Extrapolating Ebla: Combining Remote Sensing, Survey and Textual Sources to Define an Early State

Dan Lawrence and Sébastien Rey

Introduction

The methodological revolution brought about by the systematic use of high resolution satellite imagery in Near Eastern archaeology, to which the work of Tony Wilkinson represents an unparalleled contribution, can perhaps be divided into two stages. Initially, difficulties associated with the rectification of CORONA spy photography and the prohibitive costs of high resolution modern imagery when it became available in the early 2000s restricted the spatial extent of the areas investigated. Various archaeological projects made use of both types of imagery with significant success (Kennedy 1998; Lonnqvist *et al.* 2011; Philip *et al.* 2002; Ur and Wilkinson 2008), but the actual areas covered tended to be fairly contiguous with the designated survey areas, meaning the imagery was used principally for prospection for archaeological sites and features which were to be visited in the field. The production of larger datasets was very labour intensive and generally only undertaken in institutions with large numbers of people working on similar problems, such as at the CAMEL lab in Chicago. More recently, however, increases in computer power, the development of automated or semi-automated techniques for CORONA rectification (Casana and Cothren 2008; Galiatsatos 2009) and the emergence of software platforms offering near global coverage of high resolution modern imagery such as Google Earth, have allowed for a second leap in the scale of analysis. Projects such as the *Fragile Crescent Project*, directed by Tony at Durham, the *CORONA Atlas of the Middle East* based at the University of Arkansas and the *PaleoSyr* Project based in Lyon have used these new datasets to manually map sites and features over vast swathes of the Middle East, transcending physical and geographical boundaries, environmental zones and national borders. Others have used sophisticated algorithms and combinations of satellite imagery and Digital Elevation Models (DEMs) to automatically detect locations of archaeological significance (Hritz and Wilkinson 2005; Menze *et al.* 2006; Menze and Ur 2012; although see Casana 2014 for some criticisms of these approaches in a Near Eastern context). Projects such as *ANE Placemarks for Google Earth* based at Uppsala University even make use of a form of crowdsourcing for site location. This expansion in coverage has in turn led to the construction of very large and highly complex datasets, often encompassing many thousands of sites and features identified and investigated in a variety of different ways. Intuitively, these datasets seem to represent a major step forward and yet their size and scale present significant and specific challenges which we have only recently begun to address. In order to unlock their full potential, careful consideration must be given to issues of data comparability, while the vast amount of information available requires new methods and forms of interpretation (Lawrence 2012). This paper demonstrates an approach for extracting meaning from such large datasets using site morphology as a framework and drawing in interpretations from survey and excavation data and ancient textual sources.

Site morphology and extrapolation

One of the most significant interpretive issues in understanding large-scale datasets, and in fact in archaeology in general (Plog 1974; Spaulding 1960), is how we deal with and consider time. It is almost a truism to describe archaeological landscapes as palimpsests, and yet the presence of sites and features which were not occupied simultaneously in the visible archaeological record, and therefore on the satellite imagery, is perhaps the greatest barrier to reconstructing how landscapes appeared at any given moment in the past. When locations visible on imagery can be visited on the ground this problem can be mitigated, although not entirely solved (Ammerman 1981; Bevan *et al.* 2013), by conventional survey techniques and excavation. However, the scale of landscape features often makes the latter impractical and expensive. The most common approach taken in Near Eastern survey uses the spatial association between sites, features and type fossils, aspects of material culture which have been more or less securely dated through stratigraphic excavation and radiometric dating techniques to particular periods, to assign periods. The presence of such artifacts (ceramics and lithics are the most common) at a particular location are taken to indicate an association with a particular period. In this way the overall dataset can be broken down into discrete groups of locations, or sites, based on the presence or absence of chronologically sensitive types. However, the sheer size of the datasets which we can now produce preclude complete ground-checking, notwithstanding problems of survey permissions and other issues of access, and since the sorts of material culture necessary to make temporal distinctions are rarely visible in satellite imagery, we cannot use this method to distinguish between different periods. The alternative proposed here is to scale up the process and treat archaeological sites as objects in themselves, with specific morphologies, visible on the imagery, which can themselves be chronologically sensitive. Using sites which have been securely dated through archaeological survey and excavation as type fossils, we can extrapolate to those which have not received the same level of investigation. Such an approach has been adopted in the Near East in an implicit and piecemeal way to examine highly specific and relatively isolated site types such as Sasanian fortresses (Sauer, this volume), *kranzhugel* settlements (Smith, this volume; Smith *et al.* 2014), Citadel Cities (Lawrence and Wilkinson 2015; Wilkinson *et al.* 2012), so called Irregular Clustered Structures (Philip and Bradbury 2010), and particular Mesopotamian urban defensive layouts (Rey 2015). However, this approach has not been systematically applied to a large dataset.

In order to use a specific morphology as a chronological indicator, we need to know two things; how strongly is the morphology associated with a particular period, and how much of the total settlement pattern is represented by that morphology. The first measure tells us how likely any given site which has not been visited on the ground is to date to any given period, while the second measure tells us what proportion of the total settlement system will be captured by mapping all such sites. This latter is of some importance if we want to investigate phenomena such as route networks or agricultural catchments, where the presence or absence of specific nodes is crucial to the overall pattern. We call the first measure the Occupation Likelihood (OL) and the second the Inclusivity Likelihood (IL). We can calculate the OL and IL for different kinds of sites within areas which have been subjected to archaeological survey and then extrapolate to the surrounding landscape, using the OL and IL as measures of the degree of confidence we have in the inferred settlement patterns. In the following example, we use data from the *Land of Carchemish Project*, a survey conducted in Northern Syria from 2006–2011 under the directorship of Tony Wilkinson (for overviews see Wilkinson *et al.* 2007; Lawrence and Ricci 2016).

High conical tells in the land of carchemish project

The morphology used in this example is the high conical tell. Whilst landscapes of mounded tell sites are ubiquitous across the Near East (Wilkinson 2003), the shape and size of these sites display a degree of variability. High conical tells (HCTs) are a particular class within this range which exhibit the following characteristics:

1. Prominent mounding, rising to at least five metres above the surrounding ground surface
2. Small size, generally between one and three hectares
3. Circular or sub-circular perimeter of mounded area
4. Steep sloping sides with a small flatter area at the summit

In the field this settlement type is fairly easy to distinguish (Figure 12.1) but importantly the height and steep sides also result in a distinctive signature on satellite imagery. This takes the form of a circular or sub-circular area with a lighter half, usually facing southwards, caused by the reflection of the sun's rays, and a darker half, usually to the north, caused by the shadow cast by the mound itself (Figure 12.2). The *Land of Carchemish Project* survey area included 16 examples of HCTs, representing a significant proportion of the overall settlement pattern (see Lawrence and Ricci, in press). Table 12.1 gives the OL and IL values for all of the phases used in the survey.

The phase with the highest OL value is the Middle Early Bronze Age, when 14 of the 16 high conical tells were occupied, meaning a HCT in close proximity to the survey area can be considered to have a probability of 0.88 of dating to this phase. The IL for this phase is 0.70, suggesting that mapping all such tells in the region would likely capture 70% of the total settlement pattern. Interestingly, the next highest figure for the OL dates to the Late Roman-Byzantine Period when 11 of the 16 HCTs were occupied. However, the expansion of settlement during the Classical Period resulted in many more sites away from tells (Figure 12.3). Thus although any given HCT has a relatively high chance of being settled in the Late Roman-Byzantine phase (probability of 0.69), the map of all such tells would only capture a small proportion of the settlement landscape (probability of 0.23, so 23%). The Ubaid Period presents a different problem; although all Ubaid settlements were on HCTs, giving an IL of 1.0 and suggesting that the map of HCTs would capture all Ubaid sites, the OL is relatively low (0.31), so less than a third of the tells were likely to have been occupied, rendering any such map less useful. In order to extrapolate from surveyed areas with confidence we would ideally want high probabilities for both the OL and IL.

High conical tells across the northern fertile crescent

Given their distinctive signature, it is possible to manually map HCTs across the entire study area (Figure 12.4) from CORONA imagery and high-resolution sources, resulting in a dataset of 798 sites. This is most probably an underestimation of the total number of HCTs since some may be less visible in certain physical

Figure 12.1 High Conical Tells (HCTs) in the field, Land of Carchemish Project, Syria. Top to bottom: LCP site 59, LCP site 47, LCP site 55, LCP site 60. Photographs by Andrea Ricci

Table 12.1. Occupation Likelihood and Inclusivity Likelihood values for all phases within the Land of Carchemish Project.

Phase	Occupation Likelihood (Number of HCTs Occupied/ Total Number of HCTs)	Rank OL	Inclusivity Likelihood (Number of HCTs Occupied/ Total Occupations)	Rank IL
Halaf	5/16 = 0.31	=7	5/7 = 0.71	=3
Ubaid	5/16 = 0.31	=7	5/5 = 1.00	1
Late Chalcolithic	7/16 = 0.43	5	7/13 = 0.54	8
Uruk	9/16 = 0.56	4	9/13 = 0.69	6
Early Early Bronze Age	10/16 = 0.63	3	10/14 = 0.71	=3
Middle Early Bronze Age	14/16 = 0.88	1	14/20 = 0.70	4
Late Early Bronze Age	10/16 = 0.63	3	10/15 = 0.67	5
Middle Bronze Age	6/16 = 0.38	=6	6/10 = 0.60	7
Late Bronze Age	9/16 = 0.56	4	9/10 = 0.90	2
Iron Age	5/16 = 0.31	7	5/29 = 0.17	11
Hellenistic-Early Roman	3/16 = 0.19	8	3/30 = 0.10	12
Late Roman-Byzantine	11/16 = 0.69	2	11/48 = 0.23	10
Islamic	6/16 = 0.38	=6	6/22 = 0.27	9

and environmental conditions (especially upland landscapes) and due to the variability in imagery types available. We were also relatively conservative in attributing HCT status, meaning we can be fairly certain that all of these locations are HCTs. There are clear patterns visible in the distribution, with clusters along the major rivers and in lowland basins and an absence of HCTs in the steppe lands to the south and in the gaps between the river systems, particularly between the Balikh and the Khabur. Using the method outlined above across multiple archaeological surveys we can further refine this spatially extensive dataset. Since the method relies on site numbers and types, a certain degree of homogeneity in field methods and chronological attribution within each survey is necessary to ensure comparability of results. We have used nine surveys brought together within the *Fragile Crescent Project* database which are demonstrably comparable in both regards (Lawrence 2012) and which provide a reasonable geographic coverage of the study region (Figure 12.5). Table 12.2 gives the OL and IL values for each survey for the phase with the highest OL value, i.e. when we can be most sure that a site immediately outside the area is relevant.

The phases used in the above table differ because of the level of refinement possible from survey collections in each survey. In western Syria, represented here by the AVRP and SHR surveys, the absence of well-dated and well-published excavated sequences mean the Early Bronze Age cannot be subdivided, while in the Jazira region, including the NJP, TBS and THS surveys, the same period is split into the early 3rd millennium and the late 3rd millennium. In the Middle Euphrates region, including the KHS, LCP, TSS and TS, numerous excavations carried out in advance of large dam projects allow for a tripartite division, with subtle differences between local sequences changing the exact dates that each phase can be attributed to. Despite this variety of chronological schema, it is clear that the highest proportion of HCTs across the region were occupied during the second-half of the Early Bronze Age, and particularly the period between 2500 and 2300 BC.

It is also clear that the OL and IL values vary quite significantly between surveys. These variations demonstrate the importance of spatial location in extrapolating from known surveyed sites to sites without ground checking, and this has profound implications for larger datasets. Returning to the regional HCTs dataset, we can model the likelihood of occupation during the Early Bronze Age by interpolating from the values given in Table 12.2 for all of the locations between surveys. This is accomplished using a GIS to produce a raster layer of interpolated OL values derived from the relative position of each of the surveys and then assigning the resulting values to the HCTs between the surveys based on their location to produce a regional map of OL (Figure 12.6). Empirically it was found that the regularised spline interpolation available in the *Spatial Analyst* toolbox of ESRI's ArcGIS produced the smoothest raster while retaining small-scale variability within the dataset (see Connolly and Lake 2006).[1]

[1] Alternative interpolation techniques and weighted models,

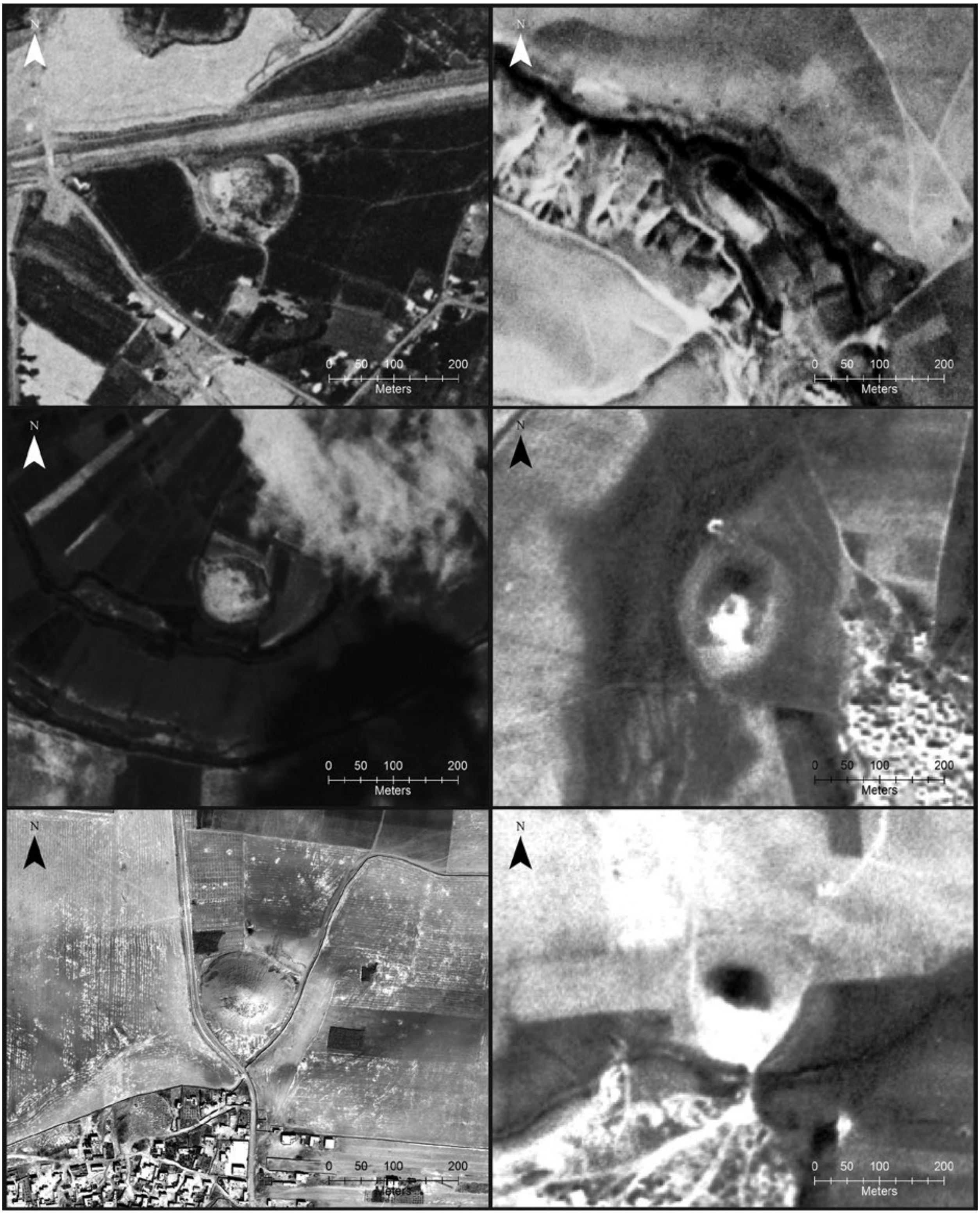

Figure 12.2 High Conical Tells (HCTs) on satellite imagery. Clockwise from top left: AVRP site 11, Corona Mission 1107 acquired 25th July 1969; TS site 30, Corona Mission 1038 acquired 22nd January 1967; LCP site 55, Corona Mission 1038 acquired 22nd January 1967; LCP site 60, Corona Mission 1038 acquired 22nd January 1967; LCP site 60, GeoEye-1 Panchromatic Image acquired 22nd September 2009; SHR site 88, Corona Mission 1110 acquired 28th May 1970.

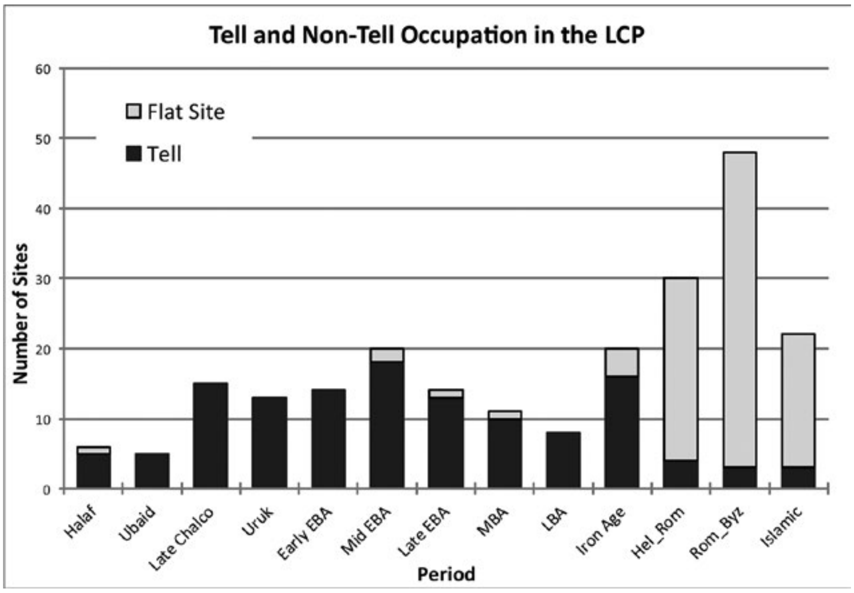

Figure 12.3 Site counts for the Land of Carchemish Project by period divided between tell and non-tell occupations

The archaeological and historical context of hcts

The map of settlement likelihood produced through the extrapolation method outlined above is itself a useful step forward, but our interpretation can be extended by bringing in archaeological and textual data.

Unfortunately, relatively few HCTs have been extensively excavated across the Near East, while the long-term occupation sequences at many of these sites make excavation a slow and complex process. However, there is a growing body of evidence which links the HCT morphology with the presence of ramparts or enclosing walls. This relationship has been articulated by Eddie Peltenburg in his discussions of the Middle Euphrates Valley, where rescue projects have resulted in the largest concentration of excavations of HCTs. On the basis of his own excavations at Early Bronze Age Jerablus Tahtani (see Peltenburg 1999), as well as others at Horum Hoyuk, Zeytinli Bahce, Şaraga Hoyuk, Shiukh Fawqani and Tell Ahmar, Peltenburg argues that the distinctive conical shape is 'due to the disproportionately robust enclosure walls embedded in the core of the mounds' (2013: 238) which hold back soil and prevent uniform erosion. We might also add EB IV Tell Qannas (Finet 1979) and EB III Tell al-'Abd (Bounni 1979) to this list — both Late Early Bronze Age strongholds (see Rey 2012) — and similar processes have been posited for HCTs in the southern Levant (Rosen 1986) and in the area around Homs in western Syria, where an exposed section revealed substantial walls at the HCT site 191 in the SHR survey (Graham Philip, pers. comm. August 2014).

The presence of walls at the sites in the Euphrates Valley allows Peltenburg to equate them with the Sumerogram BAD_3 which appears in 3rd millennium sources from both Northern and Southern Mesopotamia and which he translates as 'fortress' or 'walled entity' (2013: 238). In the Presargonic texts of Girsu, BAD_3 seems to mean a fortified watchtower, perhaps surrounded by houses (Camille Lecompte, pers. comm.). Some texts mention associated stocks of goods suggesting they could also operate as storehouses, and others seem to imply associated fields and agricultural lands (Rey and Lecompte forthcoming). Lecompte has argued that BAD_3 operates in a similar manner to an-za-gar_3 in the pre-Sargonic Period; this is of some interest here as during the Ur III Period the latter could also signify a dwelling place (Steinkeller 2007). The Sumerian an-za-gar_3 is also related to the Akkadian term *dimtum,* which has a variety of meanings including a fortified tower or dwelling, a landed estate and a fortified settlement with associated land (see Kolinski 2001: 3–5 for discussion and references). In Northern Mesopotamia, the term BAD_3 appears in texts from Ebla (Bonechi 1993: 68–69). Because these may refer directly to the area under investigation here, they are worth discussing in some detail.

Bad_3 in the Ebla Texts

The era of the Eblaite proto-Syrian archives (24th century) saw the culmination of a political system marked by the rivalry between the small Sumerian city-states and various cities and kingdoms of Greater Mesopotamia. Ebla, located in a geographically distinct area in Western Syria, was a vast kingdom controlling part of the Syrian plain and part of the Middle Euphrates, and was in competition with the urban centres of Mari, and probably Abarsal and Nagar, for control of Western Syria and Upper Mesopotamia (see Archi and Biga 2003). The age of the rival cities ended with the conquest of Sargon of Akkad and his dynasty

including gravity models, will be discussed in a future publication.

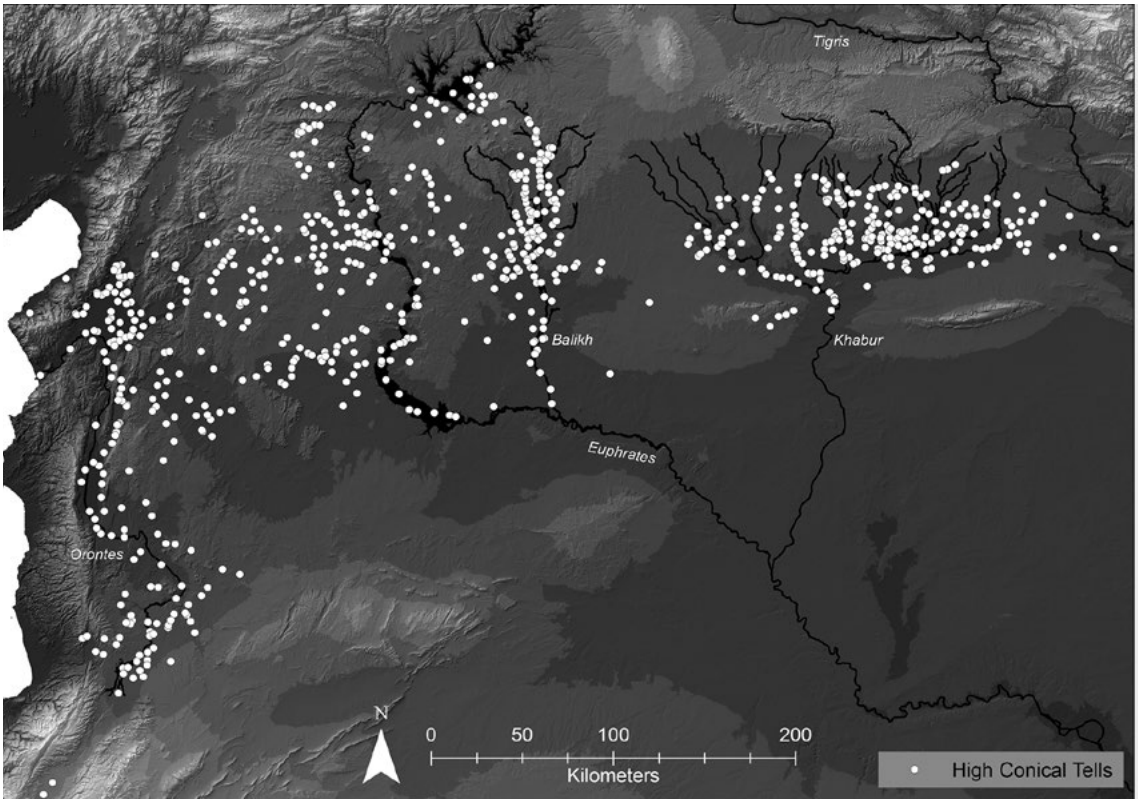

Figure 12.4 Distribution of High Conical Tells mapped for this project (N = 798)

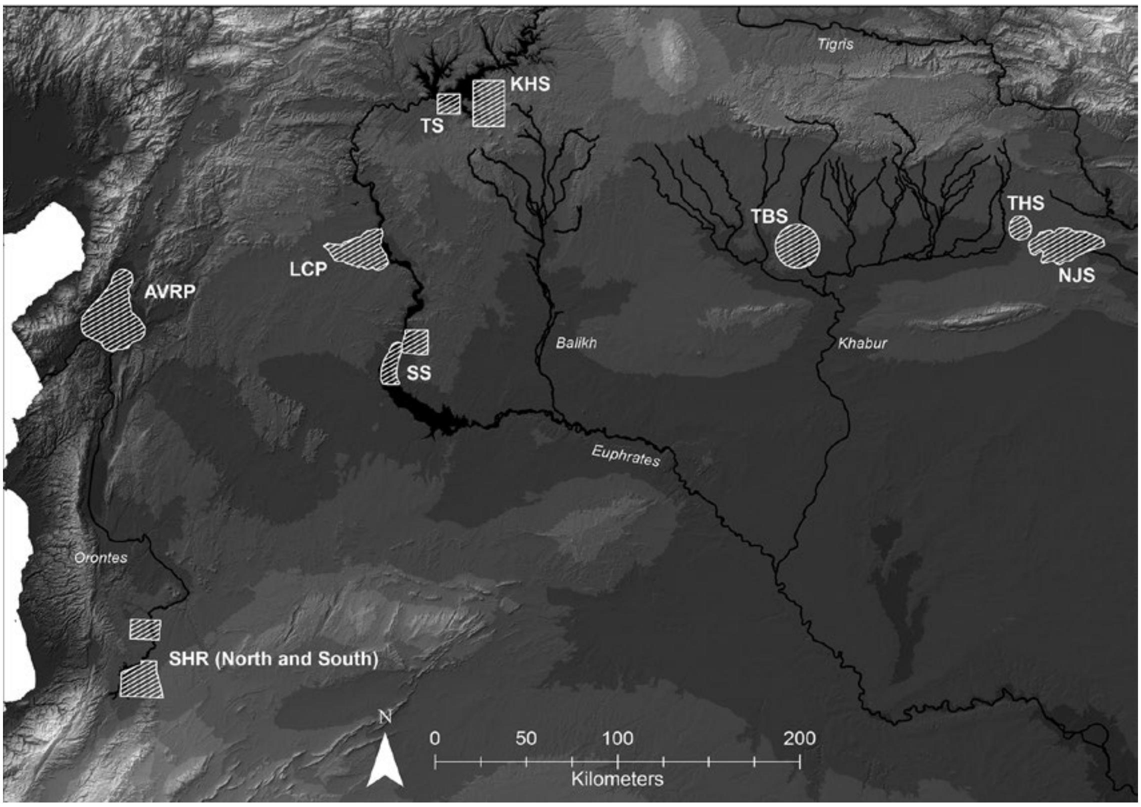

Figure 12.5 Distribution of High Conical Tells coloured by interpolated Inclusivity Likelihood (IL) values

Table 12.2. Occupation Likelihood and Inclusivity Likelihood values for phases with highest OL from nine sample surveys.

Survey Name	Phase	Approximate Dates of Phase (Years BC)	OL	IL
Amuq Valley Regional Project (AVRP)	Early Bronze Age (Undifferentiated)	3000–2000	0.76	0.65
Kurban Höyük Survey (KHS)	Middle–Late Early Bronze Age	2600–2200	0.60	0.35
Land of Carchemish Project (LCP)	Middle Early Bronze Age	2600–2300	0.88	0.70
North Jazira Project (NJP)	Late 3rd Millennium	2500–2000	0.33	0.08
Sites and Monuments in the Homs Region (SHR)	Early Bronze Age (Undifferentiated)	3000–2000	0.77	0.60
Tell Beydar Survey (TBS)	Late 3rd Millennium	2500–2000	0.78	0.68
Tell es-Sweyhat Survey (TSS)	Middle Early Bronze Age	2600–2300	0.50	0.20
Tell Hamoukar Survey (THS)	Late 3rd Millennium	2500–2000	1.00	0.50
Titris Höyük Survey (TS)	Middle Early Bronze Age	2600–2400	0.60	0.35

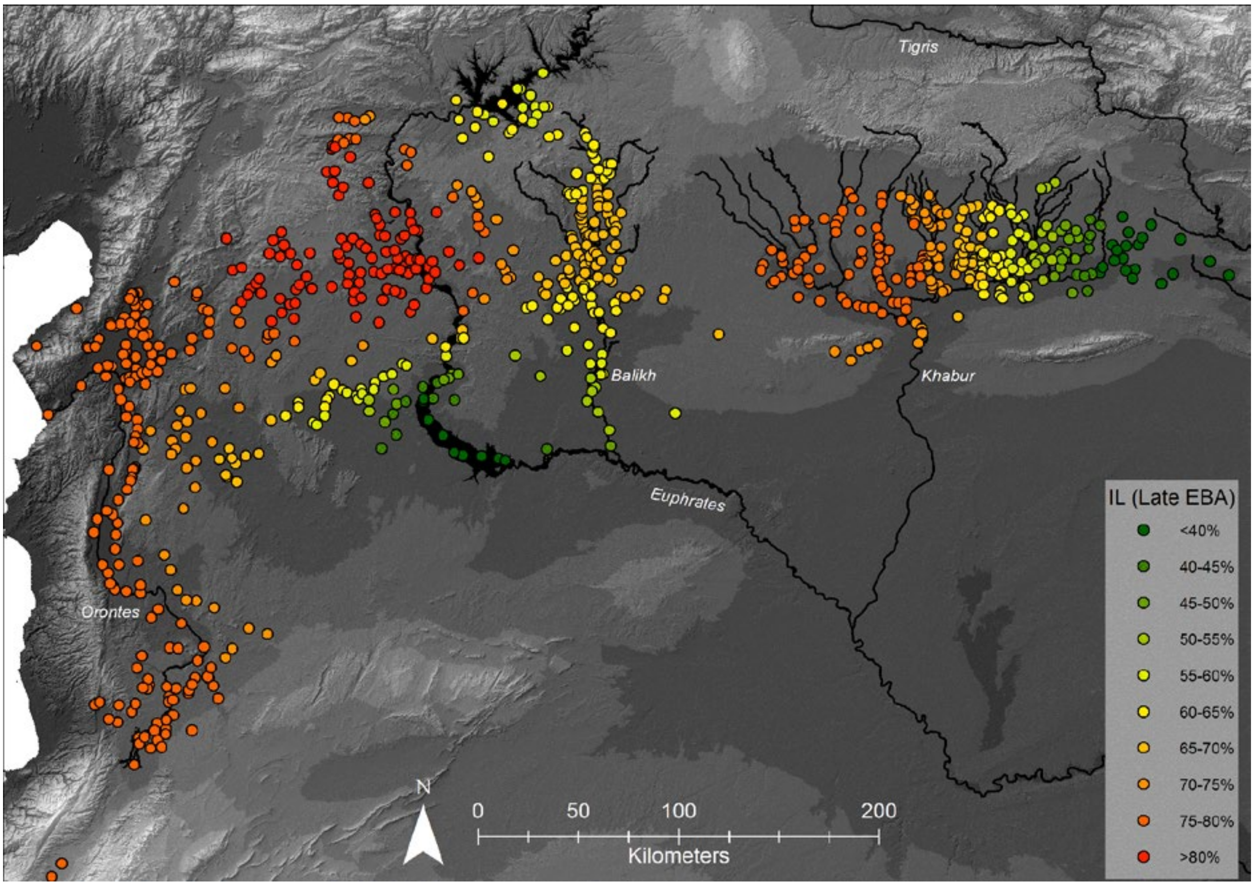

Figure 12.6 Major Early Bronze Age centres and other features with High Conical Tells coloured by interpolated Inclusivity Likelihood (IL) values

Table 12.3: Transliteration and translation of and extract of tablet ARET XIII 5 from the Ebla archive

col. i	**(§ 1)**
(§ 1)	...
1. [...]	and the / its settlements-BAD3
2. [*u_3* BAD$_3$]-⸢BAD$_3$⸣^{ki}	are in the hands (belong to)
3. *in* ŠU	of the king
4. EN	of Ebla ;
5. *ib-la*^{ki}	(§ 2)
(§ 2)	Kablul
6. *kab-lu$_5$-ul*^{ki}	and the / its settlements-BAD3
7. *u_3* BAD$_3$-BAD$_3^{ki}$	are in the hands
8. *in* ŠU	of the lord / king
9. EN	of Ebla ;
10. *ib-la*^{ki}	(§ 3)
(§ 3)	Za'ar
11. *za-'a$_3$-ar*^{ki}	Uziladu
12. *u_3-zi-la-du*^{ki}	and the / its settlements-BAD3
13. *u_3* BAD$_3$-BAD$_3^{ki}$	are in the hands
14. ⸢*in*⸣ ŠU	of the lord / king
15. EN	of Ebla ;
16. *ib-la*^{ki}	(§ 4)
(§ 4)	Quttanum
17. *gu$_2$-da-da-num$_2^{ki}$*	and the / its settlements-BAD3
col. ii	are in the hands
1. [*u_3* BAD$_3$-BAD$_3^{ki}$]	of the lord / king
2. ⸢*in*⸣ ŠU	of Ebla ;
3. EN	(§ 5)
4. *ib-la*^{ki}	all the others
(§ 5)	settlements-BAD3
5. BAD$_3$-BAD$_3^{ki}$	those under the control
6. *kul-a* KI	of the Lord / King
7. LU$_2$ ŠU	of Ebla
8. EN	which are under the control
9. *ib-la*^{ki}	of the Lord / King
10. *in* ŠU	of Ebla;
11. EN	those under the control
12. *ib-la*^{ki}	of the Lord / King
13. LU$_2$ ŠU	of Abarsal
14. EN	are under the control
15. *a-bar*-SAL$_4^{ki}$	of the Lord / King
16. *in* ŠU	of Abarsal.
17. EN	(§ 6)
18. *a-bar*-SAL$_4^{ki}$	Karkemiš
(§ 6)	is in the hands
19. *gar$_3$-gar$_3$-mi-iš*^{ki}	of the Lord / King
20. *in* ŠU	of Ebla ;
col. iii	(§ 7)
1. [EN]	Tinnu
2. [*ib-la*^{ki}]	and the / its settlements-BAD3

col. i	**(§ 1)**
(§ 7)	are in the hands
3. *ti-in-nu*^{ki}	of the lord / king
4. *u*$_3$ BAD$_3$-BAD$_3$^{ki}	of Ebla ;
5. *in* ŠU	(§ 8)
6. EN	Arga
7. *ib-la*^{ki}	are in the hands
(§ 8)	of the lord / king
8. *ar-ga*^{ki}	of Ebla ;
9. *in* ŠU	(§ 9)
10. EN	Ladainu
11. *ib-la*^{ki}	are in the hands
(§ 9)	of the Lord / King
12. *la-da-i-nu*^{ki}	of Ebla;
13. *in* ŠU	(§ 10)
14. EN	Darrulaba
15. *ib-la*^{ki}	is in the hand
(§ 10)	of the Lord / King
16. *dar*$_5$*-ru*$_{12}$*-la-ba*^{ki}	of Ebla ;
17. *in* ŠU	
18. EN	
19. *ib-la*^{ki}	

(2334–2193), who built an empire encompassing the whole of Mesopotamia, Mari and Ebla. In the Ebla archives, BAD$_3$ is used in a variety of contexts; here we discuss two sets of texts which shed light on the potential meaning of the term and the implications this has for our archaeological interpretations of HCTs. The first of these is the text known as the Ebla-Abarsal treaty, which terminates a series of hostilities between the two cities (see Fronzaroli and Catagnoti 2003). Since the treaty provided Ebla with control of river trade, we must assume that Abarsal was located east of the Euphrates, perhaps at Tell Chuera (see Archi 2014). The text refers to a series of cities along the Euphrates with their BAD$_3$s ‘in the hands of the king of’ either Ebla or Abarsal (see Table 12.3).

The form of this list, with BAD$_3$ associated with a particular city, suggests some relation to rural settlement as well as a political affiliation to a higher level entity, while the plural use in all cases suggests there should be a number of such sites in the landscape.

The second set of texts comprises economic documents which refer to the city of Hama on the Orontes River. Here, BAD$_3$ is used to refer to a specific type of settlement and is associated with the term UGULA or superintendent (Table 12.4). Again, the relation of the BAD$_3$ to the cities of Hama and Tubi suggest a rural setting, while there is a clear sense that such settlements were in some way affiliated to the urban centres, both in the Sumerian/cuneiform itself and in the content of the texts where goods appear to have been redistributed on that basis.

Taken together, the texts from Ebla suggest a three-tiered hierarchy of settlement organisation, in which Ebla claimed control over a series of cities, many of which retained client kings, which in turn maintained links with surrounding settlements through a system of overseers (UGULA). If the evidence from the Southern Mesopotamian sources on the meaning of BAD$_3$ is taken into account, these settlements should be fortified, while from the use of the term in the Ebla texts there should also be a large number of them in the landscape, at least in the Middle Euphrates region thought to relate to the Ebla-Abarsal treaty and in the vicinity of Hama.

Table 12.4: Transliteration and translation of extract of three tablets from the Ebla archive.

ARET III 531, f., col. iii:	
5’. 1 SAL{tug2}	1 fine cloth
6’. ḫa-lu{ki}	(for) Halu
7’. BAD3{ki}	from the settlement-BAD3
8’. ’a3-ma{ki}	(dependent of) Hama
ARET XV 38, f., col. xii :	
4 1 gu-zi-tum 2 IB2×3-SA6-GUN3{tug2}	1 specific kind of of garment
5 UGULA ka-ti{ki}	(for) the superintendent of Kati
6 BAD3{ki}	of the settlement-BAD3
7 ’a3-ma{ki}	(dependent of) Hama
ARET XIII 9 (extract)	
f.	
col. i	
1. 4 *mi-at* UDU-UDU	Four hundred sheep,
2. 40 GU_4-GU_4	40 cattle,
3. [n] *mi-at* LÀ-ḪA I_3-GEŠ	x hundred jar of oil,
4. ŠE	barley,
5. ZIZ_2	emmer,
6. GIG-GUN_3	common stained wheat
7. *a-’a_3-wa*	for a total of
8. 3 *li-im* GU_2-BAR	3000 measures gubar,
9. LU_2 EN	those which are of the king of
10. *si-da-ri_2-in*^{ki}	Sidarin,
11. LU2	those which
12. *’a_3-ma*^{ki}	were collected
13. IL_2	in Hama
14. *si-in*	for
15. BAD_3^{ki} BAD_3^{ki}	the settlements BAD3
col. ii	
1. *du-bi_2*	of Tubi.

Reconstructing the landscape of Ebla

Returning to the probability map of HCT distribution in the later EBA, we can see that there is a concentration along the Middle Euphrates and in the west around Hama and north of Homs. In fact, there is a general correlation between high likelihood of EBA occupation and the extent of the Eblaite state (Figure 12.7). The boundaries of the state were likely fluid but from the textual sources and following Alfonso Archi’s reconstruction (2014) we can say that Ebla controlled Alalaḫ, and therefore the Amuq plain, and Ḫaššum, identified with Tilbeshar (south of Gaziantep) which was conquered in the early years of the Minister Ibrium. Eastward Ebla reached the Euphrates north of Karkemiš. Not far from Emar, Ebla possessed a port on the Euphrates, called MaNE. In the south, the kingdom of Ebla included Ḫamat (now Hama) and Tunip (Tell ‘Asharneh), both in the Orontes Valley, but it is still difficult to say if it reached Homs and Qatna. The recently discovered 220 km *Très Long Mur* (very long wall, Geyer *et al.* 2010), dated to the EBIV Period in the steppe region to the east of the Orontes Valley, has been interpreted by Bertrand Lafont as delimiting the extent of the Eblaite state in this region, perhaps establishing the border to the south and east of the Orontes all the way down to the Beqaa Valley (Lafont 2010). Since Byblos is not attested,[2] the border would run west along the mountains west of the valley of the Orontes. Outside of these areas, the probability map suggests HCTs are less likely to date to the EBA. In the Balikh valley, for example, there are a number of HCTs but extrapolating from the survey data suggests relatively few of them date to this period. In this case it is possible that a separate phase of rampart building, perhaps during the earlier EBA (Peltenburg 2013) or in the Middle Bronze Age (Kolinski 2001) accounts for the preponderance of this morphology. In other areas, such as the stretch of the Euphrates between Emar and Tuttul, there are hardly any HCTs. Whilst this may in part be due to the physical geography of the region, with limited areas of fertile plain suitable for cultivation and a decrease in rainfall compared to areas further north (Wilkinson *et al.* 2012), it may also reflect the region’s political significance as a contested zone between the kingdoms of Ebla and Mari.

Conclusions

In summary, we have linked together data derived from remote sensing, archaeological survey and excavation,

[2] See however the interpretation of M. G. Biga (2014: 97–98).

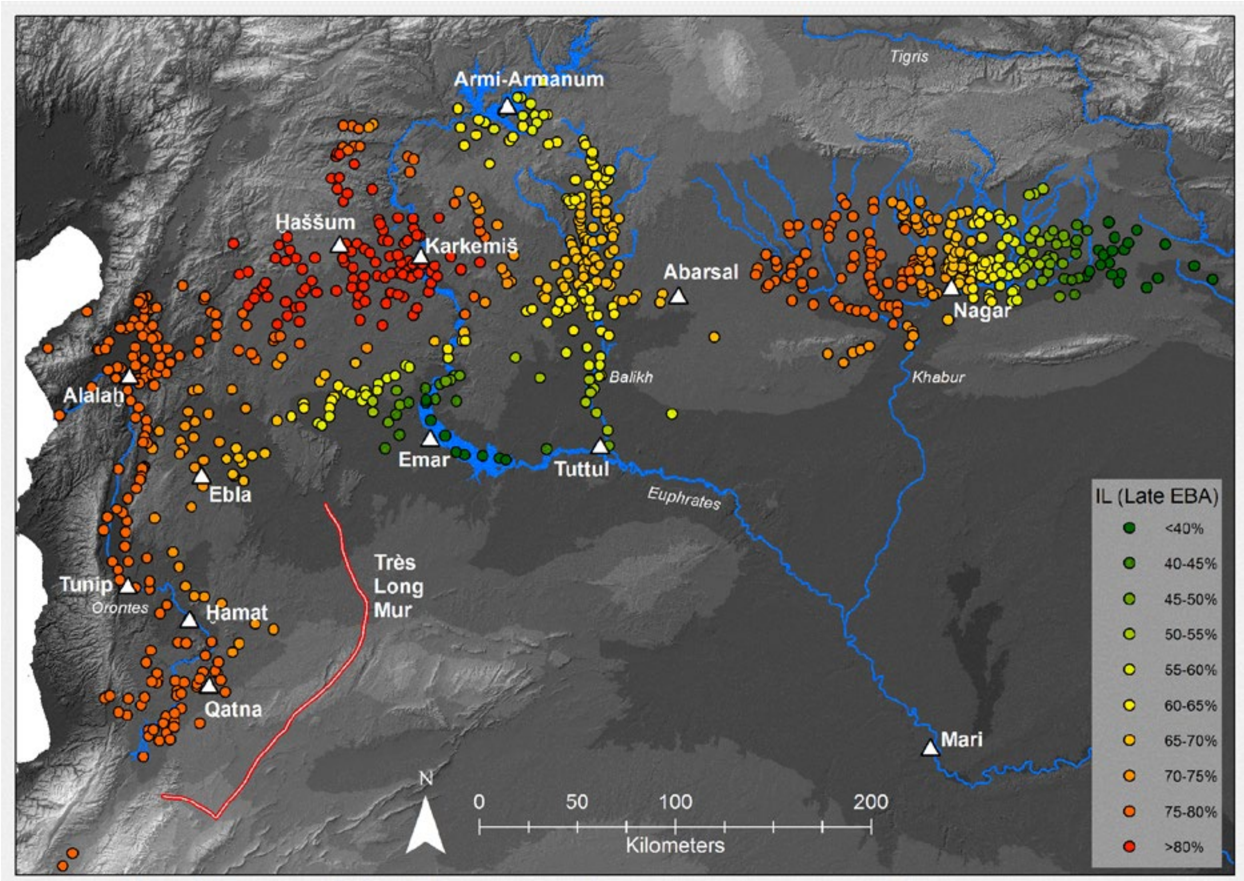

Figure 12.7. Distribution of High Conical Tells coloured by interpolated Inclusivity Likelihood (IL) values with major sites identified and including the approximate location of the so-called *Très Long Mur*

and textual sources to reach an interpretation of the later EBA state of Ebla. Mapping all HCTs through remote sensing data and then extrapolating from the survey record to make chronological predictions revealed that HCTs are not uniformly distributed in either space or time. By making two further assumptions, that HCTs retain their distinctive shape due to internal fortifications and that in the EBA these settlements can be equated to the term BAD_3 as it appears in textual sources, we have been able to explain some of the patterns visible in the overall settlement data. If these assumptions are accepted, the combination of data sources suggests that the Eblaite state had a particular form of territorial organisation in which land was controlled and managed through a nested system of relatively autonomous entities. Small fortified communities dotted the landscape and were managed by an UGULA or superintendent answerable to local urban elites, who in turn were 'in the hands of' the king of Ebla. Such a system would not preclude the sorts of communal land tenure arrangements hypothesised for small rural settlements during this period (see, for example, Wilkinson 2010). In fact, the mutability of these small communities would fit well with evidence for the idea of a patrimonial arrangement of ownership as a series of nested structures modeled on the household of the king (Schloen 2001).

The approach taken here, in which the morphology of individual sites is used to make predictions about their period of occupation and other traits, is a viable entry point into the sorts of large datasets we are now able to construct through satellite imagery. Interpretations made in this manner represent one of the few ways in which archaeologists can still engage with the record in areas such as Syria, where access to sites in the short-to-medium term seems unlikely. Moreover, technological innovations in remote sensing data acquisition and processing mean that our ability to recognise and define morphological aspects of sites will only increase. For example, high resolution digital elevation data derived from spaceborne synthetic aperture radar (SAR) systems such as TanDEM-X are beginning to be used in archaeology and have recently been applied in a Near Eastern context (Erasmi *et al.* 2014). Combining such techniques with large-scale composite datasets represents a fruitful new avenue of research.

Bibliography

Ammerman, A. J.
1981 'Surveys and archaeological research.' *Annual Review of Anthropology* 10: 63–88.
Archi A.
2014 'La situation géopolitique de la Syrie avant l'expansion d'Akkad.' *Mari, ni Est, ni Ouest* (Supplément Syria II): 161–172.
Archi, A., and Biga, M. G.
1982 *Testi Amministrarivi di Vario Contenuto*, ARET III. Roma: Archivi Reali di Ebla Testi.
2003 'A victory over Mari and the fall of Ebla.' *Journal of Cuneiform Studies* 55: 1–44.
Biga, M. G.
2014 'Inherited space — third millennium political and cultural landscape'. In *Constituent, Confederate, and Conquered Space in Upper Mesopotamia, The Emergence of the Mittani State, Topoi. Berlin Studies of the Ancient World.* Vol. 17, 93–110. Berlin, Boston: De Gruyter.
Bonechi, M.
1993 *I Nomi Geografici dei Testi di Ebla*, Répertoire Géographique des Textes Cunéiformes XII/1. Wiesbaden: Dr Ludwig Reichert .
Bounni, A.
1979 'Preliminary report on the archaeological excavations at Tell al-'Abd and 'Anab al-Safinah (Euphrates) 1971–72.' *Annual of the American Schools of Oriental Research* 44: 49–61.
Bevan, A.; J. Connolly; C. Hennig; A. Johnston; A. Quercia; L. Spencer; and J. Vroom
2013 'Measuring chronological uncertainty in intensive survey finds: A case study from Antikythera, Greece.' *Archaeometry* 55(2): 312–328.
Casana, J.
2014 'Regional-scale archaeological remote sensing in the age of big data: Automated site discovery vs. brute force methods.' *Advances in Archaeological Practice: A Journal of the Society for American Archaeology* 3: 222–233.
Casana, J., and Cothren, J.
2008 'Stereo analysis, DEM extraction and orthorectification of CORONA satellite imagery: Archaeological application from the Near East.' *Antiquity* 82: 732–749.
Conolly, J., and Lake, M.
2006 *Geographical Information Systems in Archaeology*. Cambridge: Cambridge University Press.
Erasmi, S.; R. Rosenbauer; R. Buchbach; T. Busche; and S. Rutishauser
2014 'Evaluating the quality and accuracy of TanDEM-X digital elevation models at archaeological sites in the Cilician Plain, Turkey.' *Remote Sensing* 6(10): 9475–9493.
Finet, A.
1979 'Bilan provisoire des fouilles belges du Tell Kannas.' In Archaeological Reports from the Tabqa Dam Project: Euphrates Valley, Syria, edited by D. Freedman, *American Schools of Oriental Research* 44: 79–97.
Fronzroli, P., and A. Catagnoti
2003 *Testi di Cancelleria: I Rapport con le Città*, ARET XIII, n°5. Roma: Archivi Reali di Ebla Testi.
Galiatsatos, N.
2009 'The shift from film to digital product: focus on CORONA imagery.' *Photogrammetrie — Fernerkundung — Geoinformation* 3: 251–260.
Geyer, B.; N. Awad ; M. Al-Dbiyat; Y. Calvet; and M.-O. Rousset
2010 'Un 'Très Long Mur' dans la Steppe Syrienne.' *Paleorient* 36(2): 57–72.
Hritz, C., and Wilkinson, T. J.
2006 'Using Shuttle Radar Topography to map ancient water channels in Mesopotamia.' *Antiquity* 80: 415–424.
Kennedy, David
1998 'Declassified satellite photographs and archaeology in the Middle East: case studies from Turkey.' *Antiquity* 72: 553–561.
Kolinski, R.
2001 *Mesopotamian Dimātu of the Second Millennium BC.* British Archaeological Reports International Series 1004. Oxford: Archaeopress.
Lafont, B.
2010 'Contribution de la documentation cunéiforme à la connaissance du 'Très Long Mur' de la steppe syrienne.' *Paléorient* 36(2): 73–89.
Lawrence, D.
2012 'Early urbanism in the Northern Fertile Crescent: A comparison of regional settlement trajectories and millennial landscape change'. Ph.D. diss., Durham University. Available at http://etheses.dur.ac.uk/5921/
Lawrence, D., and A. Ricci
2016 'Long term settlement trends in the Birecik-Carchemish sector.' In *Carchemish in Context*, edited by T. J. Wilkinson, E. Wilkinson, and E. Peltenburg, 38–67. Oxford: Oxbow.
Lawrence, D., and Wilkinson, T. J.
2015 'Hubs and upstarts: Trajectories of urbanism in the northern Fragile Crescent.' *Antiquity* 89: 328–344.
Lönnqvist, M.; M. Törmä; K. Lönnqvist; and M. Nuñez
2011 *Jebel Bishri in Focus: Remote sensing, archaeological surveying, mapping and GIS studies of Jebel Bishri in central Syria by the Finnish Project SYGIS.* British Archaeological Reports International Series 2230. Oxford: Archaeopress.
Menze, B., and Ur, J.
2012 'Mapping patterns of long-term settlement in Northern Mesopotamia at a large scale.' *Proceedings of the National Academy of Sciences* 109(14): 778–787.
Peltenburg, E. J.
1999 'Tell Jerablus Tahtani 1992–1006: A summary.' In *Archaeology of the Upper Syrian Euphrates: The*

Tishrin Dam Area, edited by G. del Olmo Lete and J.-L. Montero Fenollos, 97–105. Barcelona: AUSA.

2013 'Conflict and exclusivity in Early Bronze Age societies of the Middle Euphrates Valley.' *Journal of Near Eastern Studies* 72(2): 233–252.

Philip, G., and Bradbury, J.

2010 'Pre-Classical activity in the basalt landscape of the Homs Region, Syria; Implications for the development of 'sub-optimal' zones in the Levant during the Chalcolithic–Early Bronze Age.' *Levant* 42(2): 136–169.

Philip, G.; D. Donoghue; A. Beck; and N. Galiatsatos

2002 'CORONA satellite photography: an archaeological application from the Middle East.' *Antiquity* 76: 109–118.

Plog, F.

1974 *The Study of Prehistoric Change*. New York: Academic Press.

Pomponio, F.

2008 *Testi Amministrativi Assegnazioni Mensili di Tessuti Periodo di Arrugum*, ARET XV, 1. Roma: Archivi Reali di Ebla Testi.

Rey, S.

2012 *Poliorcétique au Proche-Orient à l'Âge du Bronze, Fortifications Urbaines, Procédées de Siège et Systèmes D*éfensifs, Bibliothèque Archéologique et Historique 197. Beyrouth : Institut Français du Proche-Orient.

2015 'Defensive topology and spatial representation of cities in the Ancient Near East.' *Annales Fyssen* 28: 1–25.

Rey, S., and Lecompte, C.

Forthcoming 'Demarcated by the gods: Sumerian cults, territory, and the Lagaš-Umma border conflict', in *Beyond Military: Fortifications and Territorial Policies in the Ancient Near East*, edited by S. Bonzano, N. Morello, C. Pappi. Leiden: Brill.

Rosen, A.

1986 *Cities of Clay: The Geoarchaeology of Tells.* Chicago: University of Chicago Press.

Schloen, J. D.

2001 *The House of the Father as Fact and Symbol.* Winona Lake: Eisenbrauns.

Smith, S. L.; T. J. Wilkinson; and D. Lawrence

2014 'Agro-pastoral landscapes in the zone of uncertainty: The Middle Euphrates and the North Syrian Steppe during the 4th and 3rd millennia BC.' In *Settlement Dynamics and Human-Landscape Interaction in the Dry-Steppes of Syria (Studia Chaburensia 4)*, edited by D. Morandi Bonacossi, 151–172. Wiesbaden: Harrassowitz Verlag.

Spaulding, A. C.

1960 'The dimensions of archaeology.' In *Essays in the Science of Culture in Honour of Leslie A. White*, edited by G. E. Dole and R. L. Carneiro, 437–456. New York: Crowell.

Steinkeller, P.

2007 'City and countryside in the third millennium Southern Babylonia.' In *Settlement and Society: Essays Dedicated to Robert McCormick Adams*, edited by E. Stone, 185–211. Los Angeles, California: Cotsen Institute, UCLA.

Ur, J., and T. J. Wilkinson

2008 'Settlement and economic landscapes of Tell Beydar and its hinterland.' In *Beydar Studies I Subartu XXI*, edited by M. Lebeau and A. Suleiman, 305–327. Turnhout: Brepols.

Wilkinson, T. J.

2003 *Archaeological Landscapes of the Near East*. Tucson: University of Arizona Press.

2010 'The Tell: Social archaeology and territorial space.' In *The Development of Pre-State Communities in the Ancient Near East: Studies in Honour of Edgar Peltenburg*, edited by D. Bolger and L. Maguire, 55–62. Themes from the Ancient Near East, BANEA Publications Series Vol. 2. Oakville: Oxbow.

Wilkinson, T. J.; E. J. Peltenburg; A. McCarthy; E. B. Wilkinson; and M. Brown

2007 'Archaeology in the Land of Carchemish: landscape surveys in the area of Jerablus Tahtani, 2006.' *Levant* 39: 213–247.

Wilkinson, T. J.; N. Galiatsatos; D. Lawrence; A. Ricci; G. Philip; and R. Dunford

2012 'Late Chalcolithic and Early Bronze Age landscapes of settlement and mobility in the Middle Euphrates: A reassessment.' *Levant* 44(2): 139–185.