Indian Journal of Fundamental and Applied Life Sciences ISSN: 2231– 6345 (Online)
An Open Access, Online International Journal Available at www.cibtech.org/sp.ed/jls/2014/03/jls.htm
2014 Vol. 4 (S3), pp. 140-145/Mahari
Research Article

FACIES AND SEDIMENTARY ENVIRONMENTS OF ZIARAT FORMATION IN THE SOUTHEAST OF AZARBAIJAN, IRAN

***Rahim Mahari**
Department of Geology, Science College, Tabriz Branch, Islamic Azad University, Tabriz, Iran
**Author for Correspondence*

ABSTRACT

The Late Paleocene-Eocene deposits," Ziaratformatin" in Shahindej, located in the east of Shahindej, the southeast of Azarbaijan province, Iran, are primarily made up of carbonate rocks. These deposits, which are of 144 meters thick, lie on the carbonates facies of Cretaceous and beneath the clastic beds of the Oligomiocene. To investigate the facies, sedimentary environments and sequential stratigraphy of these successions, a stratigraphic section was made in the southeast of Karatape village. Carbonate facies in this section have deposited in open marine, front bar barrier, back bar, sub tidal, and interidalfacies belts. The study of these fancies and comparing them with old and modern sedimentary environments reveal that these successions have deposited in a carbonated platform of homoclinal ramp type. The study of the vertical succession of microfacies shows at last five main sequences, which are made up of shallowing and deepening parasequences.

Keywords: *Paleocene, Eocene, Facies, Sedimentary Environment, Shahindej, Azarbaijan, Iran.*

INTRODUCTION

Late Paleocene - Eocene deposits have considerable outcrops in the general direction of west Shahindej Mountains located in the east of Shahindej. These deposits are distinguished with a color different from that of Cretaceous carbonates and Fajan red formations.

In Iran, the boundary between Paleocene and Eocene has not been precisely specified, and often is characterized with transitional boundary.

Azarbijan that is located in the Northwest of Iran has a complex geological history. Formations include Precambrian, Paleozoic, Mesozoic and Cenozoic in this region shows similarities with considerable area of Central Iran, but Cenozoic magmatism and changes of it has affected on regional geology of area (Aganabati, 2006) Ziarat formation is the second stratigraphic unit of the Cenozoic set in the east of Shahindej area.

The study area located at Latitude 36 29 20, and Longitude 46 52 54 .It is situated in the southeast of Karatape village, east of Shahindej, in the Azarbijan state, northwest of Iran (Figure 1).

Figure 1: Location map of the studied section in Northwest of Iran

The study of this diversity at different parts of the area will be of great importance in the development of a basic knowledge for the interpretation of historical geology.

MATERIALS AND METHODS

Research Method

In this research, in order to identify facies and their vertical and horizontal changes, some field studies were carried out. Having chosen an appropriate cross-section in a way that the lower and upper boundaries of layers were discernable, measuring and sampling were carried out in a direction perpendicular to the layers strike. From the collected samples, 49 thin sections were prepared and went under microscopic examination. Finally, using Dunham method (Dunham, 1962), the rocks were labeled, and to interpret the facies as well as to present a sedimentary model and stratigraphic sequence, the methods developed by Wilson (Wilson, 1975), Flugel (Flugel, 2004), Reading (Reading, 1996), were employed.

Lithostratigraphy

The Late Paleocene - Eocene successions in the stratigraphical section in Shahindej are placed with the angular unconformity on the Cretaceous carbonates, and at the top, are covered with the disconformity by a thick clasticfacies of the Miocene. The sample field cross-section is of 144 meters thick. The Late Paleocene - Eocene succession in the stratigraphic section of Shahindej includes a considerably thick layer of marine sediments. These sediments, in the lower part, start with browen sandstone, alternation of thin and thickbeddedlimestones, dolomite and marl (that often is covered). The topmost part of the Late Paleocene - Eocene layers includes browen thin bedded limestone with a regular layer structure (Figure 2).

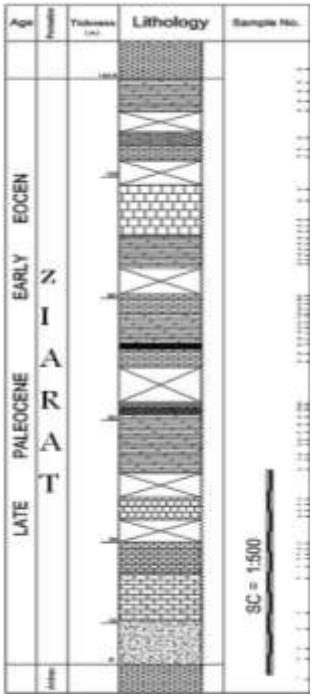

Figure 2: Stratigraphic column of Late Paleocene - Eocene deposits in the southeast of Shahindej

Sedimentary Microfacies

The microscopic study of the samples of Late Paleocene - Eocene successions in the stratigraphic section of Shahindej led to the identification of 11 different microfacies of the open marine (A), front Bar (B), barrier (C), back bar (D), subtidal (E), interidal and supratidal flat (F) environmental belts

Group A: Open Marine Microfacies

Micofacies (A1): Mudstone, The matrix of this microfacies is micrite. Some part of this matrix is recystallized to microspare. The little particles of radiolarites and sponges are recognizable. This facies

has been bioturbation effects. There is a little variety of allochems and a lot of fine grain matrix. Lack of mud cracks and evaporates minerals or pseoudomorphs with the above reasons are show low energy under water environments. Energy index (Flugel, 2004) of this microfacies is 3 – 4. (Figure 3)

Microfacies (A2): Radiolaria Wackstone, This facies is mainly made up of micrite and contains pieces of open marine organisms like radiolars and some large bentic foraminifers. Also in this microfacies is seen the general orientation.

Microfacies (A3): Radiolaria Bioclast Wackstone – Packstone, This facies is totally made up of micritc matrix with some planctonic forms and radiolarias. Local cement and general orientation seen. Bioturbationstractures are abundant. Energy index of this microfacies is 4 (Figure 3).

Group B: Front Bar

Microfacies (B): Milliloied Bioclast Packstone: large bioclast of Alveolinea and Milliloieds in micritic matrix with good sorting in the bioclasts and some local cementation indicated the front bar environments. It's a little thickness in the stratigraphy column. Energy index 5 indicated for this microfacies (Figure 3).

Group C: Barrier

Microfacies (C): Alveolinea Grianstone: This facies is completely made up of big bits of bioclast, espetioaly Alveolinea, Milliloiedes and Opertorbitolistes with some interaclasts in spary calcite poi kilo topic cement. Good sorting of allochems, abundant of intraclasts and lake of fine grain muddy matrix can indicated energy index 6 and barrier environments (Figure 3).

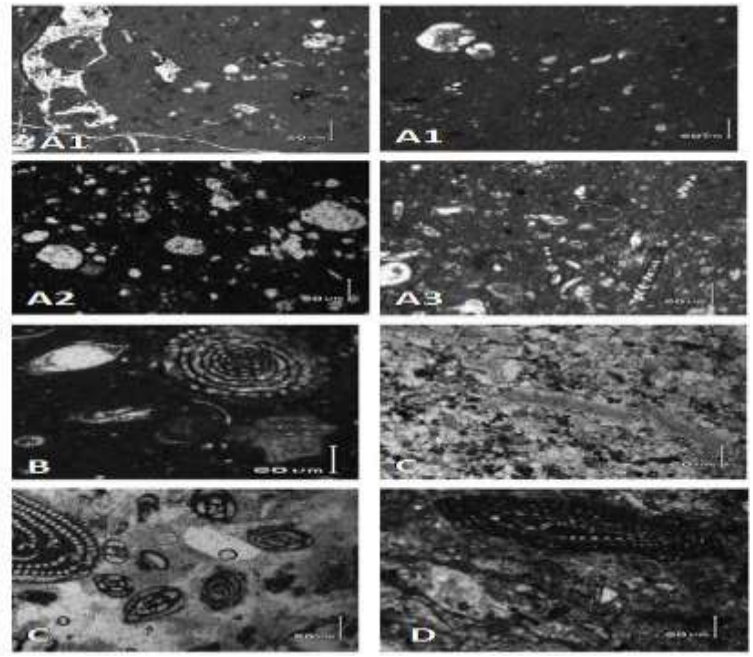

Figure 3: Sedimentary microfacies(X40) of Ziarat formation deposits in Shahindej

Group D: Back Bar

Microfacies (D): Bioclastic packstone, This microfacies composed of broken marine bioclasts such as alveolinea, milliloiedes and bivalves in poorly washed (Folk, 1965) matrix with some lithic pellets, interaclasts and gastropoda, ostracodabioclasts. Also gluconiteic non skeletal allochems be seen. Based on the specifications of this facies, energy index is 7, that indicated back of bar environments (figure 3).

Group E: Subtidal

*Microfacies (E): Bioclastic Opertorbitolites Wackstone***,** This microfacies is mainly made up of benthic foraminiferous porcelaneus, such as opertorbitolites, milliloiedes and alveolinea in micritic fine graind

matrix. These characteristics determined energy index 8 and low energy lagoonalsubtidal environments (Figure 4).

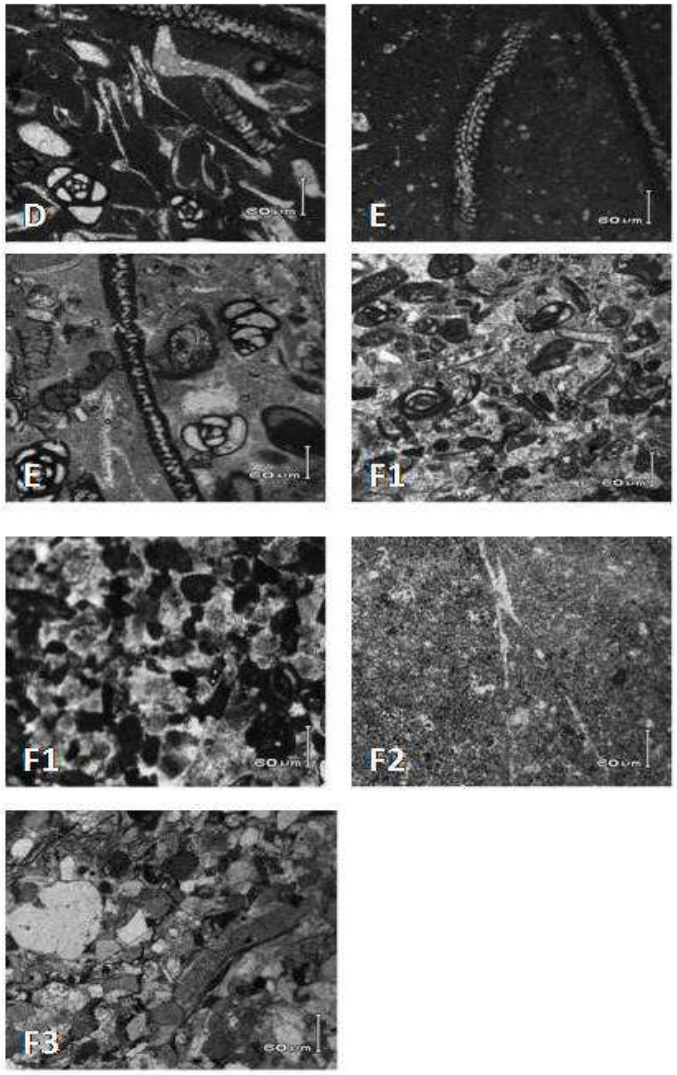

Figure 4: Sedimentary microfacies(X40) of Ziarat formation deposits in Shahindej

Group F: Tidal Flat (Intertidal and Supratidal)

Microfacies (F1): Pelloidal Bioclastic Grainstone, Spary calcite cement encompass sorted pellets and bioclasts of surrounding subenvironments in sandy size is formed this microfacies. Energy index is 8 and 9, that indicated intertidal flat (Figure 4).

Microfacies (F2): Dolomitic Mudstone, Fine grained micrite without any identifiable allochems that in most parts is dolomitizied. This microfacies determined supratidal environment with energy index 9 and 10 (Figure 4).

Microfacies (F3): Cherty Litharenite (Sandstone), This facies include quartzic sandy grains in 40 – 50 percent, lithic grains in about 20 percent and some feldesparic grains in calcitic cement. The grains are often subanular and poorly sorted (Figure 4).

Research Article

Interpretation of the Sedimentary Environments

The frequency of micrite, and the skeleton of the open marine organisms, such as radiolar, sponge and some bentic foraminifers show the sedimentation of A group facies is in the beneath of wave base in the open marine. A1, A2, A3 facies have deposited in the deeper part of the open marine. The facies B, C and D that indicated high energy environments, due to the difference in their amount of allochem, and type of orthochem have separated from each other. The existence of big foraminifers bits and lack of fine grain matrix is indicative of a shoal bar. The facies B has deposited in the part near the open marine belt of fore bar facies. Facies C, because of having sparite and bioclast bits, is indicative of deposition in the carbonate barrier environment. D, too, containing matrix and cement with unsorted bioclasts make up the back bar pack stones. Group Efacies, having milliloieds, gastropoda and ostracoda, is related to a lagoon environment with a relatively free rotation of water in inner ramp (Buxtone, 1989). The facies F is suggestive of the tidalflat. In this flat, there exist vast amounts of sandy limestone and lime-sandstone. Their horizontal and vertical changes and analogy with old and modern sedimentary environments show that these facies have deposited in a homoclinal ramp carbonate platform (Figure 5). The sedimentation environment of the open marine facies belts of these

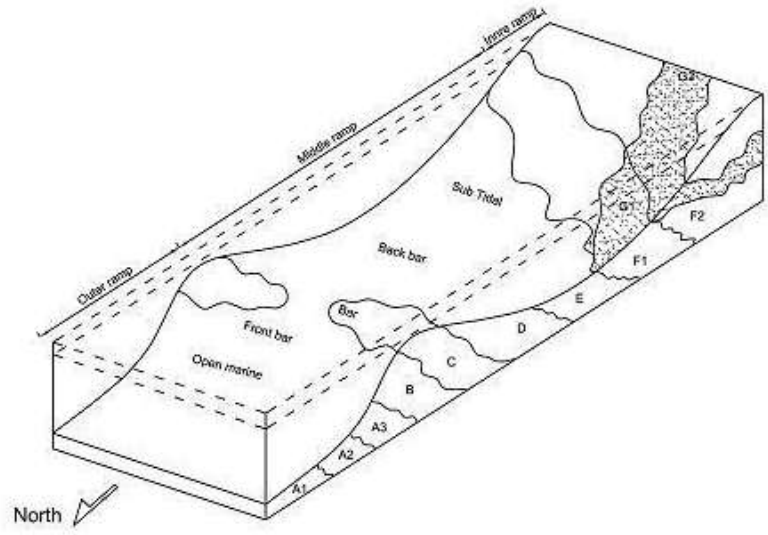

Figure 5: Sedimentary model and distribution of microfacies of Ziarat formation

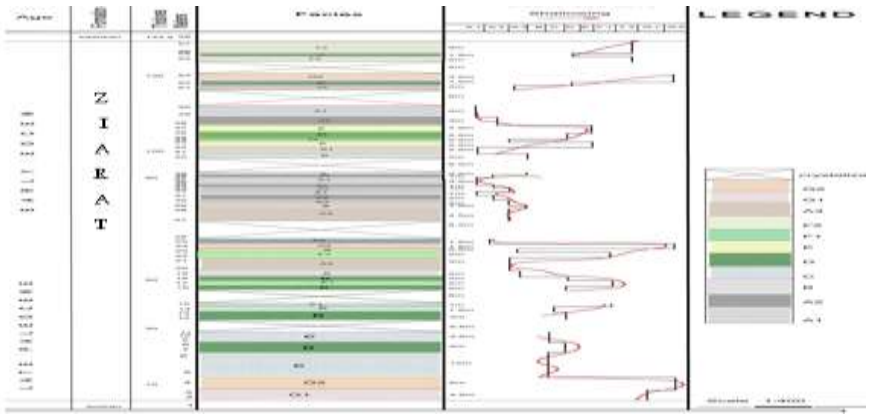

Figure 6: Sedimentary cloumn and vertical distribution of microfacies of Ziarat formation, and sea level diagram

Successions is similar to the modern sediments of the deep environment of Trocial coast platform (Purser, 1973) and Neoene radiolarian facies in northen India (Sharma, 2011). The facies which are dependent on facies belt of bar also corresponds with the bars of the modern belts in Bahamas (Hine, 1977) and Trotial coast (Purser, 1973)

CONCLUSIONS

The sediments of the late Paleocene - Eocene successions at Shahindej section have deposited in open marine facies belts, fore bar, barrier, back bar, subtidal (lagoon) and tidal flat (intertidal, supratidal).
The open marine microfaces included **A1:** Mudstone, **A2:** Radiolaria Wackstone, **A3:** Radiolaria Bioclastic Wackstone-Packstone. Fore bar microfacies contains of **B:** Milliloied Bioclastic Packstone, The Barrier microfacies **C:** Alveolinea Grainstone and the back bar facies **D:** Bioclastic Packstone. Subtidal (lagoon) is characterized by **E**: Bioclast Opertorbitolites Wackstone. Tidal flat microfacies consisting of **F1**: Pelloidal Bioclast Grainstone, **F2**: Dolomitic Mudstone and **F3**: Cherty Litharenite.
Vertical and horizontal changes of the facies and comparing them with old and modern environments show that the facies of these successions have deposited in a carbonate platform of the homoclinal ramp type. Sequence stratigraphy of these successions indicates that Late Paleocene - Eocene deposits at the Shahindej section contain five 3rddeg (Slass, 1963). Sedimentary sequences which are made up of shallowing and deepening parasequences (Slass, 1963) (Figure 6).

REFERENCES

Aga-nabati A (2006). *Geology of Iran* (Geological Survey of Iran publication) 586. (In Persian).
Buxtone MWN and Pedley HM (1989). A standardized model for Tethiary carbonate ramp. *Journal of the Geological Society* **146** 746 – 748.
Dunham RJ (1962) Classification of Carbonate Rocks according to depositional texture. *In*: *Classification of Carbonate Rock: A Symposium*, Edited by Ham WH (American Association of Petroleum Geologists Members) **1** 521.
Flugel E (2004). *Microfacies of Carbonate Rocks: Analysis, Interpretation and Application* (New York, Springer) 976.
Folk RL (1965). *Petrology of Sedimentary Rocks* (Hemphill Pubication, University of Texas Libraries).
Hine AC (1977). Lily bank, Bahamas. History of an iolite sand shoal. *Journal of Sedimentary Petrology* **47** 1544-1581.
Purser BH and Evans G (1973). Regional sedimentation along the Trucial coast, SE Persian Gulf. In: *The Persian Gulf* (Springer – Verlag Berlin) 211 – 231.
Reading HG (1996). *Sedimentary Environment and Facies* (Blackwell Science Publication) 615.
Sharma V, Daneshian J, Bhagyapati Devi L (2011). Early Neogene Radiolarian faunal tarnover in the northern Indian Ocean: Evidence from Andaman- Nicobar. *Journal of Geological Society of India* **78**(2) 157-166.
Slass LL (1963). Sequences in the cratonic interior of North America. *Geological Society of America Bulletin* **74** 93-114.
Wilson JL (1975). *Carbonate Facies in Geologic History* (New York, Springer - Verlag) 471.