

GIS AND REMOTE SENSING FOR A PRELIMINARY ASSESSMENT OF THE ARCHAEOLOGICAL LANDSCAPE IN THE EBLAITE CHORA (SYRIA)

1. INTRODUCTION. THE EBLA CHORA PROJECT

Since the beginning of the Italian Archaeological Expedition in Syria (MAIS) in 1964 (DAVICO *et al.* 1965) and the unique discovery of 17,000 clay tablets from the archives of the Royal Palace G in 1975-1976 (MATTHIAE 1978), Tell Mardikh-Ebla stands as a crucial settlement in the history and the archaeology of the Ancient Near East. Most of the texts concerns administrative practices and date to the Early Bronze IVA (Mardikh IIB1, 2400-2300 BC), when Ebla was the capital of a kingdom covering a large area of present day northern Syria. The discoveries from several excavations highlighted the role Ebla had in the large scale trade between Egypt, the Arabian Peninsula, the Mediterranean and even further East with the discovery of raw lapis lazuli imported from Afghanistan.

The Ebla Chora Project (ECP), a 4-year program totally funded by the European Research Council (FP7-IDEAS no. 249394) recently provided the opportunity for a long term archaeological research of the area. The main goal of the project was to understand the functioning mechanism of an early state and the relations of a Bronze Age capital with its surrounding territory. Ebla Chora was conceived as a multidisciplinary project, where the archaeological data were combined with those from philology, geology, botany, agronomy, etc. in an attempt to consolidate and analyze comprehensively the mass of information collected in almost fifty years of archaeological campaigns. Nonetheless, the ECP occurred at the beginning of the Arab Spring in 2011, thus it was impacted by the civil war affecting Syria. Field activities planned over the four years were postponed and attention was diverted to the systematic study of the existent data acquired in previous decades. The outcome of these activities were published in a first volume (MATTHIAE, MARCHETTI 2013). In the present article the attention focuses on the results hitherto achieved in the assessment of the archaeological landscape of the Eblaite chora.

2. AREA OF INVESTIGATION (AOI)

Tell Mardikh-Ebla is a 60 ha site located 55 km SW of Aleppo, about 400 m asl (Fig. 1). The project covers some 3500 km² and it was designed to encompass the different ecological zones which shape this territory, as well as according to the regional archaeological surveys, either finished or still in

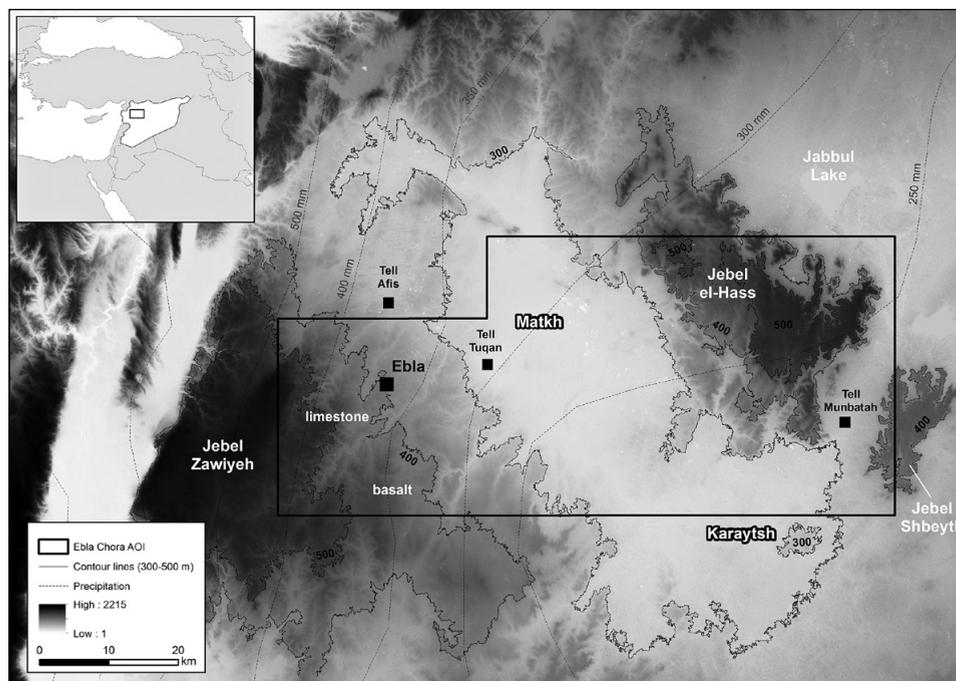


Fig. 1 – The site of Tell Mardikh-Ebla and the main ecological features of the area (on the background the Aster GDEM v. 2 2011).

progress, conducted in Ebla’s environs (MANTELLINI 2013). Ebla lies between two seasonal watercourses (*widyān*) on the NE slope of the Jebel Zawiyeih (here 500 m asl), in a gently sloping plain characterized by white limestone formations at N and black basalt outcrops at S. Almost in the middle of the AOI is the Matkh (200-250 m asl), a flat marshland draining the perennial waters of the Nahr el-Quweyq from N and the numerous *widyān* from the Jebel Zawiyeih at W and the Jebel el-Hass at E. The fertile gray-brown soil makes the Matkh the most cultivated area around Ebla. The major settlement is Tell Tuqan (26 ha), located on the SW shore of the depression and the object of a specific investigation since 1978 (for an up-to-date overview on the exploration at Tell Tuqan see BAFFI, FIORENTINO, PEYRONEL 2015).

The eastern part of the AOI is characterized by the reliefs of the Jebel el-Hass (ca 630 m asl) and the Jebel Shbeyth (ca 460 m asl). Between the two ranges, the Khanaser corridor approaches the Jabbul Lake. Noteworthy, this corridor has no significant archaeological sites except for Tell Munbatah, a roughly circular tell of ca 6 ha. The so called “arid margins” begin at S. This is a vast steppe historically considered as a contact point between the

sedentary farmers and the nomadic herdsmen of the Syrian desert (GEYER *et al.* 2007, 270). SW of the Jebel el-Hass the steppe is partially interrupted by the Karaitsh, a number of seasonal lakes that fill with water in winter and dry up in summer leaving a salty crust. The territory of Ebla falls into the hot semiarid Mediterranean steppe (ARNOLDUS-HUYZENDVELD 2013, 326), with a strong negative gradient of precipitation from the Mediterranean to the E (CANTELLI, PICOTTI, MARTINA 2013, 316). The economy is based on agriculture, both rain-fed in the foothill and irrigated in the plain, and breeding, especially sheep. The most common crops are cereals and legumes, whereas horticulture is practiced in small plots near villages. The typical reddish brown soil around Tell Mardikh is exploited for growing pistachios, olives and fruit trees (ROSSI, VENTURA, VIGNUDELLI 2013). The main water supply is ensured by underground water (DE MAIGRET 1984, 330-332). Wells and cisterns were discovered in close connection to the settlements of any period. The digging of a well was so important that the king of Ebla was apprised, as mentioned in some tablets, and a textile was offered to the messenger delivering the news (BIGA 2003, 183).

3. ARCHAEOLOGICAL LANDSCAPE IN THE EBLAITE CHORA

Two main features characterize the archaeological landscape around Ebla: artificial mounds (tells) and ruins. The tells are usually connected to the Chalcolithic and Bronze Age settlements and they are considered as the most typical feature of the Near Eastern archaeological landscape (WILKINSON 2003, 100-127). They are multilayered sites built with mud bricks, often combined with squared stones, and they have either a conical shape or a truncated cone shape with a flat top and sloping sides.

The second feature are the ruins of Hellenistic, Roman, and Byzantine settlements whose state of preservation differ from case to case. Some are well preserved, and their layout is visible on the ground, while others are buried and their existence inferred by scattered architectural fragments. A third feature, extremely difficult to recognize from archaeological remains, are traces belonging to pastoral communities engaged in sheep breeding. In this context, the only structure apparently connected to the nomadic and semi-nomadic lifestyle is the kite. Kites are stone enclosures of different shapes and size that are considered to have been used as corral to trap wild animals, especially gazelles (BRAEMER, ECHALLIER 1995; WILKINSON 2003, 175-176).

4. METHOD

The approach used for the archaeological assessment within the ECP was based on both the recovery of data from previous surveys as well as

the desktop detection of new sites by means of remote sensing techniques (GALIATSATOS, MANTELLINI 2013; MANTELLINI, MICALÈ, PEYRONEL 2013, 176-181; BITELLI *et al.* 2014). Such an approach was already employed successfully for those regions of Syria and the Near East where field accessibility was problematic, if not impossible. Thus, this remote sites identification, conceived as a preliminary task to be later validated in the field, became final since field activities were suspended.

Considering that the ECP is based on a multidisciplinary approach and that the data from different sources must be shared among the various teams, the GIS plays a crucial role in data management and analysis. A webgis was therefore also developed (<http://www.eblachora.eu/>). The spatial datasets employed within the ECP comprise many sources differing in scale and period of acquisition. The datasets described below represent only those strictly pertaining to the Ebla territory and those used in the preliminary assessment of the Bronze Age settlement pattern (see further on method and datasets in MANTELLINI, MICALÈ, PEYRONEL 2013).

4.1 Previous surveys

In 1964, at the very beginning of the MAIS, two surveys were planned around Tell Mardikh. M. Liverani explored eleven Pre-Classical tells, whose pottery related to the occupation of the Early Bronze IV-Middle Bronze I (LIVERANI 1965). In the same year, S. Pericoli Ridolfini recorded the ruins of twenty-six Classical settlements of Roman and Early Islamic periods (PERICOLI RIDOLFINI 1965). In the early 1970s the systematic survey conducted by A. de Maigret around the Matkh resulted in fifty-four Pre-Classical sites (DE MAIGRET 1978). Later on, some sites pertaining to the Eblaite territory were also included in the Tell Afis survey (CIAFARDONI 1992; MAZZONI 2005).

4.2 Topographical maps

In the first desktop assessment topographical maps were used for a double task. First, they served as a basis to locate the sites already recognized during the previous surveys. Second, the toponyms reported on these maps allowed locating other sites that would have required a subsequent validation with both satellite images and field visits. The maps more used within the ECP belong to the French and the Soviet series. The former were used by Pericoli Ridolfini and de Maigret in their explorations.

The French maps were drawn during the French mandate in Syria (1923-1946). The 1:50,000 series was very useful for archaeological purposes because of the high detail in reporting both Bronze Age tells and stone ruins (*kbirbet*, *r.nes*) of Classical cities and villages. The Soviet maps also proved to be an excellent tool to reconstruct the landscape transformation in many

regions of the Middle East and Central Asia. Realized at different scales, they are extremely remarkable for their precision and mapping of archaeological sites (RONDELLI, STRIDE, GARCÍA-GRANERO 2013; MANTELLINI 2014, 40-41). The 1:100,000 scale maps (1980s) were used in both site detection and during a preliminary survey carried out within the AOI in September 2010.

4.3 Satellite imagery and aerial photos

The medium resolution Landsat Thematic Mapper images (1991) were used for a general picture of environmental and ecological aspects. Two high-resolution satellite images were purchased specifically for the ECP. The first is a panchromatic stereo-pair of Cartosat-1 (September 2009) that covers an area of 27,5×27,5 km with a resolution of 2,5 m. The second is a WorldView-2 (August 2011) with a resolution of 0,5 m in panchromatic and 1,84 in multispectral. The latter was mainly employed in the classification of physical and cultural features, such vegetative analyses, in a small area (317 km²) between Tell Mardikh and Tell Tuqan (BITELLI, MANDANICI, VITTUARI 2013).

The most important results in the archaeological assessment around Ebla were achieved by combining the historical CORONA photographs with up-to-date Google Earth images. The former are the well-known pictures taken by the US spy satellites during the Cold War and declassified in 1995. CORONA panchromatic photographs were particularly useful in the detection of tells and many other features related to anthropic activities (off-sites, canals, roads, etc.), and more generally in mapping the landscape transformations over the last fifty years. Despite the issues connected to their rectification process, the low cost and the medium-high resolution supported a large use of the CORONA photos in many regional-scale archaeological projects in the Near East and Mesopotamia (PHILIP *et al.* 2002; BECK *et al.* 2005; CASANA, COTHREN 2013; UR 2013). The images from Google Earth also represent a fundamental tool in modern archaeological research. They can be used to plan field activities and, as in the case of Ebla, the high resolution available allowed validation of some doubtful features previously detected on the CORONA photographs (MANTELLINI, MICALE, PEYRONEL 2013, 168). A small part of the AOI (ca 600 km²) between Tell Mardikh and Tell Tuqan was also covered by aerial photos. The shots were acquired on 1st October 1967 by the Syrian Air Force and later they probably served as a basis for the Syrian topographical maps series.

4.4 Digital Elevation Models (DEMs)

Two digital elevation models were employed within the ECP. The first was the Japan-US Aster GDEM v.2 (30 m resolution). A second, more detailed,

DEM was created from the recently declassified HEXAGON imagery (July 1975). Given the impossibility to acquire safe GCPs on the field, GCPs from 1:50,000 scale French maps and 1:100,000 scale Russian maps were used to process the images. The result was a 10 m resolution DEM.

5. SITES DETECTION AND ARCHAEOLOGICAL ASSESSMENT

Considering the approach employed, and the prospect of future field validations, the sites hitherto included within the inventory belong to two categories: Known and Potential sites (MANTELLINI, MICALE, PEYRONEL 2013, 176) (Fig. 2). The former were those available from previous surveys and combined spatial datasets. The Known sites were eighty-five and they included sixty-four Pre-Classical tells and twenty-one ruins of Classical settlements. The Potential sites referred to those anthropogenic features detected on maps and satellite images that necessarily required a further field inspection. They are seventy, classified in five major categories: tells, ruins, off-sites, canals, and kites. The detection of potential sites, especially those that are not tells, was usually associated with the interpretation of CORONA photographs, without toponyms correspondence on maps (GALIATSATOS, MANTELLINI 2013). Instead those toponyms on maps, which are usually correlated with anthropic features on satellite images and aerial photos, were considered as potential tells.

The first chronological assessment was largely based on the periodization proposed by DE MAIGRET (1978). After many campaigns at Tell Mardikh-Ebla and other key sites of northern Syria, one of the major task of the ECP was to review these chronologies on the basis of the updated ceramic seriation. The sherds are many and they demand extensive work and revisiting typological comparisons. This task is presently in progress. Meantime, however, it is possible to have preliminary considerations on the development of the settlement pattern in the Eblaite chora, with special attention to the Early Bronze Age (EBA) and principally based on the Known sites (MANTELLINI, MICALE, PEYRONEL 2013, 176-181).

The first observation concerns the distribution of sites (Tab. 1). The Chalcolithic-Bronze Age tells are spread over the whole AOI, especially around the Matkh and in the foothill of the Jebel Zawiyeh. The ruins of Classical settlements are mainly located on the latter, while the steppe and the eastern ranges are less intensively settled. The early occupation dates to the EB I-III (3000-2500 BC), or even to the Late Chalcolithic, with ten sites exploiting the potential for agriculture and the availability of water offered by the Matkh. The sites located around the shore line of the lake are without any clustering or hierarchy (DE MAIGRET 1978, 86-87; PEYRONEL 2015, 109-111). Although it is almost impossible to ascertain the size of each site in different periods without any stratigraphical control, except for Tell Tuqan, the EB I-III sites

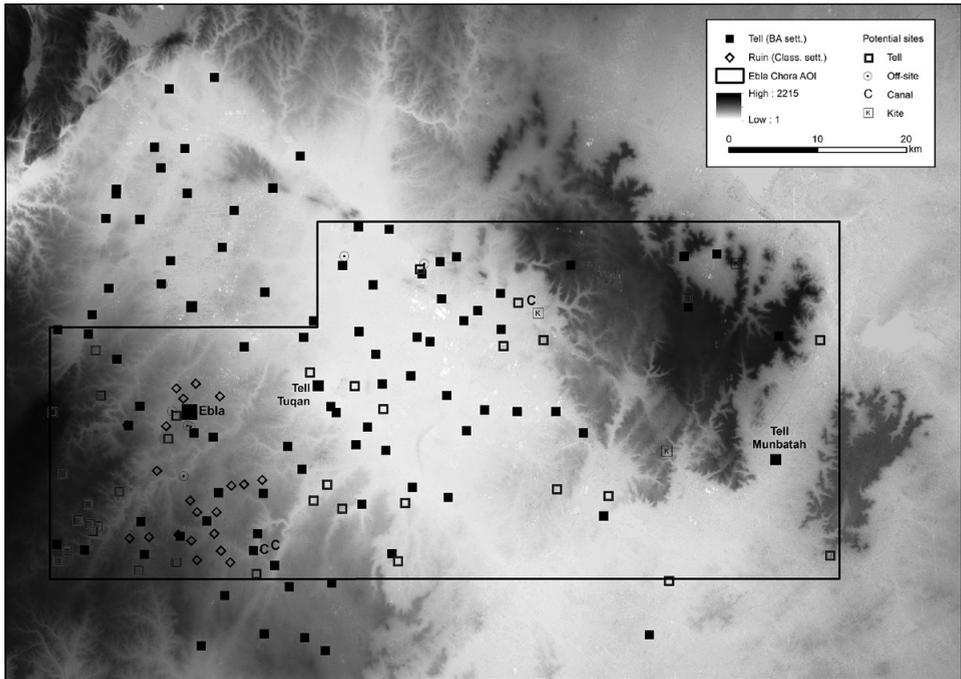


Fig. 2 – Archaeological assessment in the Eblaite chora, including the ruins of the Classical periods and potential sites (on the background the Aster GDEM v.2 2011).

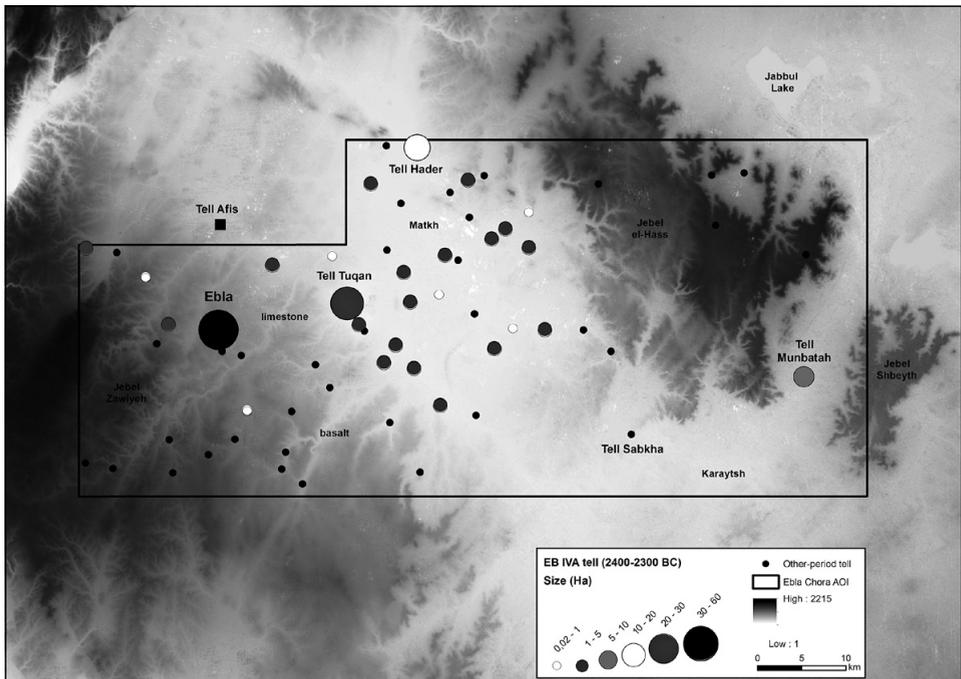


Fig. 3 – Classification of the EB IVA sites (2400-2300 BC) according to the size (on the background the Aster GDEM v.2 2011).

Area	EB I-III	EB IVA	EB IVB	MBA	LBA
Limestone	2	5	7	8	2
Basalt	-	1	2	7	-
Matkh	10	18	12	18	6
Steppe	-	4	3	3	-
Total	12	28	24	36	8

Tab. 1 – Classification of the sites in the Eblaite chora according to EB A periods and ecological zonation.

are small in size (0,3-4 ha). The number of sites increases sensibly in the following EB IVA (2500-2300 BC), during the Mature Early Syrian period at the time of the Eblaite kingdom apogee (2400-2300 BC). The sites recorded are twenty-eight, with a remarkable expansion around the Matkh and the occupation of both the western and the eastern foothills (Fig. 3).

It is arguable that Ebla and other settlements on the foothills developed because of the water supplied by cisterns and wells. Alongside the agriculture around the Matkh, the frequent mention of textiles in the tablets suggests that sheep breeding and wool processing also played an important role in Ebla's economy. The lack of large irrigation schemes, from either historical sources nor from the archaeological record suggests that, even then, agriculture was rain-fed (FIORENTINO *et al.* 2012). Potential canals have been detected only in two cases, and they possibly relate to small scale and village irrigation (GALIATSATOS, MANTELLINI 2013, 307). The occupation decreases to twenty-four sites in the following EB IVB period, when some settlements were abandoned. It occurred around the Matkh as well as along the foothills and the plain, whereas few “marginal” sites had no interruption. The steppe was certainly still exploited for sheep breeding, however the presence of fortified settlements like Tell Munbatah and Tell Sabkha could be explained by the need to prevent incursions from the E and S (DE MAIGRET 1978, 90).

During the Middle Bronze Age (2000-1600 BC) the sherds, especially those collected on the sites around the Matkh, indicate a new expansion. The thirty-six settlements recorded show a more complex articulation, and larger sized single sites (PEYRONEL 2015, 117). At the same time, the settlements in the arid margins were apparently abandoned and the territory was controlled by semi-nomadic tribes (PEYRONEL 2015, 118). Finally, a remarkable decrease of settlements characterizes the whole region during the Late Bronze. The sites are only eight and, again, they are located around the Matkh and on the foot hill of the Jebel Zawiyeh (DE MAIGRET 1978, 91).

6. CONCLUSION

Although was impossible to access the field, the updated information from Ebla and its surroundings allowed a first archaeological assessment. The early

occupation was ensured by the fertile soil and the water of the Matkh. Later, the settlements on the foothills developed due to underground wells and cisterns. The economy was principally based on sheep breeding and wool production combined with dry-farming (DE MAIGRET 1981, 30-31), however it is likely that some small-scale irrigation was practiced locally. Presently it is extremely difficult to establish the limits of the chora of Ebla only on the basis of textual information (BIGA 2013, 260-261). The possibility offered by the re-examination of de Maigret's ceramics will allow a new chronology for the sites he visited. Many other sites and anthropogenic features, including the potential ones, have been detected by using remote sensing techniques. However future field visits and ground controls are fundamental tasks for a better definition of the Eblaite chora.

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ABSTRACT

The paper focuses on the preliminary assessment of the archaeological landscape around Tell Mardikh-Ebla (Syria). The ERC funded Ebla Chora Project allowed to conduct a systematic collection of findings from the site and its surrounding neighbors. The information from previous surveys was combined with the data from spatial datasets (topographical maps, aerial photos, satellite images, DEMs) in order to provide a first inventory of sites of the Eblaite chora. A preliminary interpretation of the development of settlement pattern and territory exploitation is now possible, especially for the Early Bronze Age (3rd millennium BC) when Ebla was the capital of a vast kingdom. Many potential sites were also detected, however their validation requires a field inspection which is currently suspended because of the civil war.

