A NEW CONCEPT FOR THE ORIGIN OF ACCUMULATED CONGLOMERATES, PREVIOUSLY KNOWN AS QULQULA CONGLOMERATE FORMATION AT AVROMAN – HALABJA AREA, NE IRAQ

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ABSTRACT

The present study aims to re-study the Qulqula Conglomerate Formation that is mentioned in the previous studies to be about 500 m thick in Halabja – Avroman area. Those studies considered the Qulqula Conglomerate Formation as a part of Qulqula Group which overlies Qulqula Radiolarian Formation and claimed Albian – Cenomanian age and deposited due to the Hercynian Orogeny. They also mentioned that it is deposited in a deep basin of high tectonic activity in which the flysch is deposited and represented by thick succession of conglomerate and shale. In the present study, all the previously mentioned characteristics concerning tectonic, age and facies of the formation in the Avroman – Halabja area are not observed. More than that, the occurrence of the conglomerate that can be called "Qulqula Conglomerate Formation" is doubtful, in this area. The authors have found a thick accumulation of conglomerate but it does not belong to Qulqula Conglomerate Formation. This is achieved according to following four facts: The first fact is that the observed conglomerate beds have dip angles nearly the same as that of the slope of the southwestern side of Avroman and Suren mountains. The second fact is that they are not covered by any strata, except soil. The third fact is that almost all clasts are derived from Avroman Limestone, which is located at higher elevation. The fourth fact is that the conglomerates overlie Qulqula Radiolarian Formation in an angular unconformity. From these four facts it was inferred that the conglomerate has the origin of proximal alluvial fan (fanglomerates), talus and slide blocks and debris that are deposited during Quaternary. It was also ascertained the absence of so called wildflysch in previous studies.

فكرة جديدة عن أصل المدملكات المعروفة سابقاً كتكوين قلقلة المدملكاتي في منطقة افرامان – حلبجة، شمال شرق العراق

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المستخلص

تهدف الدراسة الحالية إلى إعادة دراسة تكوين قلقلة المدملكاتي الذي يصل سمكه إلى 500 متر في منطقة افرامان – حلبجة وكما ذكر سابقا. في الدراسات السابقة وصف تكوين قلقلة المدملكاتي على انه جزء من مجموعة قلقلة والذي يقع فوق تكوين قلقلة الراديولاري. وكذلك أشارت إلى اعتبار عمر التكوين Albian – Cenomanian والذي ترسب كنتيجة للحركة الاوروجينية الهرسينية والتي ترسبت في حوض عميق ذو فعالية تكتونية عالية. وكنتيجة لهذه الفعالية التكتونية تكونت ترسبات الفلش الهائجة والتي تتكون من المدملكات والطفل.

في الدراسة الحالية لوحظ بان جميع المواصفات المذكورة أعلاه بما فيها التكتونية والعمر الجيولوجي والسحنات الرسوبية غير موجودة في منطقة افرامان – حلبجة. إضافة إلى ذالك وجود شك في تواجد المدملكات التي يمكن أن تسمى "تكوين قلقلة المدملكاتي " ولوحظ سمك كبير من المدملكات ولكن لا تعود إلى تكوين قلقلة المدملكاتي. واستند هذا وفقا لأربعة عوامل هي : **1-** إن ميل المدملكات يساوي تقريبا زاوية الانحدار للطرف الجنوبي الغربي لطية افرومان وسورين. **2-** لا تغطي المدملكات أية طبقات باستثناء التربة. **3-** إن معظم المكونات تعود لتكوين الافرامان. **4-** إن المدملكات في منطقة افرومان – حلبجة تقع فوق تكوين قلقلة الراديولاري بشكل عدم توافق زاوي. طبقا للعوامل المذكورة في أعلاه يمكن الاستنتاج بان المدملكات قد تعود في أصلها إلى مراوح فيضية ورسوبيات المنحدرات وركام الانزلاق التي تعود للعصر الرباعي. كما اثبت عدم وجود السحنة Wildflysch بل اصح أن يسمي Mollasse facies. لذالك تم تغير العمر من ألبيان – سينومانيان إلى العصر الرباعي.

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INTRODUCTION

According to Bolton (1958) in Buday (1980), Qulqula Conglomerate Formation overlies Qulqula Radiolarian Formation, the age and stratigraphic position of this group is inadequate controversial because of studies and complex structure of the occurrence area. Buday (1980) mentioned that the Qulqula Conglomerate Formation was first described by Bolton (1955), but a more precise definition and description was given by Bolton (1958) and no changes were introduced in the definition of the formation since that time. According to Buday (1980) no fossils are reported till that time and the contacts of the formation are not precisely defined. From the description of Buday (1980) and from reconnaissance survey it appears that the conglomerates, which are overlying Qulqula Radiolarian Formation are called Qulqula Conglomerate Formation.

Baziany (2006) and Karim and Baziany (2007) have proved that the Qulqula Conglomerate Formation, at the type locality, west of Qaladiza town, is nothing except a unit of the Red Bed Series (Conglomerate Unit). According to the results of the aforementioned two studies, the present study tries to re-study the conglomerates in Avroman – Halabja area. The study concerned with the exposed conglomerate beds above Qulqula Radiolarian Formation according to sedimentology, field and stratigraphic relation. Sissakian (2000) indicated Qulqula Conglomerate Formation in Qandil area, while in the studied area (Halabja – Avroman area) the formation is not shown, previously. In the present study, the geological map (Sissakian, 2000) is used for indication of the conglomerate that was called Qulqula Conglomerate Formation (Figs. 1 and 2).

The studied area is located within Sulaimanyia Governorate in northeastern Iraq at the north of Halabja town. It is an elongated narrow belt extends from Khurmal town to northeast of Penjwin town (Figs. 1 and 2). The studied area includes Avroman and Suren mountains that border the Sharazoor plain, at the northeast (Figs.1 and 2). A thick conglomerate bed is exposed along southwestern slope of the two mountains. This conglomerate is the only one in this area that is located above Qulqula Radiolarian Formation and has 500 m thickness.

The aim of this study is to elucidate the age, nature and geographic location of the Qulqula Conglomerate Formation, which is mentioned to be exposed in Halabja – Avroman Area. This is acquired by studying lithology, age, field relation and stratigraphy of the conglomerate in the field and laboratory. Buday (1980) recommended the need of Qulqula Conglomerate Formation for extensive study. He indicated many studies, as subdivision of the formation into individual units, definition of the boundaries and determination of the age. He also called for finding relation of adjacent formations in time and space.

GEOLOGICAL SETTING

The studied area is located within Western Zagros Thrust Belt. Structurally, the studied area is located within the Imbricated and Thrust Zones (Buday and Jassim, 1987 and Jassim and Golf, 2006). The same authors, in their tectonic subdivision of Iraq considered the studied area in the Qulqula – Khuwakurk Subzone. The area is characterized by obscured anticlines and synclines, which have been stacked together as very thick and tight packages of layers that are overturned towards southwest or even over thrusted. Stocklin (1974) called the studied area “Crushed Zone” this is because it is highly deformed.

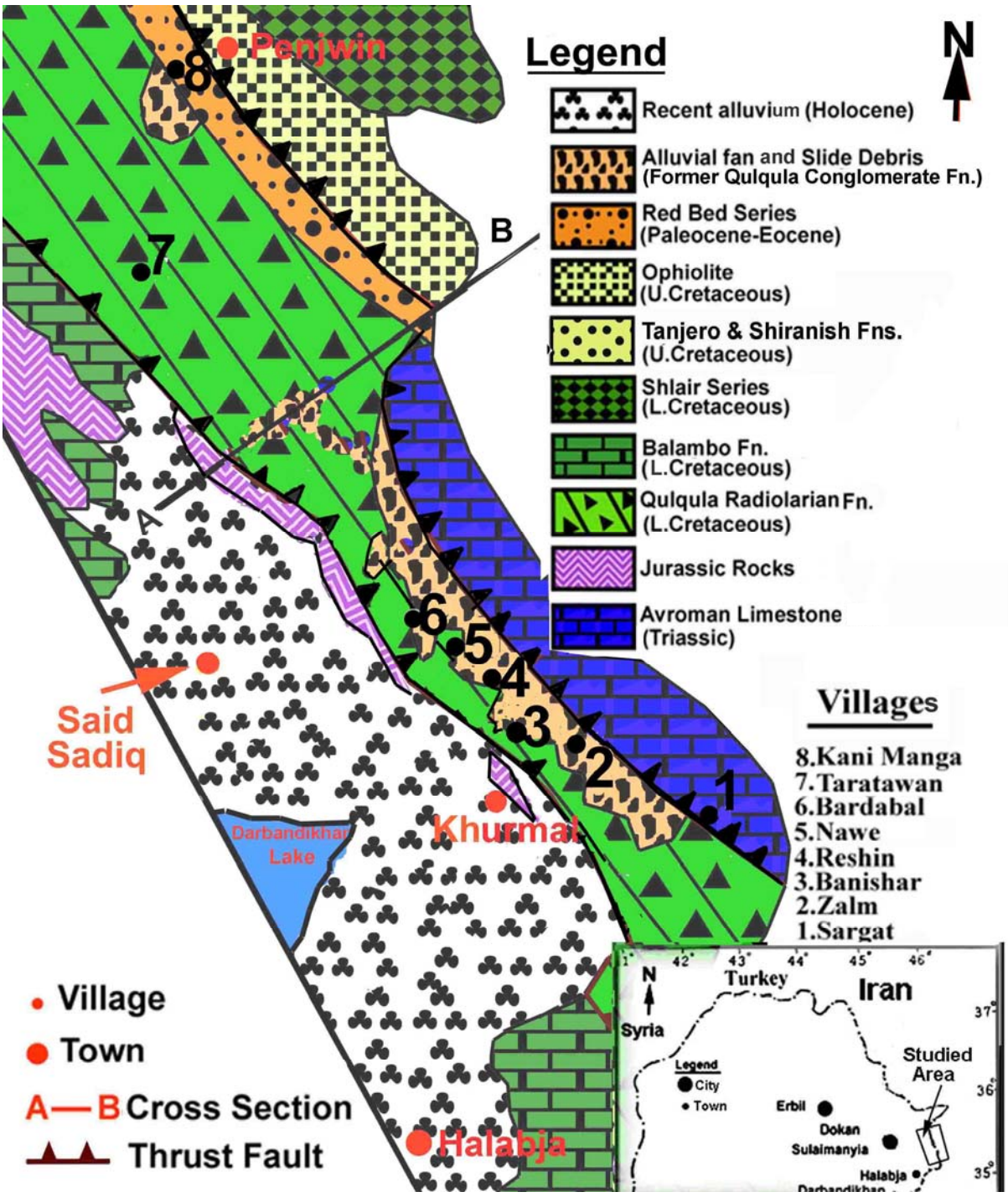

Fig. 1: Geological map of the Penjwin – Khurmal area showing the location of the Former Qulqula Conglomerate Formation (modified from Sissakian, 2000).

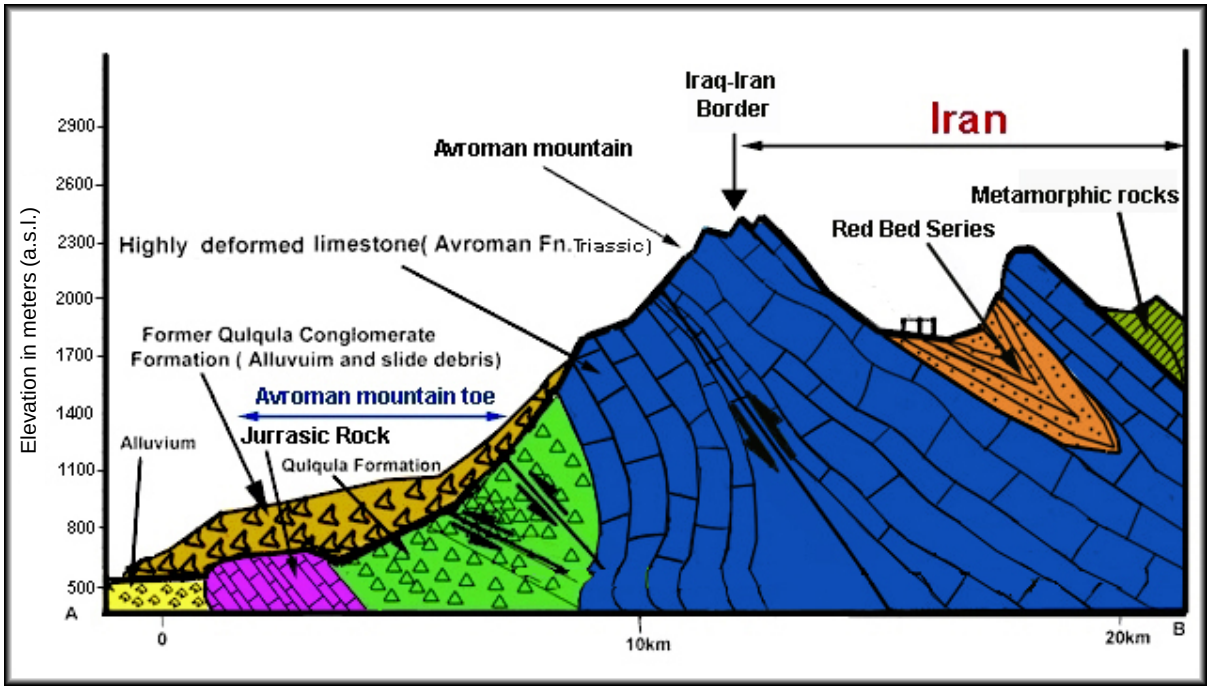

Fig. 2: Geological cross section of the Suren mountain (western part of Avroman mountain) (modified from Ali and Ameen, 2005) showing the location of Qulqula Conglomerate Formation.

STRATIGRAPHY AND LITHOLOGY

The studied conglomerates consist of angular to sub angular and badly sorted blocks, boulders and gravels of grey or milky limestone, which are lithified by calcareous cement. They are grain supported and no sandstone and red claystone are found with these conglomerates. In most cases the constituents show some degree of transportation while others are extremely angular (Figs.3 and 4A). The thickness of the conglomerate is highly variable in this area, ranges between (1 – 550) m.

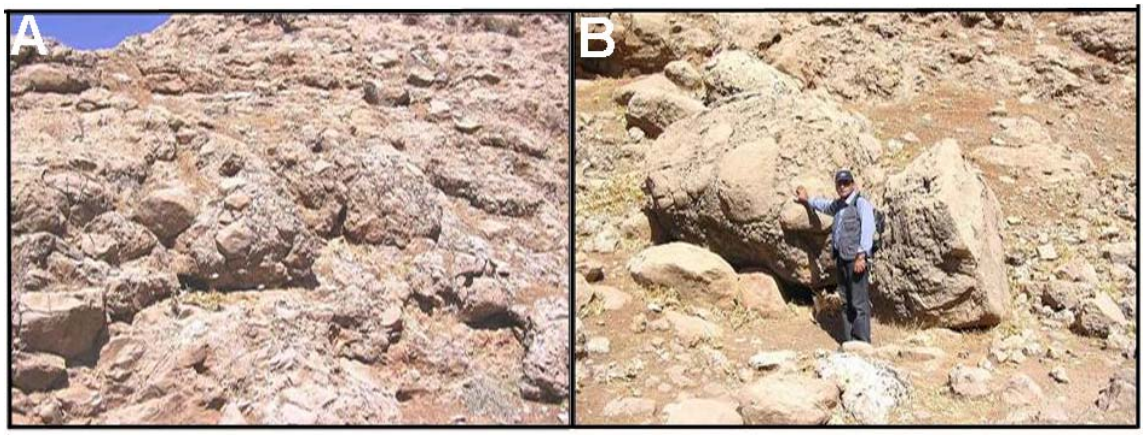

Fig. 3: Coarse limestone fanglomerate (A) at 400m east of Zalm village and (B) at 1500m north of Banishar village, Avroman mountain toe north of Halabja town.

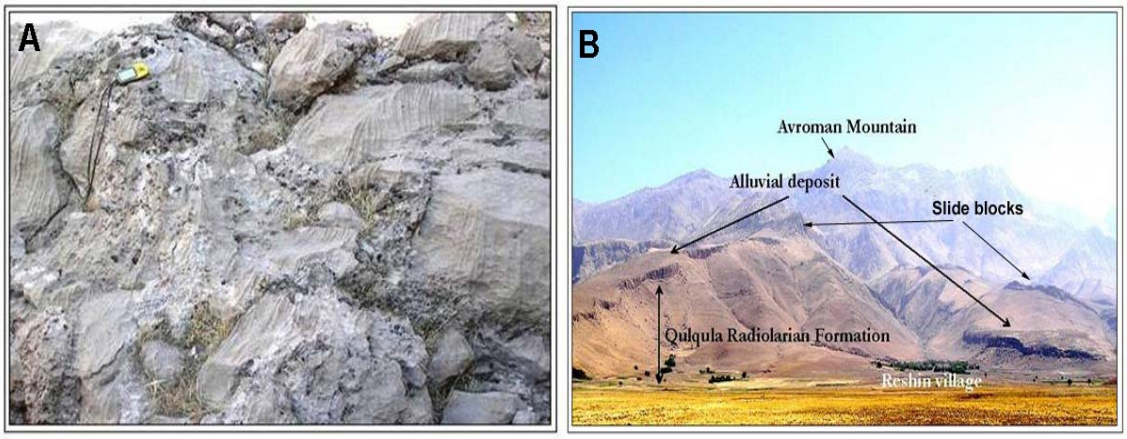

Fig. 4: **A)** Rill erosion on lithified boulders of Qulqula Conglomerate Formation on the southwestern side of lower slope of Suren Mountain near Banishar village, northeast of Said Sadiq town.
B) Massive Sedimentary breccias as alluvium deposited above Qulqula Radiolarian Formation, north and east of Reshin village, at Suren Mountain.

Bolton (1958) in Buday (1980) reported that Qulqula Conglomerate Formation, exist in Halabja – Avroman area and consists of breccia but the amount of the conglomerate is restricted. He further added that the conglomerate there forms tectonically small bodies and its age and other relations to chert and limestone (Qandil and Chuarta areas) is not clear. Buday and Jassim in Jassim and Goff (2006) have mentioned that Qulqula Conglomerate has the thickness of 500m, in Halabja area. In the present study, field survey is conducted for finding the conglomerates. The survey is succeeded by finding thick limestone conglomerates which have prerequisite of the formation as defined by Bolton (1958) in Buday (1980). This is acquired according to the following four facts. The first is that it is located at the top of the Qulqula Radiolarian Formation (Fig.4B). The second is that its thickness, in some place, is about 500 m as the case near Ahmad Awa village. The third is that the conglomerate consists of limestone breccia (as a conglomerate, when classification of Pettijohn (1975) is considered. The fourth is that there are other limestones and chert breccias, in the area, but they are located at the base of Qulqula Radiolarian Formation, below the limestone beds that are mentioned by Bolton (1958). The thicknesses of these breccias are not more than 10 m and are located between Balambo (or older formations) and Qulqula Radiolarian Formation. The breccia (or conglomerate) is described by Karim (2003). According to the first three facts, the stratigraphic position and lithology of the limestone breccia coincide with that mentioned by Buday (1980). But, the age of the formation contradicts with the ideas given previously, due to the following five facts:

The first fact is that the dips of the strata of the conglomerate that previously was called "Qulqula Conglomerate Formation" is equal to the slope of the Avroman and Suren mountains (Figs.4B and 5). This structural feature does not coincide with Albian – Cenomanian age that is indicated by Buday (1980) and Jassim and Goff (2006). This is because the deposition of the conglomerate occurred after the anticline (or mountain) reached the present shape, during Quaternary. The second fact is that the conglomerate is covered only by soil and there is no any stratigraphic unit on the top (Fig.5). The third is that almost all clasts are derived from Avroman Limestone, which now is located at higher elevation (Figs 2, 4B and 5B). The Avroman Limestone crops out at an elevation of about 400m higher than the position of the

conglomerate. This relation of the elevation, further more proves the relation of the conglomerate with the Quaternary sediments and not Albian – Cenomanian, as mentioned by previous studies. The constituents of the conglomerate showed the same fossils as those of Avroman Limestone, which contain ghosts of ooids and oncoids (Fig.6). The ooids that are found in the conglomerate are compared with those found by Karim (2006 b), in the strata of Avroman Limestone. The comparison showed high degree of similarity, which shows indirectly that the conglomerate is derived from Avroman Limestone by erosion and mass wasting. The boulders are transferred from high elevation to the present position to be deposited as alluvial fans, which later subjected to cementation (Fig.3). Therefore, the facies are molasse and not wildflysch, as mentioned by the previous studies (Buday, 1980). The fourth fact is that the conglomerate not exists only over Qulqula Radiolarian Formation, but also occurs over Avroman Formation and in the Sharazoor plain (Figs.2 and 5). The fifth fact is that the conglomerate overlies the Qulqula Radiolarian Formation in angular unconformity (Fig.2).

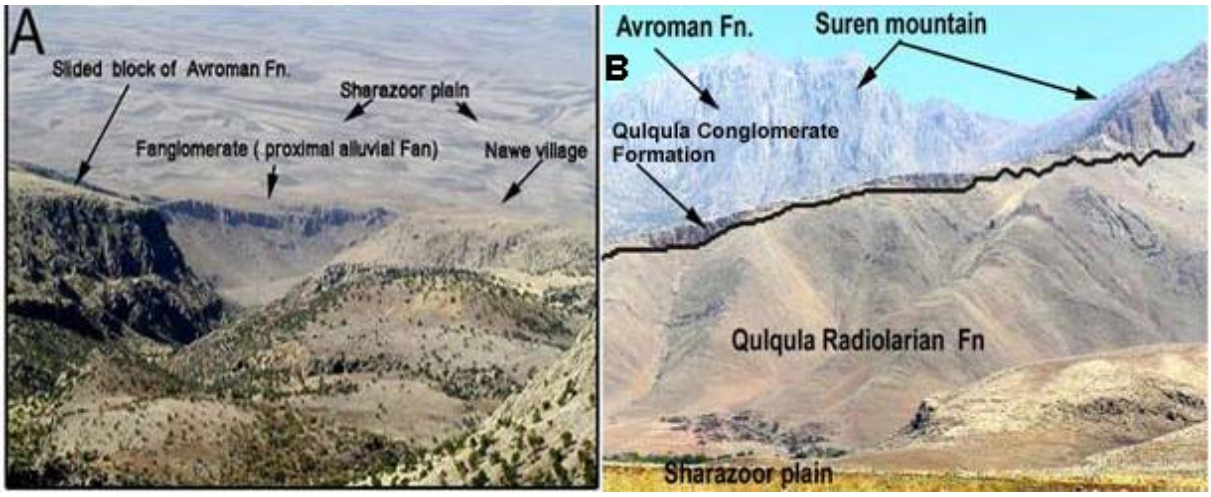

Fig. 5: **A)** Qulqula Conglomerate Formation as can be seen from the summit of Suren Mountain.
B) Limestone breccia angularly rested above Qulqula Radiolarian Formation at the north of Dara Gullan village, with dip angle nearly equal to slope angle.

From the five mentioned facts, it was inferred that the conglomerates are deposited during Quaternary and not during Albian – Cenomanian. The conglomerates are deposited as proximal alluvial fan (fanglomerates), talus and slide blocks and debris, which later subjected to cementation.

It is worth to mention that GEOSURV found similar Quaternary deposits (as conglomerate) in the same area during field work in 1976 (personal communication with Mr. Sissakian, 2007). Sissakian (2000) has shown conglomerates in the same area as Bammu Conglomerates. But, the relation of these conglomerates with Qulqula Conglomerate Formation is not indicated.

The studied conglomerates exist in three forms, these are:

1- Thick bedded conglomerates

This type is the most common and exists as thick beds with lateral extension of several kilometers. These are exposed along the lower slope of southwestern side of Suren and

Avroman mountains, north of Khurmal and Said Sadiq towns. At these localities, in some cases, the conglomerates appear as thick massive limestone and show rare granularity (Figs.4b and 5). The field study revealed that this type exists on both Qulqula Radiolarian Formation and Avroman Limestone. The conglomerates extend to near the peak of the Suren and Avroman mountains at elevation above 2200 m. The conglomerate exists at this elevation as lithified massive or bedded talus. It consists of extremely angular gravels and boulders which are cemented by impure calcareous cement (Fig.7). The conglomerates are interpreted, in this study, as sediments of talus cone accumulated by gravity falling and sliding.

2- Separate blocks of conglomerate

The second type occurs as relatively small and separate blocks; the largest of them has diameter of more than 30 m. These blocks can be seen along the two paved roads to Nalparez from Shanadari and Kaolos, especially between Tarratawan and Dolla Chawt villages (Fig.8). These blocks rest on Qulqula Radiolarian Formation and they consist of gravels of alluvial origin, as they show indication of transportation. These blocks are most possibly, derived from bedded conglomerate (type one) by sliding from Suren mountain.

3- Slipped bedded blocks

Thick and massive beds can be seen over Qulqula Radiolarian Formation with thickness of more than 500 m (Fig.9). These beds rarely show granularity and laterally change to the above mentioned two types. Due to high thickness, massiveness and gray color it appear as Qamchuqa Formation as reported by Jovanovic and Gabre (1979) and Ali and Ameen (2005). These beds are previously assigned as Qulqula Conglomerate Formation. But, according to the authors interpretation, these beds belong to Avroman Limestone, which have slided as large blocks from high elevation and rested on Qulqula Formation. During sliding, these blocks have suffered from some fracturing and brecciation. The conditions of the sliding of these blocks are almost similar to those occurred in Sinjar Formation in South of Sulaimanyia city (Karim and Ali, 2004 and Ali, 2005).

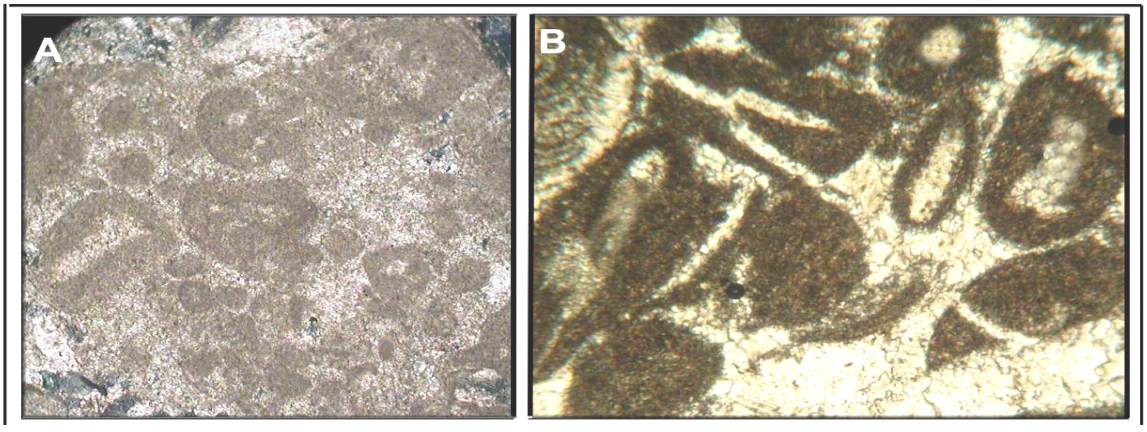

Fig. 6: **A)** Thin section shows ghost of ooids in the sedimentary limestone breccias, southwestern side of the Suren Mountain, X20, N.L.
B) Thin section of limestone of Avroman Limestone (from Karim, 2007 b). The comparison of these two photos shows that the clasts are derived from Avroman Mountain.

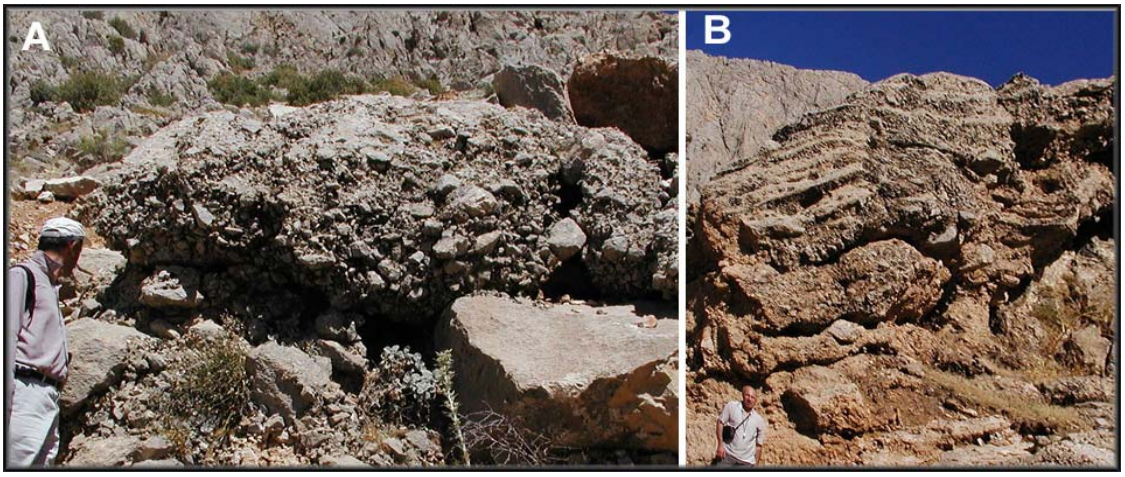

Fig. 7: Lithified talus near the summit of Suren mountain on Avroman Limestone at the elevation of 2200 m, **A)** Massive talus. **B)** Stratified talus.

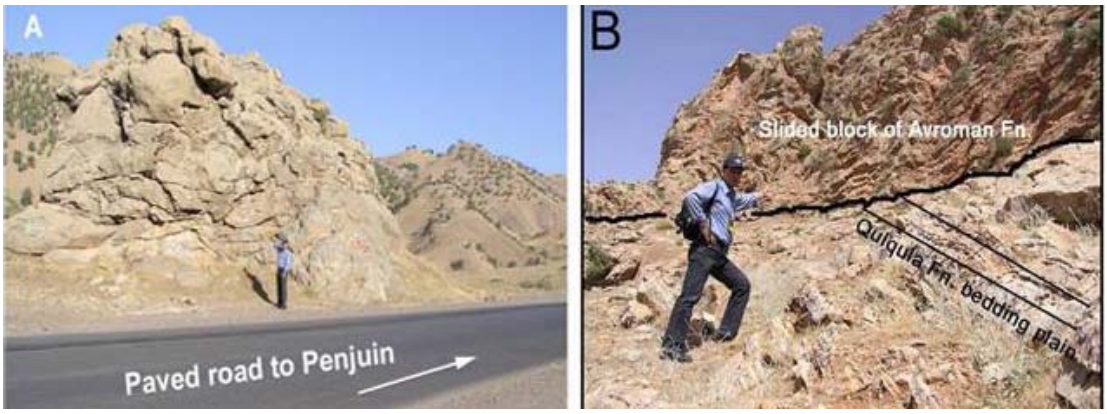

Fig. 8: **A)** large block of breccia located on the Qulqula Radiolarian Formation, directly to the west of Tarratawan village.
B) Angular relation between the conglomerates and Qulqula Radiolarian Formation at Zalim valley.

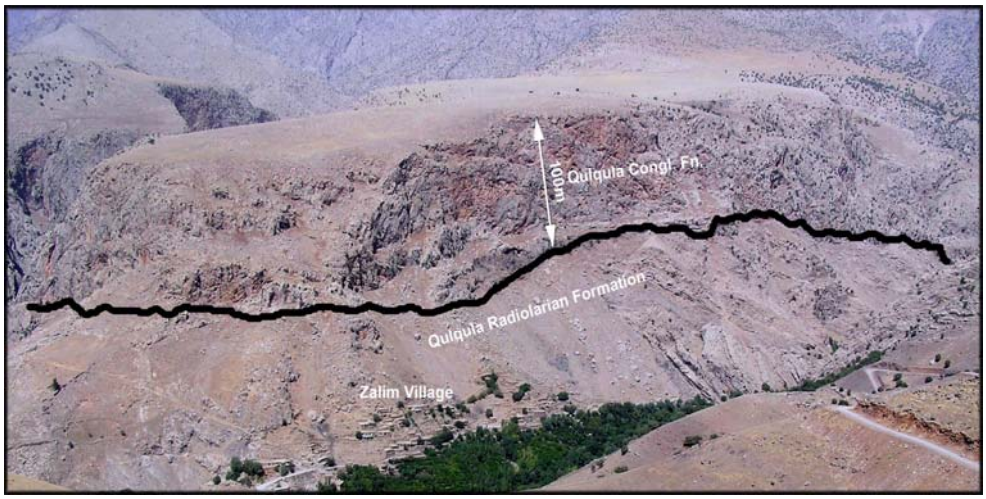

Fig. 9: Zalim valley (upstream of Ahmad Awa valley) showing Qulqula Conglomerate Formation (possibly as slipped blocks) overlying Qulqula Radiolarian Formation at angular unconformity.

CONCLUSIONS

The present study concluded the following:

- It is found that there is no occurrence for the Qulqula Conglomerate Formation in the Halabja – Avroman area.
- For the first time, the so called Qulqula Conglomerate Formation is studied in detail in Avroman – Halabja area.
- The lithology of the conglomerate, at Avroman – Halabja area, consists of thick beds of badly sorted angular pebbles, boulders and blocks of lithified limestone.
- Most of the clasts are derived from Avroman Limestone.
- The age of the conglomerates is changed from Albian – Cenomanian to Quaternary. This is achieved by geomorphologic, stratigraphic, structural and sedimentologic evidences.
- The facies of the conglomerate is changed from wildflysch to molasse, which consist of sediments of fanglomerates, talus and slide debris and blocks.

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