentary, WhichArea easy flat descend steeper simple from the middle Toward the   West and   the   south westernand   gradually towards the   East and   the southoriental, where that 85% from its territory easy.

3- The highest annual rate of solar brightness recorded at Al-Khalis station was (8.4(While Khanaqin station recorded an average of (7.5), In terms of the sun, the highest rate of solar brightness was in the summer, the seasonal average in Khanaqin station was (9.6), As for the Khalis station, its average was reached in the summer (11.2) .

4-The area is characterized by low temperatures. The average temperature during the winter months (December, January, February) is in Khanaqin station.NSMine (18.8NS°As for the Khalis station, it reached (18.3 NS°) while the minimum temperature was6.4 - 5.2 NS°) in Khanaqin and Khalis stations, respectively. Temperatures begin to rise during the summer months after the transitional season, spring from mild and humid NSIt is relatively hot and dry NSThe Khanaqin station records the highest seasonal thermal rates, which amounted to (45.4NS°), while the lowest temperature was recorded (27.8NS°), As for the Khalis station, the average maximum temperatures in the summer were (43.3NS°), while the temperature reached 24.6) NS°The thermal range of the two stations in the study area was ((40.9 for Khanaqin and Khalis station, while the annual range reached(28.1 - 29.3 NS°),in a Khanaqin and Khalis stations, respectively .

5- The annual rate of wind speed for the stations of the study area varies from one station to another, as the Khalis station records the highest annual rates with a value of (2.7 m/s), while the Kharis station records (0.9 m/s).

6- Reach Total Annual for rain for stationsKhanaqin and Khalis (206.5 – 181.5mm) Onstraight

7- The summer months represent the highest months in the rise in the monthly rates of evaporation, as the highest rate reached in the month of July and in Khanaqin station it reached (556.7mm), the pure terminal of the connection NSMine (409.4mm)

8- Soils vary in the study area, and the highest soil area was the soil of silt river basins, which amounted to 693 km2, or 73.7 of the area of the study area.

Recommendations

1- In view of the nature of the surface in the study area, in which moderate slope prevails and the appropriate geological structure, it was recommended to exploit and invest the running water in the area, whether in the main or secondary basins and to benefit from it by constructing dams.

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