

Lithological, structural study, and reconstruction of the paleoenvironment of the Tazalakht region

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Abstract – The Tazalakht region, located in the western Anti-Atlas in Morocco, is the subject of an in-depth field study aimed at obtaining a detailed macroscopic field description, with the objectives of reconstructing the local paleoenvironment and determining the style of deformation that has marked the area.

Field mapping is essential for understanding the composition of each facies and the associated style of deformation. This process involves several stages, from macroscopic descriptions to the determination of deformation style. The Tazalakht deposit consists of a quartzite base, unconformably overlain by a sedimentary cover. Beginning with monogenic conglomerates, followed by the Tata-Taroudant group, the Ouarzazate conglomerate is succeeded by the "Base Series", whose strength varies according to paleogeography and which forms the cover.

This series begins with a breccia of angular quartzite elements, sometimes with decreasing granoclassing and a silty matrix associated with mineralization. The top of the basic series features alternating siltstones and sandstones, followed by carbonate formations such as Tamjout dolomite, dolomitic sandstones and, finally, lower limestones. Analysis of the sedimentary figures in these carbonate formations enables us to determine the paleoenvironment of the area, indicating the presence of a distal platform due to the stromatolites in the limestones. In terms of deformation, the Tata-Taroudant Group undergoes soft deformation, while brittle deformation is observed in the quartzite base and cover.

Keywords – Field Mapping, Sedimentary Cover, The Basic Series, Paleoenvironment, Deformation.

I. INTRODUCTION

The Tazalakht mine is one of the oldest in the Western Anti-Atlas. Its exploitation since the Middle Ages (12th century) by the Almoravids for copper is evidenced by the extent of the ancient works.

The Tazalakht region is located in the Western Anti-Atlas region, about forty kilometers east of Tafraout and approximately 170 kilometers southeast of Agadir. The average altitude is 1800 meters.

The lithostratigraphic sequence of the Tazalakht area shows that it consists of a quartzitic formation that likely represents the paleo-relief. The sequence begins with a conglomerate level (Fig. 2), followed by the basal series, which is composed of a quartzitic breccia with alternating sandstones and siltites. The Tamjout dolomite overlies this series, along with a series of lower limestones.

II. MATERIALS AND METHOD

At the Tazalakht site, the bedrock consists of quartzite and conglomerate, and its paleogeography is characterized by a series of highs and paleobasins, where the conglomerates of the Late Precambrian III (Ediacaran) and the basal series of the lower Cambrian are deposited. The basal series is composed of a level of quartzitic breccia and an alternation of siltite and sandstone with occasional micro-conglomerate intercalations, overlain by the Tamjout dolomites.

III. RESULTS

Lithostratigraphic study of Tazalakht

Quartzitic bedrock:

This basement is represented in the sector by deformed quartzites during the main phase of the Pan-African orogeny, approximately 685 million years ago, belonging to the Lkest group.

In the quarry, these quartzites are present in the form of a high relief.



Figure 1: Quartzite

Ediacaran Conglomerates

These are monogenic conglomerates, consisting of an alternation of layers with quartzitic elements smaller than 5 cm and layers with decimetric elements (20 cm).



Figure 2: Ediacaran Conglomerates

The basal series

An alternation of siltites and sandstones encases the majority of copper mineralizations in the Western Anti-Atlas, as is the case in Tazalakht. The breccia is overlain by an alternation of sandstones and siltites, controlled by paleogeography. It exhibits variable thickness. In areas where mineralization is concentrated, such as the Tazalakht quarry, this alternation is particularly pronounced.



Figure 3: The sandstones and siltites of the basal series

The Lower Limestone Series

It is a very thick carbonate-dominated formation, consisting of an alternation of limestone beds and marly layers, ranging from decimeter to meter thickness.



Figure 4: Lower Limestone

Deformation in the study area

Brittle deformation

The brittle structures affect both the quartzitic basement and the Infracambrian cover.



Figure 5: A quartzite vein

Soft deformation

The Tata-Taroudant Group cover displays anticlinal and synclinal structures, with axes oriented N-S to NNE-SSW.



Figure 6: Limestone deformation

Paleoenvironmental reconstruction

The distensive and differential tectonic movements in the western Anti-Atlas, within the context of Cambrian or late Precambrian rifting, gave rise to a NE-SW graben.

It is a series with stromatolites, corresponding to the "lower limestone rich in stromatolites."

The subsidence intensifies primarily along the Ait Abdallah-Igherme axis.

On the other hand, the areas of Ifni, Anzi, and perhaps Ait Baha appear to constitute a less

submerged marine plateau, sufficiently distant from the emergent margins of the basin so we have a Distal platform.



Figure 7: Stromatolites in limestone

IV. DISCUSSION

The formations of the basal series to the north of the Tazalakht quarry have a steep dip (75° - 80°), almost vertical, which is associated with the presence of a kilometer-scale fault (3 km) oriented in a north-south direction.



Figure 8: The basal series

The vertical nature of the geological formations guided us in our movement towards the southern part of the dome, where the geological formations have a low dip, in order to create a geological cross-section and a stratigraphic log.

V. CONCLUSION

The Tazalakht deposit comprises a quartzitic base from the Jbel Lkest group, overlain in a discordant

manner by a cover from the Ouarzazate and Tata-Taroudant groups. The Ouarzazate group consists of monogenic conglomerates with rounded quartzitic elements embedded in a clayey matrix. The Tata-Taroudant group begins with a detrital series called the "Base Series," followed by carbonate formations including the Tamjout dolomite, dolomitic sandstones, and lower limestones. These formations suggest a shallow and calm marine environment with the presence of stromatolites and current ripples [4]. Ductile deformations are present in the Tata-Taroudant group, while brittle deformations are found in the quartzitic base and the cover, connected by subplanar fractures. Fractures oriented north-south to north-northeast - south-southwest traverse the formations of the Tata-Taroudant group at the anticline's hinge.

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