

Landscape archaeology and ancient establishments strategy: Spatial analysis for the investigation of Roman colonial territories in Wadi Abiod, Aures, Eastern Algeria

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Abstract:

The present article exposes the potential of a geo-archaeological approach in revealing the diversity of settlement strategies within the colonized areas according to an intramountainous landscape conditions. It attempts to understand the Roman expansion in the valley of Wadi Abiod, an important fluvial artery in the eastern Atlas based on the reconstruction and analysis of ancient roads systems. The nature of Roman colonization in the area is currently heavily debated, therefore the paper aims to contribute to this discussion by investigating the non-urban aspect of this segment in the Aures region through a combination of all information provided from extensive field surveys (from 2018 to 2020) and Geographical Information System-based analysis that were confronted with geological and geomorphological controls of the territory. The preliminary results of this integrated approach reveal the importance of the roads in expanding the scope of Romanization in a land crossing complex that seems at the margin of interest to the Romans.

Key Word: Geo-archaeology; GIS; Roman expansion; Ancient roads; South Aures; North Africa.

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I. INTRODUCTION

The Roman political growth as empire could not have been achieved without a skillful maneuver system, which fostered economic exchange and information transfer. Therefore, The reconstruction of ancient roads system is important for the investigation of the Roman mobility and control of a given territory that could be driven by past economic, social, political and military factors (Carreras, C.; De Soto, P., 2013). These networks that are often related to the morphology of a given territory were strongly influenced by geological, geomorphological and topographical attributes such as rock deposits, spatial extensions of water courses, drainage networks, and slope profiles. Thus, a comprehensive evaluation of the past movement circuit should include a multidisciplinary approach, in which lithological, morphological, and hydrological study should be confronted with the archaeological analysis (Younsi et al., 2020).

The Aures, a massif that invaders bypass because it is not only impregnable but its inhabitants are always quick to wage war has long been a subject of controversy among archaeologists. In reality, the space produced a mosaic where the Berbers (the Aures' inhabitants) and the Romans were side by side. In this demarcation, the range, retaining its height and its insularity, gave arguments to an ethnic opposition which is therefore implied by the rejection of the Romanization. But does this refusal mean an exclusive tendency to be a belligerent? Because to read the writings relating to this situation, the relationship between the local groups and the Romans was a warlike interlude. However, neither epigraphy, historiography nor even archaeology was directed at such an assertion.

It has to be said that the Romans displayed a certain indisposition when it comes to invading mountainous areas. The evidence that in Algeria, compared to the surrounding plateaus, the Aures seems to have remained on the fringes of Romanization. Nevertheless, the framing of its reliefs was speculated in order to avoid any disturbance or incursion. Yet had it been introduced for defensive purposes?

The purpose of this contribution does not pretend to escape this controversy. Moreover, it is useful to present another reading of this ancient history by focusing on the territorial development of a segment located in the southern part of the massif considering that the ancient cartography of the region that is available is still considered insufficient.

If the first Roman road layout was designed to favor contact between Roman citizens and colonies so how was the situation in the valley of Wadi Abiod?

To investigate the possible Roman expansion in the valley a geo-archaeological approach has been applied on this sector. A preliminary geological and geomorphological analysis of the region were performed to investigate the lithological, morphological, and hydrological influence on the selection of the mobility's circuit in the region. These factors were analyzed at a regional (Aures) and at a local scale (Wadi Abiod valley) in parallel with a broad study of the scientific literature. Therefore, a deep investigation based on a detailed geological mapping was performed in order to verify the relations between the different distribution of deposits and the archaeological finds.

Topographic data have been extracted from a Digital Elevation Model (DEM) with a spatial resolution of 30 m. The information obtained was essential for the investigation of the possible factors for settlement preferences.

The above obtained data were then confronted, with parallel and thorough prospection along the Wadi Abiod in order to gather as much data as possible related to archaeological evidences from the Roman period and which were confronted with literature and documents such as Peutinger's table of the Roman road networks as well as epigraphical data found in the *Corpus Inscriptionum Latinarum* (CIL. VIII) related to North Africa.

Data collection and management, were also conducted using spatial analyses and Geographical Information System (GIS) that were applied to shed light on the location preferences and settlement strategy of communities for the understanding of past social processes.

II. RESEARCH CONTEXT:

At the beginning of the second century, the Romans entered the foot of the Aures mountains, and this occurred in many phases. Throughout these periods, many changes and additions have taken place in the North African landscape.

There is not enough evidence to tell us about the state of the Aures and its residents during the first century, but it appears that it was the same as long as the expansion of the Roman occupation had not yet attained the slopes of the Aures mountains. All these hypotheses put forward by contemporary historians are likely to be considered insufficient. However, it should be pointed out that too often the lack of precision and confusion complicates the reading of the data: this is the case of the local people who practiced transhumance and who were attributed to either Gaetuli or Musulam tribes. It should also be remembered that these tribes when their customary law was disrupted, the revolt was quickly adopted. This fact reveals not only the attachment of these tribes to their freedom but also to their land (Bouchareb, 2011). The Roman progression took place in a total groping process, ignoring the tribal mentality. In fact, during the reign of Tiberius, the presence of the Legio III Augusta in the region was accompanied by the reduction of the tribes' grazing lands and rangelands. The conflict ended with the redistribution of land on both sides. However, the Romans, probably understood the vital importance of the grazing lands for the transhumant populations and this consecrated relationship to territoriality was also well thought out afterwards.

Consequently, the Romans adopted a strategy based on the framing of this massif by routes marked out by military settlements. Thus, from Theveste, a road was built along the northern foothills to Lambaesis, the final settlement of the Legio III Augusta. They applied the same formula on the southern foothills; from Ad Majores (near Negrine), a road went south from Vescera (Biskra) to Thabudeos (Tobna). During the reign of Hadrian, Gemellae (Kasbat) an important post, was established further south in 126 A.D, extending to Castellum Dimmidi (near Messaad) by the vexillations of Septimius Severus. Completing them with the longitudinal line that connected Thabunae to Lambaesis, these routes circumscribed the massif (Bouchareb, 2011). The valley of Wadi Abiod has not escaped the Roman interest. Probably the most famous of the Roman inscriptions remains the one engraved on a rock at the exit of the Tighanimine gorges, testifying the colossal work carried out by the legio Ferrata IV (CIL VIII 10230) in 145. Historians see it as just a work of development of the passage in the gorge, however it is possible to conclude that these efforts had concerned the layout of an entire route. Moreover, the road continued as far as Vescera and the remains of a fortress have been found at Tkout (Figure 1).

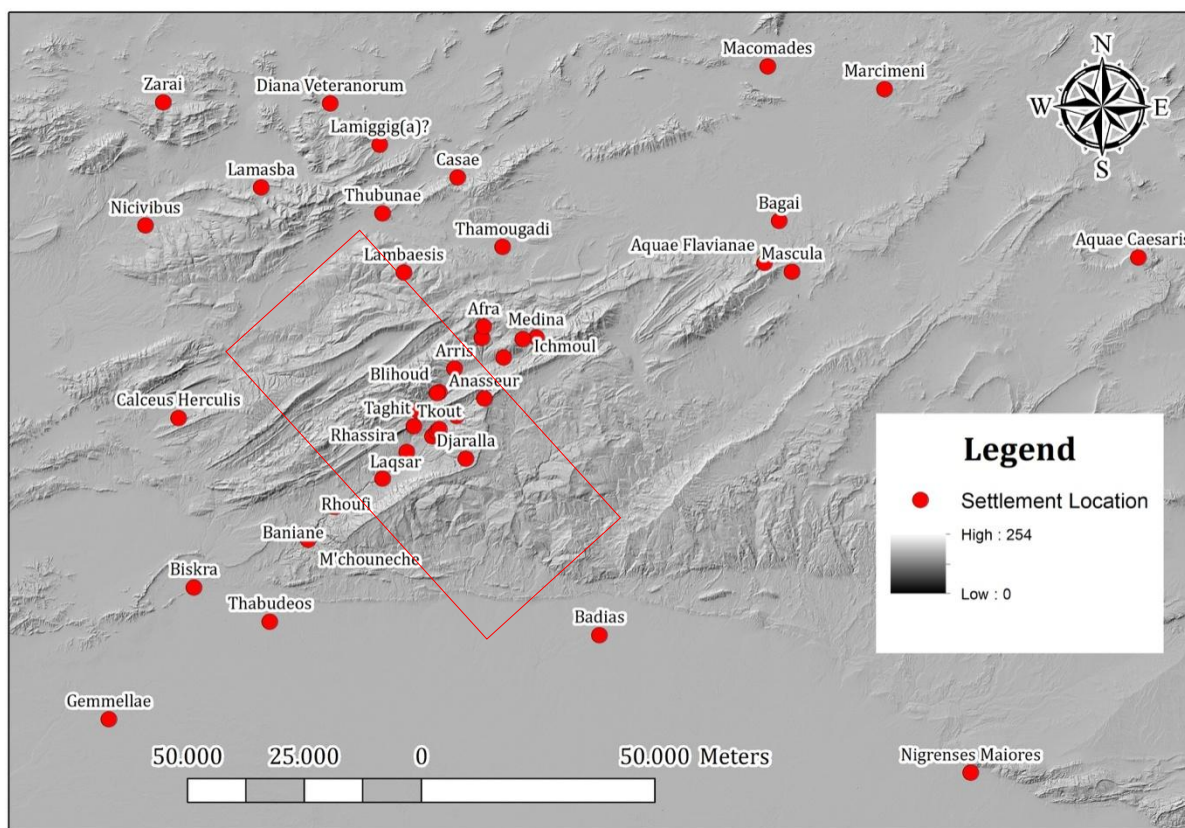


Figure 1. Hillshade of the study area with showing the discovered archaeological finds along the valley of Wadi Abiod inserted within the red rectangle.

III. REGIONAL GEOLOGICAL AND GEOMORPHOLOGICAL CONTEXT

The valley of Wadi Abiod (Figure 2), is inserted between Ahmar khadou and Arhan mountains (Mtns.) in the Aures. This latter is placed at the hinge of two large ensembles that constitute the Algero-Tunisian Atlas Saharan. It is limited to the North by the plain of Timgad, to the East by the Nememcha Mtns., to the South by the Saharan plains, and to the West, the Aures gradually decreases towards the basin of Hodna and its annex the basin of the Outaya.

The Atlas Mountains (Figure 3) are made up by a Meso-Cenozoic sedimentary sequence that, from Trias to Quaternary has went through a series of deformational events (folds and faults) related to tectonic stress which resulted in the development of the mountain range (Bracéne et al., 1998; Askri et al. 1995). This long tectonic history has drawn a geological limit corresponding to a multi-kilometer tectonic accident, marking the end of the North Saharan Pliocene (Marmi&Guireaud, 2006). This flexure gives the entire territory a general south-west / north-east direction serving as a major benchmark (Frizon de Lamothe et al., 1990). It generated the main morphological features (e. g. ridges, saddles, valleys, paths river) and influenced the natural landscape and environment of the area.

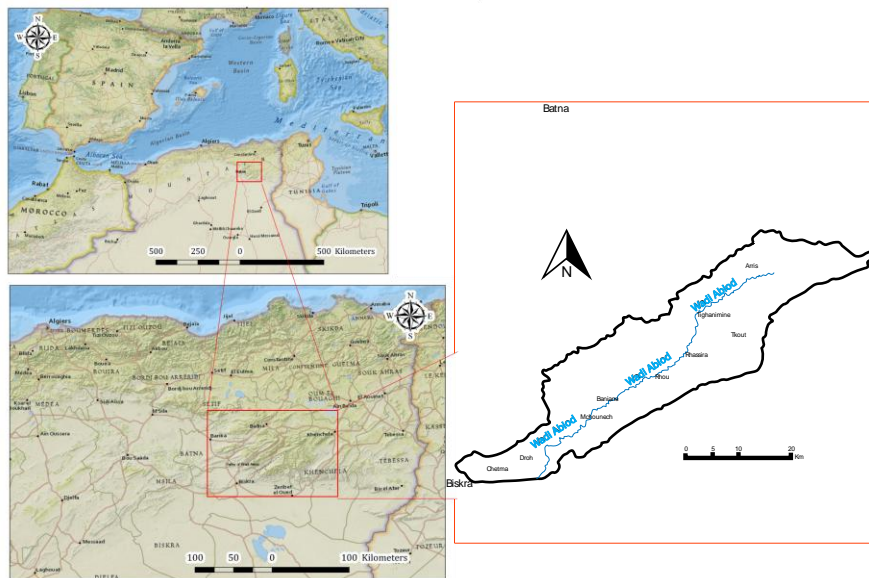


Figure 2. QGIS basemap illustrating the position of the studied area and its delimitation.

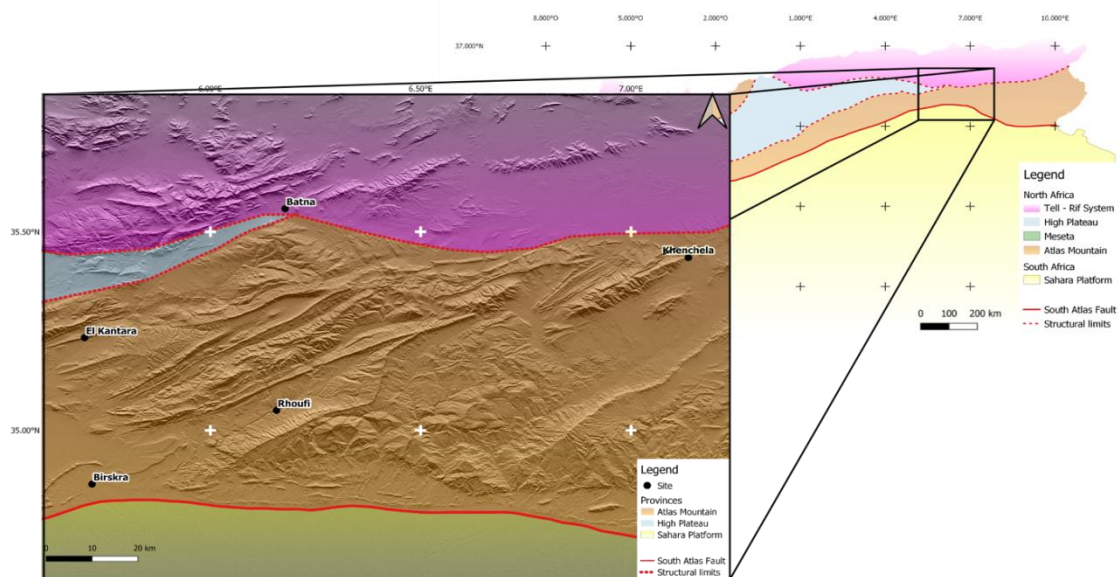


Figure 3. Overview of the position of the Aures in the Saharan Atlas of eastern Algeria.

The valley Wadi Abiodis one of the valleys of this massif, located just north of the southern Atlasic Fault, in the transitional region with the High Plateaus. It belongs to the large hydrological basin of ChottMelghir, and is formed by the union of torrents descending from the steep slopes of the highest point in the Aures of which is Chelia Mtn.

and Ichemoul Mtn.(2100m). After crossing Tighanimine, it crashes in the canyons of Rhoufi and the gorges of Mchouneche, then opens a path towards the Saharan plain to the gorges of Foum el Gherza.

The geological formations consist of detrital deposits of the Lower Cretaceous; argilo-carbonate deposits of the Upper Cretaceous and Jurassic; the Tertiary sediments are predominantly carbonate from the Paleocene to the Middle Eocene, while the Neogene is essentially detrital. Lateral variations in facies are very frequent and concern all levels. While the Plio-Quaternary is characterized by the persistence of Tertiary sedimentation with the development of ablation forms, presence of crusts and the formation of a lacustrine system (Ballais, 1984).

From a hydrological point of view (Figure 4), The Auresconstitutes the water reservoir that alimnts the adjacent plains.The valleys in its southern part are distinguishable by their abundance in periods of rain and a total drought in the rest of the periods of the year,unlike the valleys of the northern partwhich have an abundant

level of water with a long flowing period due to the continuous precipitations. In addition to what was said, the Auras has several springs, found in the form of headwaters flowing between the rocky layers of refractory facades and lower areas of valleys. These sources are characterized by the persistence of waterflow throughout the year.

The hydrographic network in the valley is not very dense, it consists mainly of the Abiod wadi and its tributaries, namely the Medina wadi in the North West and the Chennaoura and Tkout wadi in the North East. The wadi is formed towards the southern foothills of the Ichmoul and Chelia massifs, by the confluence of several streams which flow parallel or perpendicular to the folds; this perpendicular path seems to be due to the numerous transverse accidents which affect the anticlines of the region (Hamel, 2009).

The wadi Abiod becomes permanent with a more consistent flow from the Tighanimine gorges, It flows from North East to South West through Rhassira, Rhoufi, M'chouneche and Droh. After Droh, it enters the periclinal termination of the anticline of Ahmar Khaddou Mtn. which it begins in a deep gorge that opens into the Saharan plain at Foug El Gherza which is its natural outlet (Hamel, 2009).

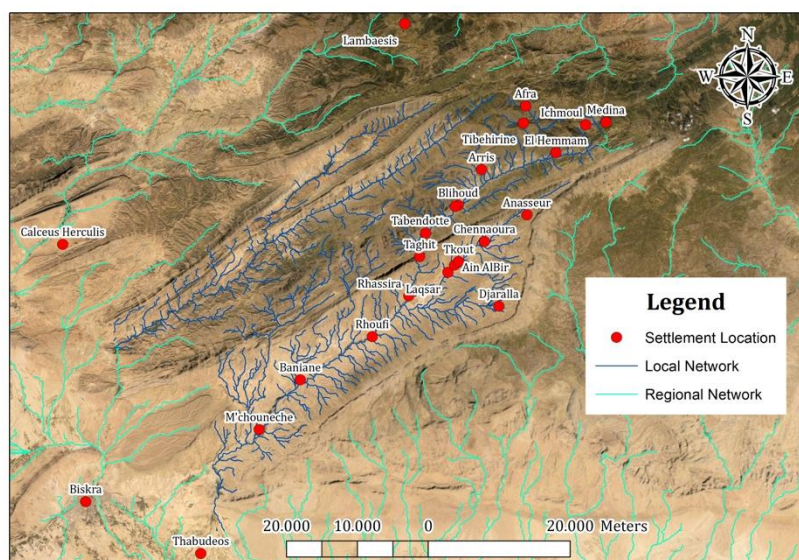


Figure 4. Channel network map with a focus on the regional scale processed with Qgis.

IV. RELIEF, TERRACES AND LANDFORMS OF THE VALLEY

The Aures appears in its general form as a single mountainous mass, as a natural fortress that cannot be penetrated due to its high peaks, the severity of its slopes, and the narrowing of its paths trapped between deep refractive grooves (2) (Figure 4).

The area is characterized by a wide range of altitudes, with the highest point above the 2000 m.a.s.l., and the lowest below the 0 m.a.s.l.: it is possible to divide the valley into seven different parts: the first one "a", is the higher most area, Chelia Mtn which exceeds the 2000 m.a.s.l.; the second sector "b" is a little depression that connects the Chelia to the second higher zone of the area, the third sector "c", is prevalently flat region with an almost constant altitude of about 1700m. The limit to the sector "c" is located at the edge of the flat region and it represents the entrance to the valley, the sector "d", characterized by a constant downslope to SW until the end of AA'. With a focus on the bottom part of the profile, from the sector "d" to the end, we can see some distinctive traits: the sector "e", characterized by a very undulatory segment because of the river meandering in this sector; the sector "f", that represents a high structure related to the Eastern edge of the valley; the sector "g", where the profile is very low and flat because it reaches the Sahara Platform limit (Figure 5) (Younsi et al, 2020).

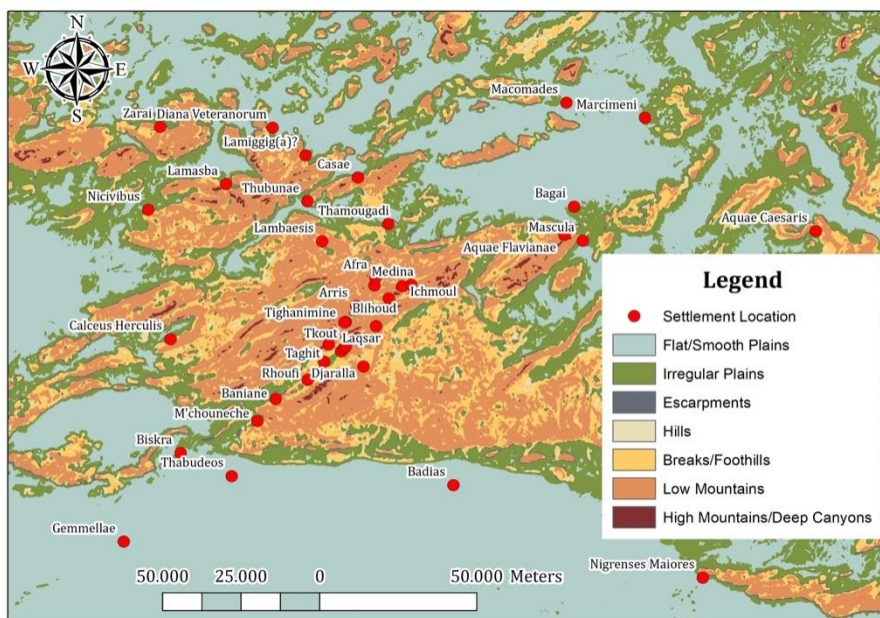


Figure 4. Landforms map processed on QGis, courtesy of the U.S., 2009. Africa Land Surface Forms. Available online: [rmgsc.cr.usgs.gov - /outgoing/ecosystems/AfricaData/](http://rmgsc.cr.usgs.gov/-/outgoing/ecosystems/AfricaData/) (accessed on 12 July 2020)

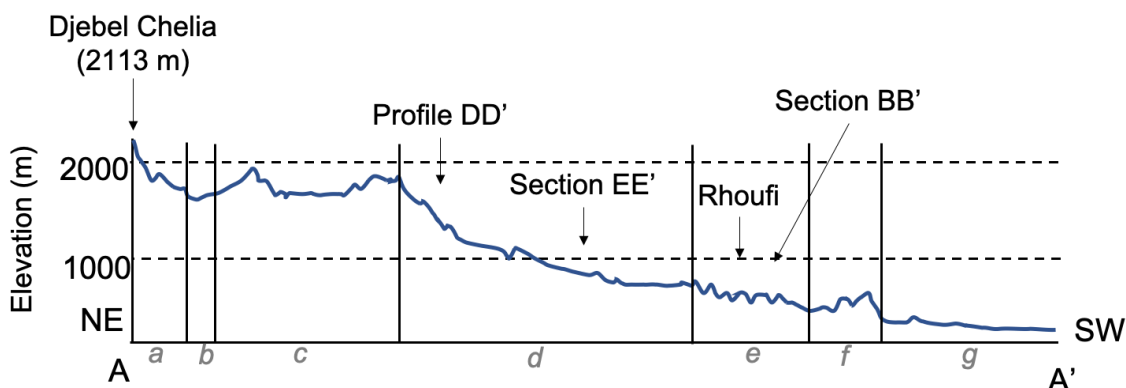


Figure 5. Topographic profile A-A' with a NE-SW trend running parallel to the valley. it's subdivided in seven sectors, form "a" to "g".

The terraces accumulated on the course of a humid phase. During this accumulation, pediments, fans and mudslides are formed. Then, when aridity appears, calcretes, eolian sands and gypsum crusts settle. In the Aures mountains, the Holocene is a period of a complex deposition (Ballais, 1986) characterized by the built up of new eolian accumulations. Compared to the Neolithic, the climate was following a direction of drought, either due to an increase in temperature, since the frost appeared very discrete or to cultivation by transforming the natural vegetation (Ballais, 1991) around 2270 ± B.P.

By the end of the accumulation of the terrace from the Neolithic period, the Roman age of the end of the accumulation can be established based on deposits containing shards of pottery from the sigille class, or come to fill an irrigation canal. In most cases, Roman structures, especially dams, are to be founded in the upper fine deposit and remain suspended above the current bed of the wadis. (Ballais, 1991)

It was Roman colonization which, by developing agriculture and sheep and goat breeding for five centuries, that allowed the destruction of a forest made fragile by the post-Neolithic drying up (Ballais, 1991)

From the lithological point of view, the valley of Wadi Abiod has a lithology consisting of marls, limestones, sandstones and conglomerates from the Lower and Upper Cretaceous (figure 6)

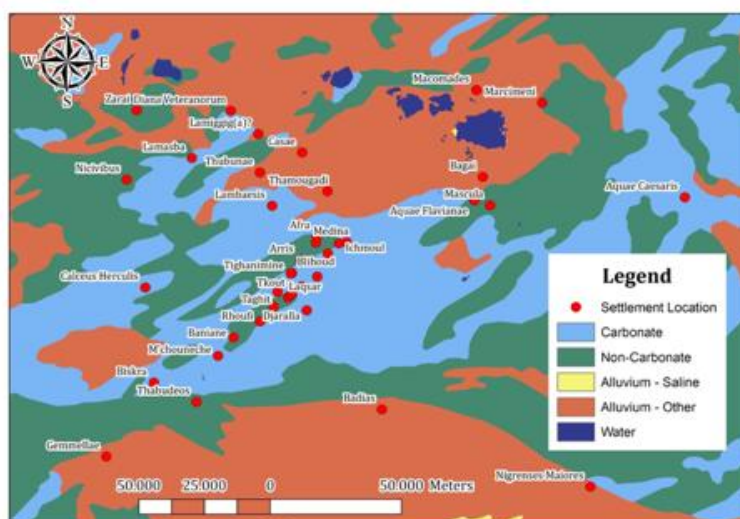


Figure. 6 Landforms map processed on QGis, courtesy of the U.S., The Nature Conservancy, 2009. Africa Surficial Lithology. Available online: rmgsc.cr.usgs.gov/~outgoing/ecosystems/AfricaData/ (accessed on 12 July 2020)

V. ARCHAEOLOGICAL ANALYSIS

During the second to the middle of the third century, mountainous areas and their inhabitants became the focus of Roman exploitative policy (Benabou, 1976) due to the expansion of the population that was in need of new lands especially under the reign of the Severans who paid attention to the rural areas (Bouchareb, 2011). These circumstances made Romans realize the importance of these mountains that offered lands and a human potential (Bouchareb, 2011) and encouraged the inhabitants to settle in and invest in agriculture. Indeed, this can be explained by the large number of agricultural sites at the expense of the military sites.

Regarding ancient roads, archaeological research has not given us sufficient evidence to form a clear idea on this matter except the inscription of the crossing of Tighanimine that stipulates a road's project on that spot and traces of a road at Jaralla (CIL VII.10230). That may be due to their disappearance over time, or that these roads were made following the natural landforms of the region.

However, Baradez (Baradez, 1949) and Morizot (Morizot, 1941) believe that the Romans have followed the pre-existing traditional paths alongside the valley. Besides, this interpretation does not apply to all sites because there are many ancient archaeological sites in high areas such as the sites of Jaralla and Anasseur.

Consequently, if we look closely to the emplacement of the epigraphical inscription that was found in the gorges of Tighanimine, that is situated south the crossing, two probabilities would rise: If the road's project was completed, this would mean that the Roman army started its work from the north, and in the case that it wasn't, this would mean that the project started from the south, and therefore the inscription was made before the completion of the project.

Hypothesizing that the work has started from the southern side would be compatible with the military camps that are spread all along the southern part of the Aures such as the camp established before 126 in Gemellae, thus the necessity of linking these camps in short ways to the northern camps in the Aures, perhaps the first of which was through the Wadi Abiod. This also would mean that they settled in Rhassira and considered the completion of the short road's distance through the crossing of Tighanimine to the northern cities of the Aures. Furthermore, they might have stopped due to the natural difficulties they have encountered, considering the narrowing of the crossing, the depth of the valley and the severity of its slope, and only settled an inscription perpetuating their project without completing it. Consequently, their arrival in the Aures was a precedent for the completion of the road, and they depended in their movements on following other routes that were previously used by the local population.

In Jaralla instead, the road was completed in a form of a solid and continuous gravel streak. This road departs from Lower Jaralla through the middle of the upper site, then proceeds to the east and possibly towards Anasseur, with a width of 2.5 meters. The characteristics of this road is coherent with the theoretical conditions for the completion of the Roman roads according to Salama (Salama, 1951): The Romans are forced to follow routes across heights instead of depressions in areas of insecurity in order to supervise the adjacent

suburbs surrounding the region so that the enemy can't perceive or restrict them. Grenier states also that Roman engineers were always avoiding the slopes, canals of valleys and depressions, and areas with severe inclination (Grenier, 1985). The theory of these two researchers is very consistent with the characteristics of Jaralla's site.

Based on these data, an attempt was made to re-construct this road network along the valley of Wadi Abiod, with the possibility of crossing a Roman path that goes from Jaralla, crossing the site of the Anasseur, Jabal Al-Hara to Medina, then to Tkout, and from it to Rhassira that is connected to the south with M'chounech (Figure 7).

Nevertheless, the presence of archaeological sites means that there are communicating roads in which we find relay points, provided with towers to guard them, and which are established around 60km of distance equivalent to a daily journey of a horse ride.

This interpretation is consistent with Baradez' suggestion, who considers them to be part of the annexes of this road as long as it is next to it. He also mentioned that M'chounech had an ancient tower set up to monitor the human movement that was traveling its way, in addition to the sites of Rhassira, Arris, and Medina that were annexed to a principal Roman road.

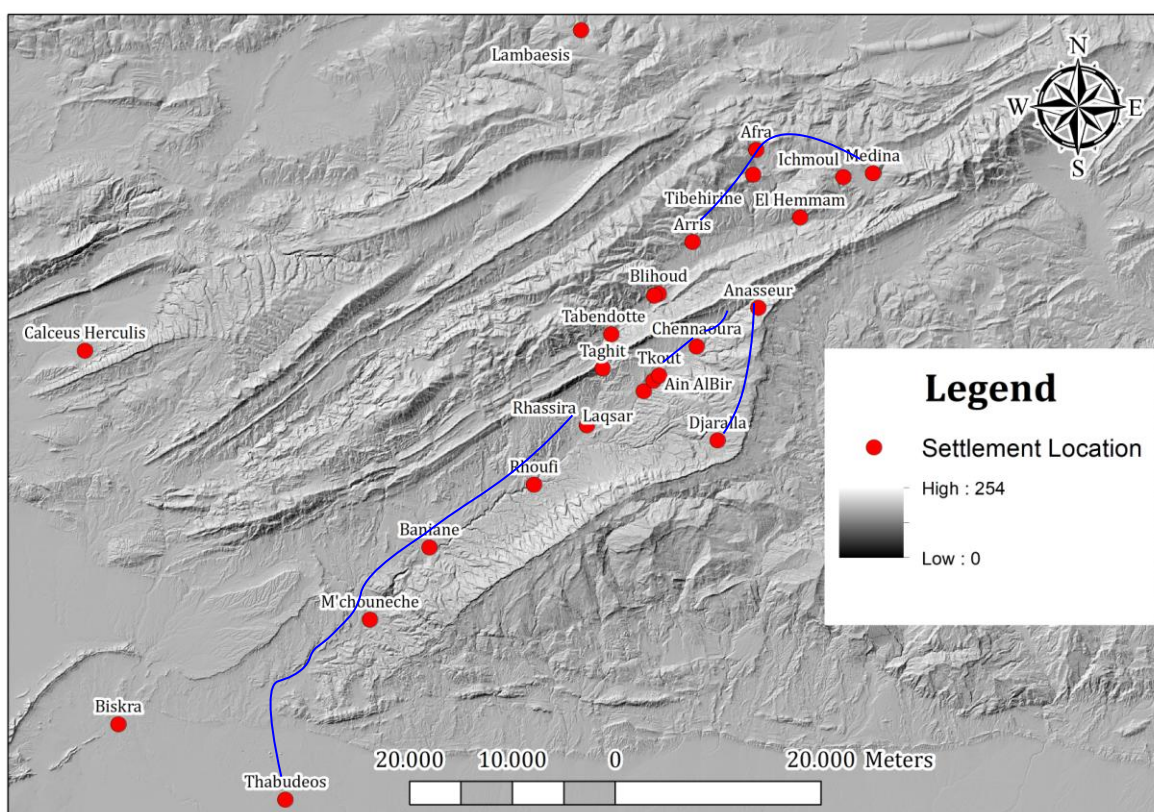


Figure 7. Map illustrating the reconstruction of the Road paths along the valley of Wadi Abiod (in dashed blue lines)

VI. CONCLUSION

Morphologically, the Aurès Massif is made up of a succession, from east to west, of several valleys with a general northeast, southwest orientation. The wadi Abiod is one of the most representative rivers of the Aurès. With a relief characterized by imposing mountains broken by fault systems of different directions, either parallel to the relief axis or transversal, giving rise to an intense hydrographic network. The semi-arid climate in the valleys and subhumid climate on the peaks activate water erosion, despite the presence of vegetation cover.

Understanding the nature of Roman roads is particularly critical for the establishment of colonies because it is a key factor in Roman expansionist and imperialist strategies developing in that period. The Aures remained in the margin of the interest of the Roman occupation, long considered as a poor land. However this didn't last for long as from the second century Rome began its expansion's project in the Aures by military operations that was represented in the construction of roads, from which we count the road Lambaesis-Biskra through EL-Kantara and then another across the course of Wadi Abiod that was provided with military

centers for observation. It is what constitutes the beginning of its entry under the Roman rule. However, the presence of these roads is not sufficient proof to say that the Aures entered under direct Roman colonialism, since they may have been established in order to shorten the distance between the military camps and the Roman cities between the north and the south of the Aures.

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