

Microfacies interpretation related to tectonical concept in Bekhme Formation

Dhia Yousif Al-Rawi Mohammed Fahad Al-Ghreri
University of Baghdad - College of science.
University of Anbar - College of science

Abstract:The relationship between tectonic high element and the sediments of the Bekhme limestone formation had been discussed. The Bekhme deposits on such a paleohigh on the upper Cretaceous represent "swell facies". The identified microfacies types were discussed as a clue, for local crustal events.

Keywords: Microfacies interpretation , tectonical concept , Bekhme Formation

Introduction

The present study is an attempt to throw light on a new concept using the various microfacies types to detect the tectonic-style in local sense. It well known that the basement-dislocations copy themselves through the sediments during the geological history [1]. Such a phenomenon is documented in the upper Cretaceous time, namely in the reefal limestone or in the swell facies of the Bekhme limestone "Bekhme Gorge" Shiranish Islam and in Shaqlawa sections (Fig.1). A rejuvenation of such basement dislocations is manifested in the younger sediment, namely in the Pilaspi limestone, in Derbed Bazian area [2]. In other words a migration of basement-dislocation in space and time is well postulated.

Such a migration is towards the geosynclinal realm and progressing from NW to SE-direction.

Microfacies:

The identified microfacies complex in the Bekhme limestone are mainly Wackestone, Packstone, Grainstone, and Boundstone [3].

Wackestone microfacies:

The biota are presented by skeletal grains and bioclastics, where the

skeletal grains are mainly benthonic foraminifera and occur predominantly in the lower third of the studied sections, namely the Bekhme and Shiranish Islam sections (Fig.2). The rock package at this part is thicker in Bekhme than that at Shiranish Islam section, and will disappear towards Shaqlawa. In other words a variation is manifested along the basal axis, which could be related to syn-sedimentary tectonism. On the other hand the

planktonic foraminifera occurs in the upper part, which is of bathymetric implication and indicating a deepening of the basin towards the upper part of the rock-package.

Wackestone to Packstone microfacies:

Such a facies is a transitional one between wacke and packstone and is common in the extreme NW-section (Shiranish Islam). The occurrence of glauconite may indicate agitated water environment, and most probably of a transgressive tract system, and may indicate a leveling of the basin.

Packstone microfacies:

It is widely distributed in Bekhme and Shiranish Islam sections. The water energy is relatively high, where a shallowing of the water in the Bekhme section is manifested. In the other words a balance is related to a great supply and a rapid subsidence. Such a compensation movement is responsible relatively for the greater thickness of Bekhme section. Furthermore it is a grain supported facies and is related to a high energy environment. It is widely distributed in Bekhme and Shaqlawa sections. In addition to, many subtypes have been identified such as peloidal, miliolid, and bioclastic, which is represented highstand system.

Grainstone microfacies:

This microfacies is occurred only in the Shiranish Islam section and is mainly grain-supported facies indicative for a high energy environment. Two sub-types have been identified, namely the pelletal and oolitic types, which is represented highstand system. This microfacies is similar to (SMF) No. 16,17 within sedimentation zones 7,8 [4],[5], [6].

Rudist Boundstone:

It is mainly composed of rudist skeletons, which are in life position. This facies occurs only in the Bekhme formation in the middle and upper part of the studied sections. The bioclastic are mainly of rudist fragments embedded in a sparsely calcitic matrix, which is indicative for a high energy environment. This microfacies is similar to (SMF) No. 6, 7 within sedimentation zones 4&5 [4],[5],[6].

(Fig. 3) show the various microfacies types which are indicative for sea transgression and regression in the studied sections.

Paleoenvironments

The present study shows a facies migration laterally and vertically which might be due to eustatic changes in sea-level, [7].

The depositional environments can be classified from intertidal environment to fore reef environment and as follows:

Intertidal environments:

It is represented by a conglomeratic unit in Geli Bekhme and Shiranish Islam sections. The conglomerate is polymictic with a size of pebbles (0.6-6cm.), which is badly sorted embedded in carbonaceous matrix.

The pebbles of Qamchuqa limestone as well as planktonic foraminifera of the upper Cretaceous have been documented within this unit [8], as reworked particles.

The planktonic foraminifera are represented by *Globotruncana* spp. and *Gumbelina* sp. which occurred syndepositionally in the matrix, as well as in the pebbles of the conglomerate. Such a conglomerate represents most probably a transgressive phase, and redeposited subaquatic sediments. The conglomeratic unit is used to signify the beginning of Bekhme formation.

Glauconite grains are available within the conglomeratic unit. Many benthonic foraminifera are identified such as *Siderolites* sp., *Textularia* sp. and *Rotalia* sp. and were deposited during the Bekhme formation. The same conglomeratic unit is found in Shiranish Islam section but thinner and unfossiliferous. It is composed of poorly sorted pebbles (1cm.) in size.

Plant debris and quartz grains are also present within this unit. The plant debris may be indicative for the type of transportation. The conglomeratic unit was deposited most probably in a tidal environment and temporary in a high energy environment. This unit represents the restricted platform towards the tidal area.

Backreef environment

It is very common and widely distributed within the Bekhme formation (Fig. 4). The sediments are mainly Bioclastic Wackestone,

foraminiferal Wackestone, Miliolid Wackestone and different types of Packstone. Periods of occurrence are restricted to the lower part of Bekhme formation. The permanent backreef environment within the Bekhme formation signifies tectonically a stable area.

Reef environment

It represents the reef proper, where the rudists form the main reef framework. The coral species are of subsidiary role.

The restricted and random distribution of the rudists indicates most probably a reef of local extension reflecting a submarine high land, which is genetically a secular upwarped environment. Such an element from a complementary system through certain time-extent, mainly intercontinental movement. The reef proper which is built by rudists is of biostrome type [9], [4], [10], [6]. Such an environment is mainly of platform carbonate character. The bioclastic are mainly from the reef, which are deposited as calcarenite and calcrudite at the foreslope area [10].

Fore reef environment:

The bioclastic which are derived from the reef proper are significant for the depositional environments. The occurrence of planktonic foraminifera are indicative of open-sea milieu. The carbonate facies-complex represent a broad spectrum ranging from Wackestone to bioclastic Packstone facies. Many skeletal grains such as *Omphalocyclus* sp. which are occurred in the Wackestone microfacies are indicative for the outer platform environment [11]. Furthermore the planktonic foraminifera are of bathymetric implication and document a deepening of a depositional basin. According to the various facies the carbonate sequence had taken place on submarine highland [12];[2];[13]. The basin configuration and its segmentation related to the facies is referenced to the variable site from a such submarine highland. The conglomeratic unit is indicative for the intertidal environment.

The ascendant sequence of the environment from a tidal to lagoon, back reef, reef proper and finally fore reef might be due to a gradual transgressive phase within Bekhme formation. An attempt is done to reconstruct the basin-configuration (Fig.4). The sea-invasion was followed towards Shiranish Islam in the NW-area. The thickness data and its decreasing toward NW may point to a crustal event. The thickness of the formation in type locality is 320m., while in Shiranish Islam area is 103m. The core of the reef is of restricted extension, which leads to a direct transition from lagoonal to open slope facies.

Discussion

Four main types of microfacies had been

identified, namely Wackestone, Packstone, Grainstone and boundstone. They are of certain areal extension, related to intensity and type of tectonism of crustal events, which reflect a polyphase movement in space and time.

The facies-spectrum (Fig.2) shows various environment. beginning with a clastic phase of conglomerate type, then a normal marine phase and finally a rudist sub-microfacies of clear water shoaling phase.

Such facies-sequence is coupled with progressive closure of the basinal trough in the extreme NE-Iraq, while the sedimentary basin is of foredeep type formed by subduction mechanism. Bathyal conditions indicate such a type (Balambo formation) and persisted into late-Cretaceous time in the extreme northeastern part of Iraq.

The facies distribution, laterally and vertically suggests basement control, where the basement dislocations were active during the upper Cretaceous. In other words, the basement block faulting affected the sedimentation pattern, especially in Maastrichtian time and was reflected in swell and basinal facies.

Such mechanism (block faulting) will be mobilized temporary and locally by the progressive closure, where the strain may be transmitted into the sedimentary cover, reflected by different type of facies. Such movement-pulses are responsible for the genesis of the submarine highs where boundstone or even grainstone have been deposited.

Finally the clues pointing such conclusions and as follows:

1-The restricted presence of boundstone and grainstone microfacies related to the flexure structure.

2-The lateral movement, which was coupled with subduction mechanism, most probably transformed in the foreland basin in many submarine high (swell facies), where the sediments are classified to be of shallow water type.

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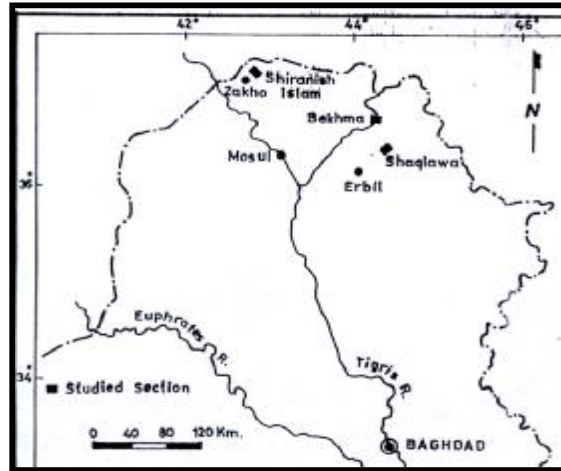


Fig.(1): location map of the studied area

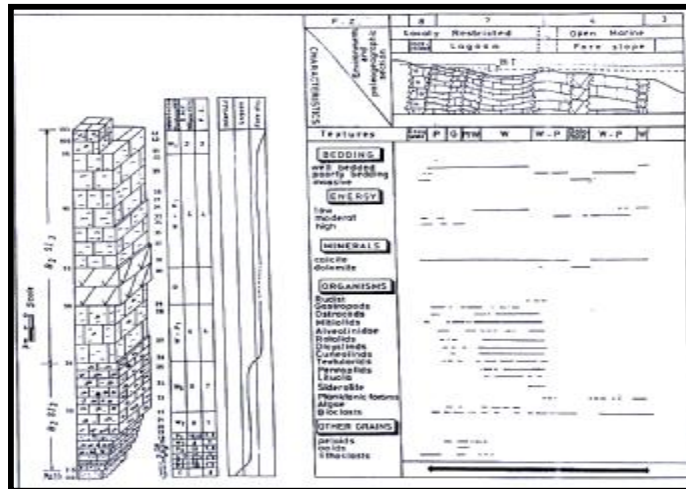


Fig.(3): Characteristics of the sedimentary environment of Bekhme formation in Shiranish Islam section.

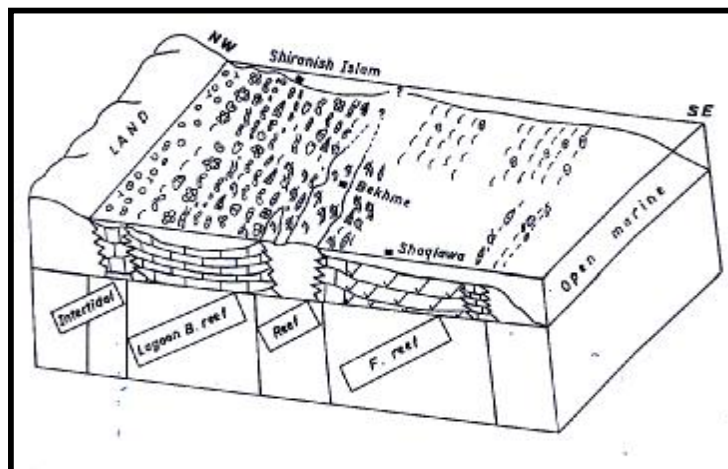


Fig.(4): Environmental model of basin configuration of Bekhme formation in the studied are.

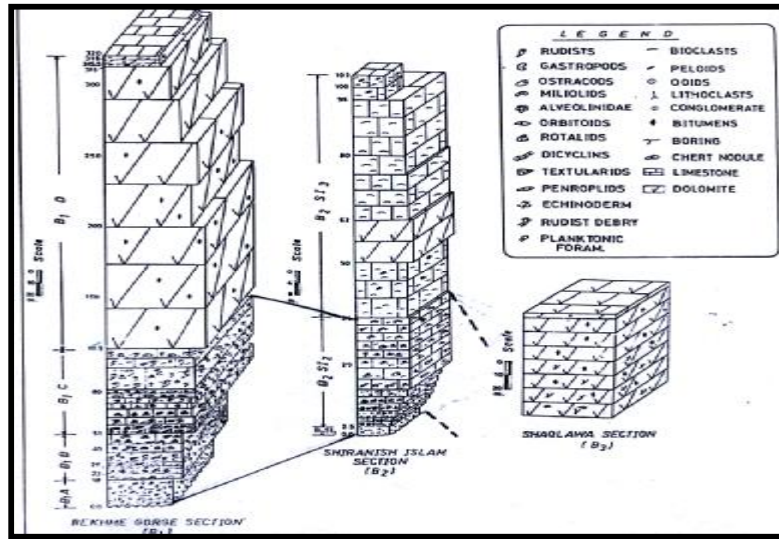


Fig.(2): Stratigraphic column, lithology and distribution of stratigraphic units in the studied sections

تفسير السحنات الدقيقة المرتبطة بفكرة التكتونية في تكوين بخمة

محمد فهد الغريري

ضياء يوسف الراوي

الخلاصة

تم مناقشة العلاقة بين العنصر التركيبي المرتفع ورسوبيات تكوين بخمة في شمال العراق، إذ اظهرت ان تكوين بخمة قد ترسبت على مرتفع في الكريتاسي الاعلى والمتمثل بسحنة ارتفاعية. وكما تمت مناقشة انواع السحنات الدقيقة المختلفة كبراهين ودلائل وضمن مقياس صغير لاحداث حركات القشرة الارضية المحلية.