

Turbidites and Tempestites from the Tamellalt region, Eastern Jebilet, Morocco

El khounajiri Hayat ^{*1}, Algouti Ahmed ¹, Algouti Abdellah ¹, Essemani Mouhamed ¹, Baid Soukaina ¹, Ezzahzi Salma ¹, Agli Saloua ¹, Kabili Salma ¹, Lakhilili Mohamed ¹, El myr Abdennacer ¹, El kihal Imane¹

¹Department of Geology/ Geosciences Geotourism Natural Hazards and Remote Sensing Laboratory (2GRNT), Cadi Ayyad University, Faculty of Sciences Semlalia, Morocco,

Email of corresponding author: hayat.elkhounajiri2@gmail.com

(Received: 22 February 2024, Accepted: 08 March 2024)

(4th International Conference on Innovative Academic Studies ICIAS 2024, March 12-13, 2024)

ATIF/REFERENCE: El khounajiri, H., Algouti, A., Algouti, A., Essemani, M., Baid, S., Ezzahzi S., Agli, S., Kabili, S., Lakhilili, M., El myr, A. & El kihal, İ. (2024). Turbidites and Tempestites from the Tamellalt region, Eastern Jebilet, Morocco. *International Journal of Advanced Natural Sciences and Engineering Researches*, 8(2), 36-39.

Abstract – The Koudiat Tamellalt deposit, part of the Paleozoic Eastern Jebilet massif (Morocco), is a high-energy zone, which makes its sedimentary nature different from normal. Consisting of a series of turbiditic facies and tempestites, the study area is marked by high-energy phenomena. The presence of tempestites at platform level reflects intense storm phases, given the presence of hummocky transverse stratification structures, clearly visible and common in sandstone massifs. Several pieces of evidence exist in the central part of the Koudiat Tamellalt formation, proving that this part was deposited in shallow waters, such as bioturbated pellets, it presents a kind of Arenicolith. This element is an indicator of bioturbation in the environment, showing that we are progressively moving towards the platform.

Keywords – Jebilet, Morocco, Kouadiat Tamelalt, Turbidit, Tempistites, Bioturbation

I. INTRODUCTION

Koudiat Tamelalt is a hill belonging to the southern part of the Eastern Jebilets. [1]. It is located near Douar Tamelalt Lakdima to the northeast of the city of Marrakech - Morocco (fig.1). The study area is made up of a series of geological formations dating from the Upper Viséan period [2], A closer look at these formations reveals several problems, some of which are linked to the transition from deep facies (turbidites) to platform facies (tempestites).

II. MATERIAL AND METHOD

This work is part of a regional study of the Viséen in the Jebilet region of Morocco. The main objective is to carry out an in-depth geological analysis, based on sedimentological studies and structural observations of the various geological formations present in the study area.

Lithofacies and sedimentary structures were identified, and sequence analysis was carried out to characterize depositional environments. Detailed lithological observations, illustrated in figure log, reveal a general lithostratigraphic subdivision into several formations, mainly sandstone facies.

For the study of microfacies, crucial for confirming paleoenvironments, thin sections were prepared and examined under the microscope.

III. RESULTS

The cross-section of the study area (fig.2) shows that the base is a schistose base, surmounted by hard sandstones with horizontal and oblique planes just above. A slump level appears, indicating hydroplastic thinning [1] (fig.3-a), and above this is sandstone alternating with pelite. The next facies to appear on this hill is a hummocky cross-stratified at the base and convoluted at the top (fig.3-b). The rest is sandstone, pelite, greenschist and occasional sandstone ending in a lineation of delis (fig.3-c). In the last 50 meters, the section ends in calcarenites with fine lamination (fig.3-d), which is translated as a transition from a silicoclastic to a silicocalcareous system.

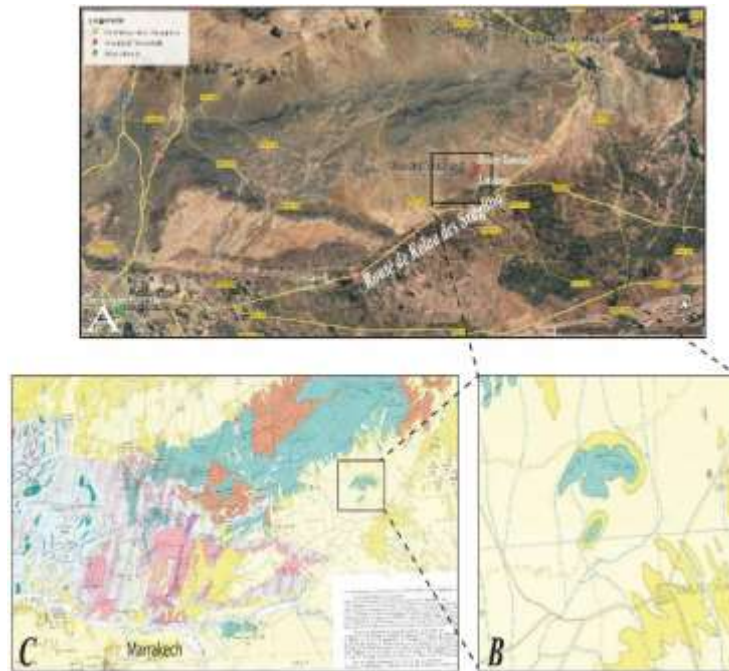


Figure 1. A: Geographical location of the study area, B and C: Location of Koudiat Tamellalt in relation to the Jebilet geological map.

IV. DISCUSSION

The convolute section is marked by further sandstone-pelite intercalations topped by overlapping wrinkles that intersect with the convolutes, which are caused by the displacement of materials on a submarine slope [1]. High-energy debris flows indicate a period of high energy in the channels [1]. The figures at the base of the turbidite sandstone boncs indicate the orientation of paleocurrents, which are believed to be moving towards the WNW [1]. According to other authors, the edge of the submarine slope was elongated NNE-SSW [3].

Several pieces of evidence exist in the central part of the Koudiat Tamellalt formation, proving that this part was deposited in shallow waters, dominated by storms located above the base of the storm waves, we notice, A bioturbated pellete bed, it presents a kind of Arenicolithes. This element is an indicator of bioturbation in the intertidal environment. [4].

A hummocky cross-stratification sandstone (HCS) with SW-NE orientation. These structures are characterized by slightly curved, low-angle cross laminations, the laminae are arranged convex upwards and concave downwards with a lower limit of set erosion. This is the most important piece of evidence for tempestite deposits. These types of deposits are the result of mechanical processes (erosion and resedimentation of sands), most often generated by strong storm currents. Obliquely shaped laminations (HCS) occur above the storm action boundary, from the coastal plain to the break in the continental slope.

It is confirmed by various authors that the coarse Tamellalt facies are littoral facies, including littoral sandstones, deltaic pebbles and sandstones and calcarenites [5]. And according to the hummocky cross stratification indicates that the bonc is generated by storms, but the convolute is generated by the current itself, but it always remains at the shallow marine or littoral level that is expressed by the figures we find.

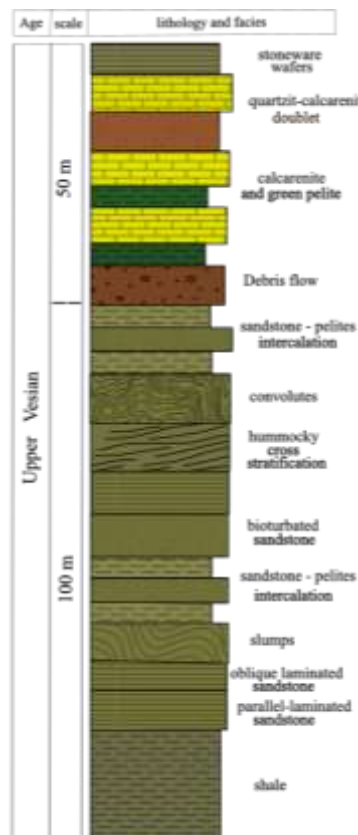


Figure 2. Lithostratigraphic column of the Koudiat Tamellalt section.



Figure 3. Facies plate from the Koudiat Tamellalt site, a: slump, b: hummocky cross-stratified and convoluted facies, c: lineation of delis, d: calcarenite.

V. CONCLUSION

The region studied is considered a paleolittoral and is characterized by a variety of geological structures dating from the Upper Viséan age, marked by high-energy phenomena that make its sedimentary nature different from normal. Turbidites record changes from its typical sequences, succeeded by tempestite sequences that record storm phases, differentiated between the two by the presence of bioturbation either at the facies level or at the level of the thin-section slides studied.

REFERENCES

- [1] J. Beauchamp, M. Essemani, and M. Nouidar, "Mouvements gravitaires et remplissage d'un bassin marin: le Viséen supérieur des Jebilet (Maroc)," *Sci. Géologiques, Bull. mémoires*, vol. 83, no. 1, pp. 57–76, 1989.
- [2] P. Huvelin, "Etude Géologique et Géologique Du Massif Hercynien Des Jebilet (Maroc Occidental).," 1977.
- [3] J. Beauchamp, "Le Carbonifère inférieur des Jebilet et de l'Atlas de Marrakech (Maroc); migration et comblement d'un bassin marin," *Bull. la Société géologique Fr.*, vol. 7, no. 6, pp. 1025–1032, 1984.
- [4] P. S. Pallas, *Miscellanea zoologica, quibus novae imprimis atque obscurae animalium species describuntur et observationibus iconibusque illustrantur*. éditeur non identifié, 1766.
- [5] J. BEAUCHAMP, B. COURTINAT, C. DESTEUCCQ, J. FERRANDINI, P. Potherat, and C. Roy-Dias, "L'Autuno-stephanien du sondage OT 6 bis dans le Haouz oriental de Marrakech: études préliminaires," *Bull. l'Institut Sci.*, no. 9, pp. 11–20, 1985.