LATE CRETACEOUS SYNSEDIMENTARY TECTONIC IN EASTERN ATLAS SAHARAN (NORTH EAST OF ALGERIA)

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Abstract:

This study focuses on the relations between sedimentary and tectonic, in the compression context of the terminal Cretaceous of Oriental Atlas Saharan (Tébessa).
Paleogeography of the upper Senonian is influenced by the paleo-structure of the platform which determines the nature of the deposits and their geometry. From the tectonic point of view, the activity of the compressive phase eo-alpine increases during this period. This device shows a sedimentary and tectonic instability that accompanies the terminal Cretaceous sedimentation which is confirmed by the presence of synsedimentary structures ("Landslide" slumps, normal faults).
The correlation between the East Atlas Saharan and West during the Maastrichtian shows a differentiation in the geometry of deposits. It reflects the variation in subsidence and sedimentation rates between these two areas.

Key Words: Terminal cretaceous, correlation, synsédimentary tectonic, landslide

Introduction

The late cretaceous is one of the most significant periods in the geological history of the Eastern Atlas Saharan in view of the important tectonic and sedimentary events that affected the region at that time.

The present study focuses on the characterization of the sedimentary of late cretaceous deposits under control of tectonic, located in the area of Tebessa, in the north eastern part of Algeria.

The selected site is located in the wilaya of Tebessa, about 17 km from the main town of the wilaya and a 3 km away from the town of Hammamet (Fig.01).

Materials and methods

The section studied is approximately 280 m thick ,which are composed mainly of limestone. The survey of the geological section was supplemented by measurements of bedding plans, fault plans, stylolithiques joints. In order to make stereographic projections, We used stéreonet Aug 2000.

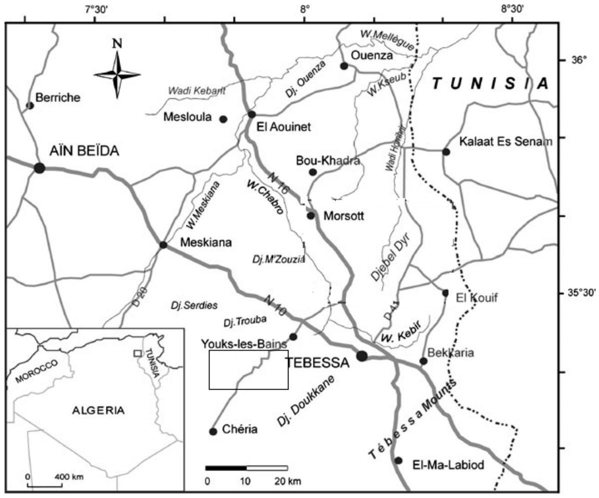

Fig. 1 Geographical location of the site

Stereographic projection
Bedding plans

	Bedding plans	
N°	**Direction**	**Pendage**
01	100	NE 15
02	120	20 NE
03	110	NE 15
04	146	16 NE
05	130	NE16
06	120	NE 15
07	55	NE 20
08	115	NE 30
09	175	NE 15
10	160	NE 30
11	160	NE 52
12	150	NE 12
13	150	NE 20
14	140	NE 10
15	130	13 NE
16	125	10 NE
17	125	15 NE
18	145	15 NE
19	127	10 NE
20	90	20 NE

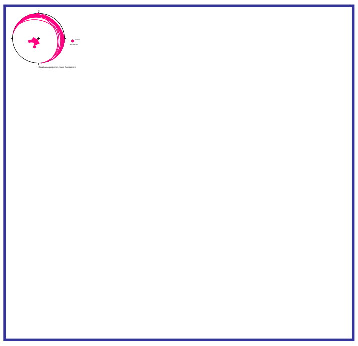

Fig.2A: Stereogram strata plans

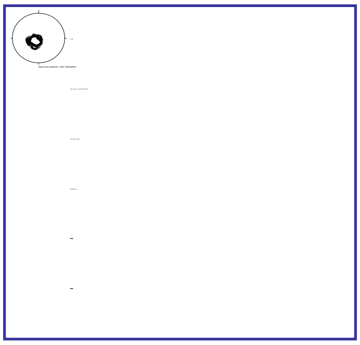

Fig.2B: Stereogram density strata plans

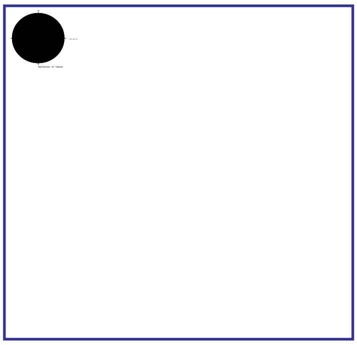

Fig.2C: Stereogram dips strata plans

Faults plans

	Faults plans	
N°	**Direction**	**Pendage**
01	25	NW 40
02	95	SW dec dex10
03	165	15 SW dec dex
04	95	15 SW dec dex
05	160	10 SW dec dex
06	175	SW dec dex20
07	130	SW dec dex5
08	30	SE30
09	40	20 SE dec sen
10	65	invF. SE67
11	55	SE 25
12	95	SW5
13	160	SW10
14	10	SE90
15	113	SW10
16	120	dex ec d SW5
17	100	SW64
18	160	SW20
19	175	NE25
20	166	NE45
21	118	NE60

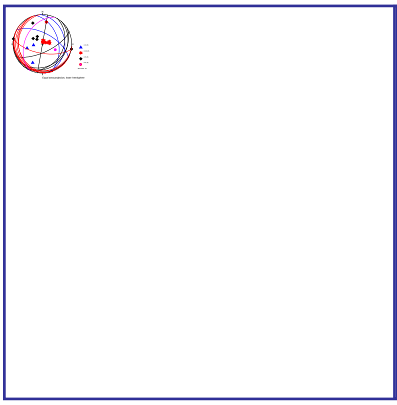

Fig.3A: Stereogram strata plans

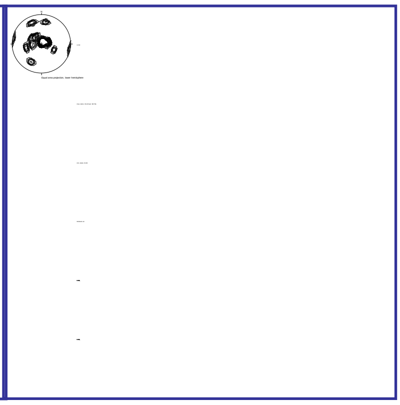

Fig.3B: Stereogram density strata plans

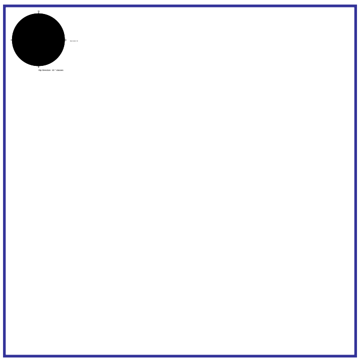

Fig.3C: Stereogram dips strata plans

Diaclasis plans

	diaclasis plans	
N°	**Direction**	**Pendage**
01	45	SE90
02	155	NE85
03	70	SE85
04	180	SE85
05	127	NE85
06	45	SE85
07	60	SE90
08	165	NE90

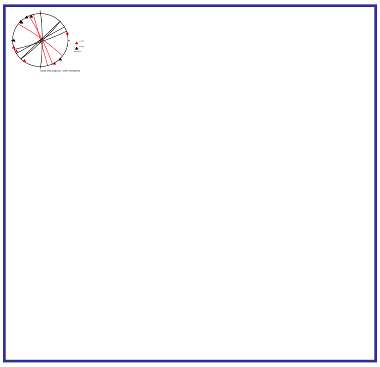

Fig.4A: Stereogram strata plans

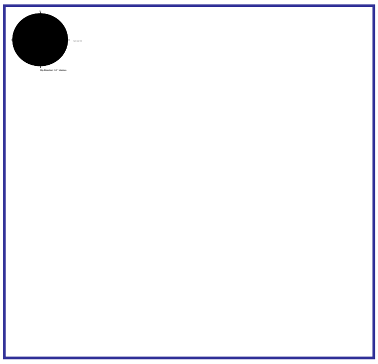

Fig.4B: Stereogram density strata plans

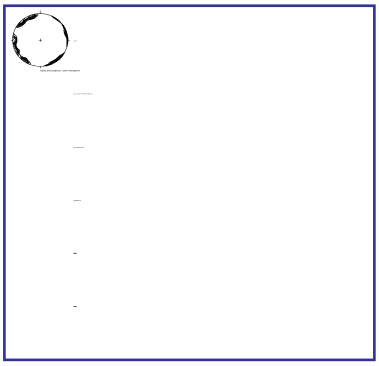

Fig.4C: Stereogram dips strata plans

Stylolites

	stylolithes	
N°	**Direction**	**Pendage**
01	118	40 SW
02	25	75 SE
03	30	60 SE
04	120	35 SW
05	40	80 SE

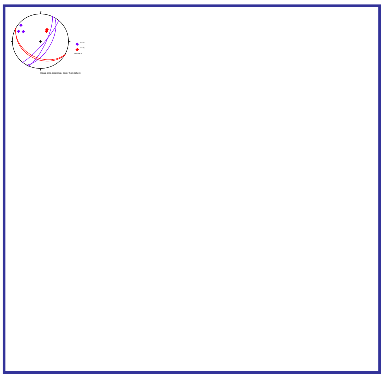

Fig.5A: Stereogram strata plans

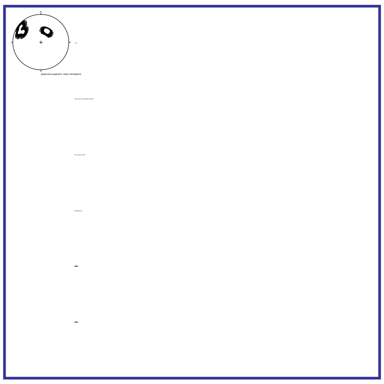

Fig.5B: Stereogram density strata plans

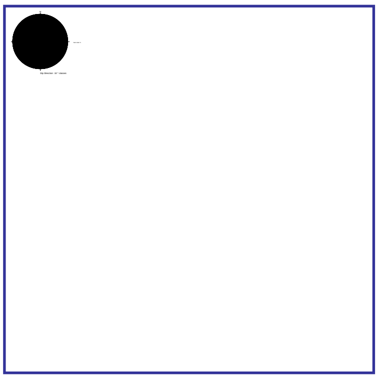

Fig.5C: Stereogram dips strata plans

Interpretation of stereographic projections

Stereograms (Fig: 2A, 3A, 4A, 5A) are projections of Schmidt, lower hemisphere with fault plans, bedding plans, and diaclasis plans, stylolithes (thin lines) and ridges (small arrows, centrifugal normal cheeks). The extension direction reconstructed by various methods (Angelier, 1984) is indicated by the arrows on the edges of large diagrams.

• The density stereograms are Dimetrevic projections (Fig. 2B, 3B, 4B, 5B). Histograms (black) (Fig. 2C, 3C, 4C, 5C) are projections of Wulf summarize the distribution of dip directions.

A-Plans strata: The stereogram of bedding plans (Fig: 2A, 2B, 2C) shows the main direction:

D: N 130 ° E, **P:** 10 ° NE. That direction does not correspond to the Atlas phase (NW / SE), or the Alpine stage (N-S). We can consider that this direction has undergone a deformation resulting from the combination of Alpine tectonics and paleotectonic (accident base) which would lead to virgation of Dj. Gaâga.

B-faults Plans: From stereogram of fault planes (Fig. 3), three mean directions are mentioned:

• **D1:** N 40 ° E, P: 20 ° SE (black thin lines);

• **D2:** N 120 ° E, P: 5 ° W (red lines);

• **D3:** N 175 ° E, P: 40 ° S (blue lines).

The first two directions correspond to steps (corresponding to the first and second recesses sinistral to dextral offsets). They are the result of shortening NS direction (phase alpine) The third direction is normal faults, they are always the result of a NS shortening (phase alpine).

C-joints Plans: From stereogram plans joints (Fig. 4), two main directions are determined:

•D1: N 50 ° E, P: 85 ° SE (red thin lines);

•D2:N 150°E, P:85°NE (black thin lines);

These two directions result of shortening direction N-S (Alpine phase).

D-joints stylolites: In the stereogram plans stylolites (Fig. 25), mentions two main directions:

D • 1: N 30 ° E, P: 80 ° SE (blue thin lines) corresponds to the direction of tectonic stylolites (perpendicular to the stratification). They are the result of shortening NW / SE (Phase Atlas).

• D 2: N 125 ° E, P: 25 ° SW (red thin lines). This direction represents Stratiform stylolites (diagenetic).

4 - The synsedimentary tectonics: In order to show the tectonic / sedimentation relationship, compression context Cretaceous of Eastern Atlas Saharan and specifically in the area of Gaâga (Tebessa) was studied and analyzed synsedimentary structures recorded. Measures levied on land allow us to highlight the existence of slumps (Plates 6, 7, 8,9) and growth faults (Fig:6,7,8,9). The slip plans are observed slumps oriented NE. Synsedimentary normal faults are steering NW / SE. These directions correspond to the episode extensional phase Laramide compressive direction NW / SE.

Conclusion

In conclusion, it appears that the region of Gaâga results from the combined action of several tectonic style and variable extensions. Management stratification plans (N 130 ° E) of Dj. Gaâga does not correspond to the Atlas phase (NW / SE), or the Alpine stage (N-S). We can consider that this direction has undergone a deformation resulting from the combination of Alpine tectonics and paleotectonic (accident base) which would lead to virgation of Dj. Gaâga. Accidents caused by Atlas phase and Alpine phase , show very different directions, and their distribution is not homogeneous throughout the cut.The generated Alpine phase form:

1 - normal faults direction N 175 ° E;

2 - the sinistral offsets (N 40 ° E);

3 - of dextral offsets (N 120 ° E);

4 - diaclasis network combined (N 50 ° E and N 150 ° E).

Atlas Phase is represented in the form of tectonic stylolites. There direction is N 30 ° E. The stratiform stylolites (diagenetic) are thus determined. There direction is N 125 ° E. The synsedimentary tectonics, well represented, has generated slumps and normal faults. These structures correspond to extensional episode of the compressive phase of the Maastrichtian.

References:

Angelier J. (1984).-Tectonic analysis of fault slip data sets. Journal of Géophysical Research.

Benmansour S. (2009).- Etude tectono- sédimentaire du crétacé terminal de l'atlas saharien oriental ; p 56-62.

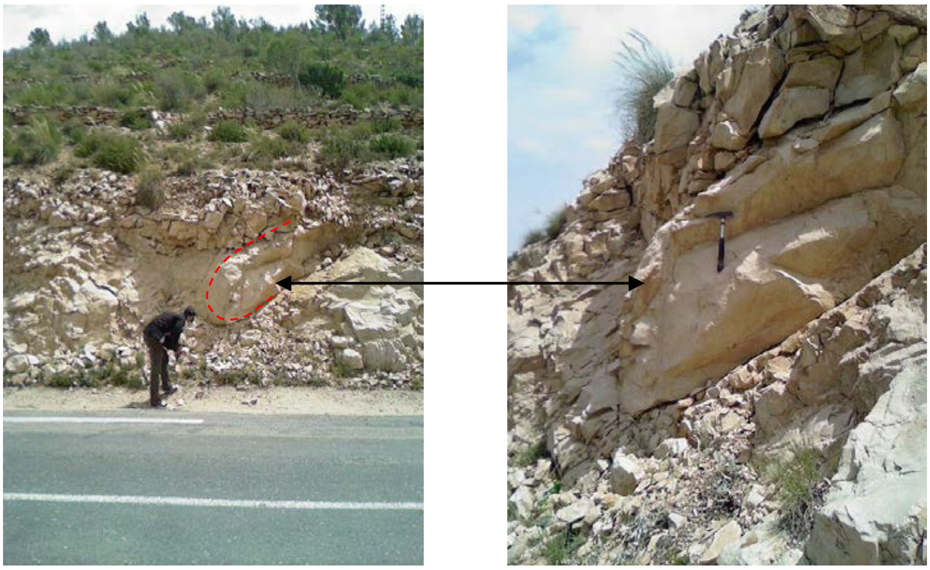

Fig. 6: Slump

Fig. 7: slump

Fig. 9: Normal synsedimentary fault