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Lithostratigraphic Correlation of the Middle Eocene–Upper Miocene Rocks between Sectors (1-5), Tansulukh Region, Al Jabal Al Akhdar NE Libya: An Integrating Study from Previously Studied Wadies

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ABSTRACT

Some new lithostratigraphic measures are introduced for the nature of existence or removal of some rock units between some studied wadies in Tansulukh area. Lithostratigraphic correlation of the exposed rock units (Middle Eocene-Upper Miocene) between sectors 1-5 in Tansulukh region was necessary to be conducted because of the suspected rock complexities between these sectors. According to the conducted lithostratigraphic correlation between studied sectors (1-5) the missing of Oligocene-Middle Miocene rock units toward sectors 4 & 5 was attributed to some paleo-structural instability during post Eocene till pre-Late Miocene times.

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1. Introduction

The Tertiary rocks (Eocene–Miocene) between the studied sectors 1-5 (Fig. 1) are characterized by lithological, and paleontological indicators that could be used in establishing regional correlation between stratigraphic sections of five designated wadies (Wadi Al Kuf, Wadi Az Zad, Wadi Al Bakur, Wadi Belgares and Wadi Zazah) of the sectors in question. The Eocene-Miocene rocks in the study area have a complex depositional and structural history. This current study was necessary to be conducted to shed lights on the carbonate rocks complexities and their spatial variations that may be caused by some strato/structural instabilities in this area.

2. Location of the study area

The study area (sector 1-5) is located in the Tansulukh village of Al Jabal Al Akhdar region between coordinate points latitudes 32°16′57.2″, 32°25'30'' N, and longitude 20°25′08″, 20°29′41″ E and covering an area of about 93 km² (Fig. 1). Ten (10) wadies are cutting across the studied sectors (1-5) from which, five (5) selected wadies are considered to represent these sectors, which are (Wadi Al Kuf, Wadi Az Zad, Wadi Al Bakur, Wadi Belgares, Wadi Zazah).

3. Objectives

Are to establish a regional lithostratigraphic correlation between studied columns and to attempt to outline some interpretation of the Eocene–Miocene sequence and their complexity in terms of stratigraphic setting.

Doyle and Bennett (1998) published a book unlocking the stratigraphical record: advances in modern stratigraphy. El-Hawat (2008) studied the facies, sequences, and unconformities of Ypresian-Early Lutetian in Cyrenaica. Yanilmaz *et al*., (2008) published a paper on facies analysis and depositional systems of defined sedimentary sequences from Precambrian to Late Miocene in NE Libya, Geology of East Libya. El-Arnauti *et al*., (2008) studied the structural style in NE Libya. Elfigih and Melad (2013) discussed the possible geological reason for the missing of the Oligocene section in sector (5) and its vicinity, Deryanah-Al Abyar area, Al Jabal Al Akhdar, NE Libya. Geinaber *et al*., (2015) studied the surface geology of Wadi Alkuf. Al hadad *et al*., (2015) investigated the geology of Wadi AL Bakur. Abdulrahman Farag *et al*., (2015) studied and mapped the geology of Wadi Belgares. Bukhamada (2015), geologically, mapped the exposed rocks and reported some observations in the area of Wadi Zazah.

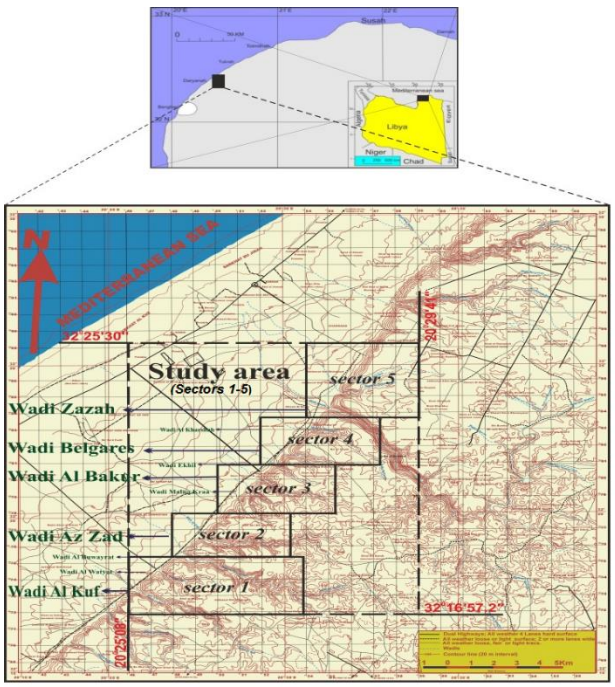

Fig. 1: Location map of the study area sectors (1-5), Tansulukh region, Al Jabal Al Akhdar, NE Libya.

4. Previous work

Many geological investigations have been carried out on the geology of Daryanah Al Abyar area, Al Jabal Al Akhdar, NE Libya.

5. Methodology

The data used in this study is based on some selected stratigraphic columns of some studied wadies (Fig. 1) namely Wadi Al Kuf of (sector 1), Wadi Az Zad of (sector 2), Wadi Al Bakur of (sector 3), Wadi Belgares of (sector 4) and Wadi Zazah of (sector 5). These stratigraphic columns were constructed and studied by previous research students of the Earth Science Department, of the academic year (2015-2016), some other literature data were also used to support this study (Yanilmaz *et al.*; 2008; Doyle and Bennett, 1998). The current study method is based on compilation and correlation of these stratigraphic columns to establish a regional lithostratigraphic correlation enables us to interpret the stratigraphic setting of the area in question. Columns were spaced using horizontal scale (1:150,000) and stratigraphic datum was selected at the basal part of Al Qattarah Formation (unconformity surface) between correlated columns. Based on lithologic/paleontologic criteria, lithostratigraphic correlation was attempted between observed formations.

6. Regional study and stratigraphic setting

The stratigraphic sequences in the study area (sectors 1-5) are represented by carbonate rocks ranging in age from Middle Eocene to Upper Miocene and comprises six (6) formations which are from older to younger, Darnah Formation (Eocene), Al Baydah Formation; "Shahhat Marl Member, and Algal Limestone Member" (Lower Oligocene), Al Abraq Formation (Upper Oligocene), Al Faydiah Formation (Lower Miocene), and Al Rajmah Group comprising of the Benghazi and Wadi Al Qattarah formations of Middle Miocene and Upper Miocene respectively (Fig. 2). The studied outcrops (1-5) have been conducted using stratigraphic columns of five (5) representative wadies (one for each sector) which are Wadi Al Kuf, Wadi Az Zad, Wadi Al Bakur, Wadi Belgares, Wadi Zazah, (Fig. 1). Several cyclic sequences have evolved between stratigraphic columns (Fig. 3) with formations thickness changed from one sector to another, and the nature of the exposed formations is changing as most of the Oligocene rocks were totally missed toward sectors 4 and 5 in the NE direction.

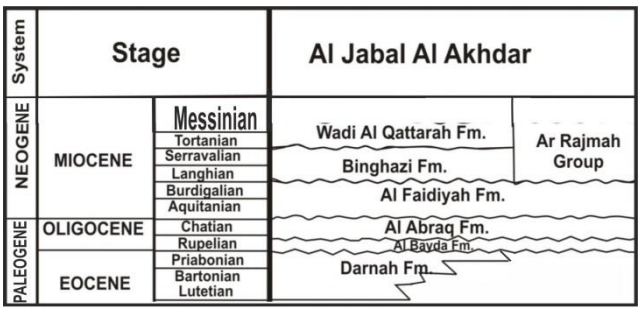

Fig. 2. Eocene-Miocene stratigraphic chart of North Cyrenaica (after El Hawat and Abdulsamad, 2004).

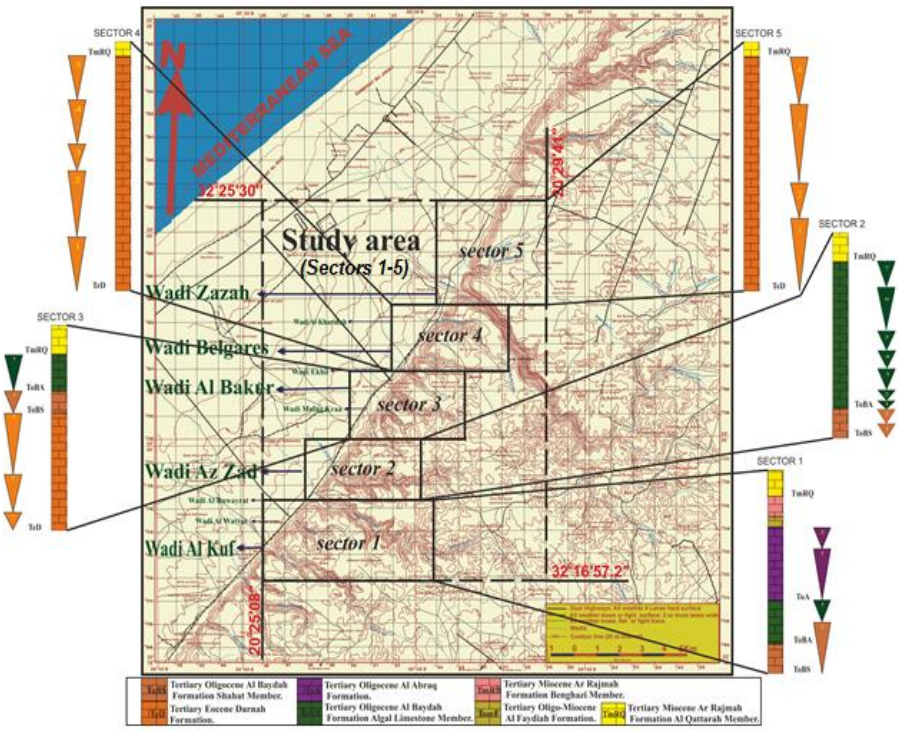

Fig. 3. Location map of the study area sectors (1-5), and lithostratigraphic columns of five selected wadies (Wadi Al Kuf, WadiAz Zad, Wadi Al Bakur, Wadi Belgares and Wadi Zazah), Tansulukh region, Al Jabal Al Akhdar, NE Libya.

7. Discussion

Lithostratigraphic correlation involves the identifications of rock units based on the lithological characters (Doyle and Bennett, 1998). Based on lithostratigraphic correlation (Fig. 4) the Oligocene rocks (Al Bayda Formation) are changing laterally to carbonate rocks of Middle Eocene (Darnah Formation) from SW to NE direction. Vertically, sequences of coarsening-upward cycles (Fig. 3) have been detected in all studied formations, where each cycle consists mainly of mud-supported texture at the base to more grainstone texture at the top. Hence, in general, a regressive mode of sequences was characterizing the Middle Eocene to Upper Miocene sections and suggested a repetitive sea level rise and drop through time. From Fig. 4, the missing of the Oligocene sediments is visible towards sectors 4 & 5 in Wadi Belgares and Wadi Zazah, where these areas may have suffered some tectonic uplift that persisted from Lower Eocene to Middle Miocene (Elfigih and Melad, 2013). In the other hand and toward sectors 1-3 in Wadi Alkuf, Wadi Az Zad and Wadi Al Bakur (Fig. 4), the area is relatively subsided and the sea seemed to be transgressed to continue deposition of Oligocene-Miocene sediments at the top of Eocene sediments.

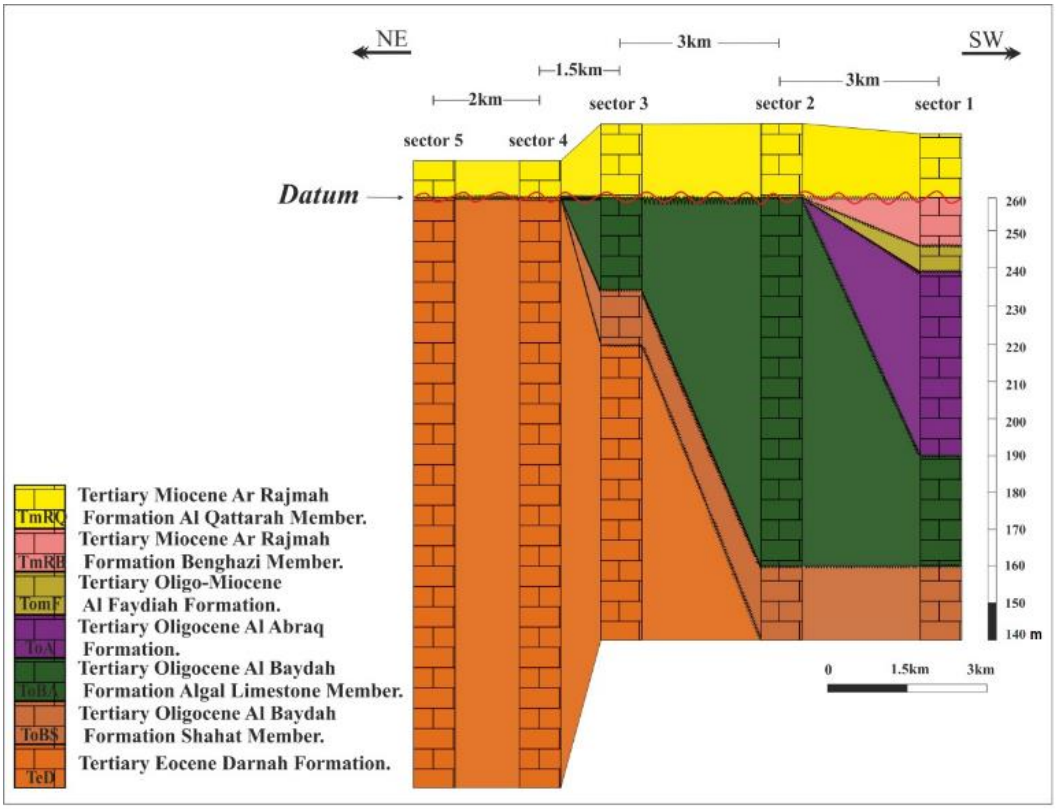

Fig 4. Lithostratigraphic correlation of the study area showing the depositional history of the studied sectors (1-5), Tansulukh region, Al Jabal Al Akhdar, NE Libya.

8. Conclusions

Lithostratigraphic correlation between sectors (1-5) have been constructed and revealed SW low relief area in the vicinity of sectors 1-3 in which uninterrupted Eocene-Miocenecyclic sequence-shave been deposited. Whereas relatively high relief area was observed to the NE direction in the vicinity of sectors 4 and 5 where the Oligocene-Middle Miocene sequences are locally missed. This stratigraphic relationship may show some paleo-structural instability or basin reactivation resulted in relief variability (emergent/subemergent areas). This lithostratigraphic correlation is only valid for the correlated sectors (1-5). However, regional study for the other nearby sectors needs to be conducted to complete the regional stratigraphic approach for the whole sectors in Tansulukh region.

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References

Doyle and Bennett (1998) Unlocking the stratigraphical record: advances in modern stratigraphy, John Wiley & Sons, Chichester, 532, pp.

El Arnauti A., Lawrece S. R., Mansouri A. L., Sengor A. M., Soulsby A. and Hassan H., (2008) 'Structural styles in NE Libya,, *Geology of the East Libya*, V. IV, pp. 153-178.

Elfigih. O. B. and Melad. H. S, (2013) 'Possible Geological Reason for the Missing of the Oligocene Section in Sector (5) and Its Vicinity, Deryanah-Al Abyar Area, Al Jabal Al Akhdar, NE Libya', *Open Journal of Geology*, 3, pp. 322-329.

El Hawat, A.S., Abdulsamad, E.O., (2004) 'The geology of Cyrenaica: a field seminar, 130 pp. Sedimentary basins of Libya', *Earth Sci. Soc.* Libya, Tripoli

El Hawat, A.S., Jorry, S., Caline, B., Davaud, E., Masse, P. (2008) 'The Ypresian-Early Lutetianfacies, sequences and unconformities of Cyrenaica: their correlation andimplications in north Africa'. In: Salem, M.J., El-Hawat, A.S. (Eds), *geology of east Libya*. Gutenberg press Ltd., Malta, pp.85-120.

Yanilmaz E., Huffman D. P., Martin M. and Gutteridge P., (2008) 'Facies analysis and depositional systems of defined sedimentary sequences from Precambrian to Late Miocenein NE Libya', *Geology of East Libya*, V. IV, pp. 3-84.