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Settlement and Landscape Development in the Homs Region, Syria. Report on Work Undertaken during 2001–2003

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This report presents a summary of the methods and some preliminary results of fieldwork by an interdisciplinary research team studying the landscape history of the upper Orontes Valley near Homs in western Syria. The particular focus of the project is to document long-term inter-relationships between settlement and landscape in two adjacent but divergent regions.

Geomorphological fieldwork on the Pleistocene and Holocene environments is considered first, with discussions focusing on the terraces of the River Orontes and the associated artefact material. Next, the geo-correction of satellite imagery and its profitable use in conducting fieldwork is outlined.

What follows are some initial thoughts and results obtained for each region through three seasons of extensive and intensive fieldwork survey as guided by remote sensing methods. For the Southern Area these results are revealing differences in the densities of 'off-site' surface material. In the basalt region of the Northern Area satellite imagery has simplified methods of site detection. The report concludes with some preliminary observations on the main trends of settlement history that are emerging from the data.

1. Introduction

Settlement and Landscape Development in the Homs Region is a joint, Syrian-British multi-disciplinary regional project that aims to explore the long-term settlement history of a previously neglected but vital region. The city of Homs and its environs are located at the apex of the Homs-Tripoli gap, which has always provided an essential link between the Mediterranean littoral to the west and towns and steppe of inland Syria to the north and east. The region is composed of a number of distinct physical environments, each offering rather different possibilities in terms of subsistence and settlement. As a result it provides an opportunity to document long-term patterns of settlement and landscape change in adjacent but divergent settings. Work has focused upon two study areas each located in the Orontes Valley of western Syria (Fig. 1). The Southern Study Area (SSA) covers around 400 km²

of lowland landscape, mostly lacustrine marls with some alluvium close to the Orontes river. The Northern Study Area (NSA) extends to approximately 120 km² and consists mainly of basaltic upland, plus a stretch of the Orontes Valley north of the present-day city of Homs (Table 1, Fig. 2). For a more detailed description of the project area and its constituent units the reader is referred to Philip *et al.* (2002, 3–6). To ensure broad comparability of results, the two study areas have been investigated using a standardised survey methodology which has been designed to facilitate the cost-effective identification and recording of a wide range of features from field scatters to agricultural installations, tells to standing stone remains.

The basic aims and approaches of the project have been presented elsewhere (Philip *et al.* 2002, 1–3). While that article dealt mainly with work in the Southern Study Area, the present article is able to consider in more detail some of the evidence and

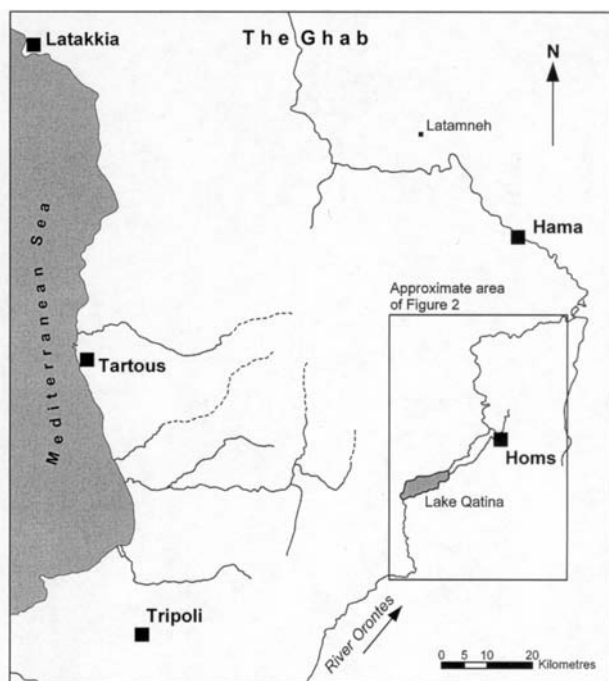


Figure 1. *The Homs region of Syria.*

issues raised in a preliminary way in that account. In particular, it is now possible to discuss the origin and status of the Palaeolithic artefacts that are relatively frequent occurrences among surface material, and to address the question of ‘off-site’ archaeology. In addition, we are also able to report on the results of work in the basalt landscape of the Northern Study Area undertaken during 2002 and 2003, and comment on the way in which the project’s use of satellite image data has developed since 2000.

2. Pleistocene and Holocene environments

Prior to the commencement of the project, few geological or geomorphological studies had been undertaken in either of the two study areas.

Geomorphological research has been directed at the investigation of several key issues, in particular within the marl zone (Unit 1), and the alluvial zone (Units 2 and 5). A fundamental question has been the formation of river terrace deposits by the ancient River Orontes (*Nahr al-Asi*) and the relationship to these terraces of lithic artefacts.

Quaternary terrace development

Fieldwork undertaken since 2000 has revealed that Lower and Middle Palaeolithic artefacts occur as field debris on the gentle eastern valley-side of the Upper Orontes, south of Homs. A series of terrace gravels of the Orontes has now been mapped in this area, represented in the landscape as calccreted conglomerates (Bridgland *et al.* 2003, 1083, Table 1). Occasional deep exposures show that these are cemented gravels filling former channels of the Orontes, sometimes interbedded with fine-grained calcareous floodplain alluvium. Clast analysis of the various gravels has shown them to be 20–65% chert/flint (at 16–32 mm. size), and stone from the gravels appears to have provided the raw material for the production of Lower and Middle Palaeolithic artefacts.

As is usual with river terrace sequences, the lowest terraces are the best preserved and the most readily mapped and reconstructed. Indeed, the lowest of all, the al-Hauz terrace, is well represented downstream of Tell Nebi Mend by fairly continuous conglomerate outcrops which form a clear bench *c.* 5 m. above the river; at the locality in Figure 3, the outcrop extends below modern river level. Higher terrace conglomerates have been observed in quarry or trench sections or in surface exposures. The last would have been considerably more common before recent agricultural intensification. The Miocene marl bedrock is significantly softer and weathers to form a fertile soil, but the intractable cemented gravels have, in recent times, been broken up and removed, often to field boundaries, in order to improve cultivation. Since the publication of the preliminary survey (Bridgland *et al.* 2003) several

Landscape Unit No.	Study Area	Area (km ²)	Environmental Zone
1	Southern	380	Marl
2	Northern	40	Alluvium
3	Northern	120	Basalt
4	Northern	40	Marl
5	Southern	20	Alluvium

Table 1. *The main environmental components of the project area.*

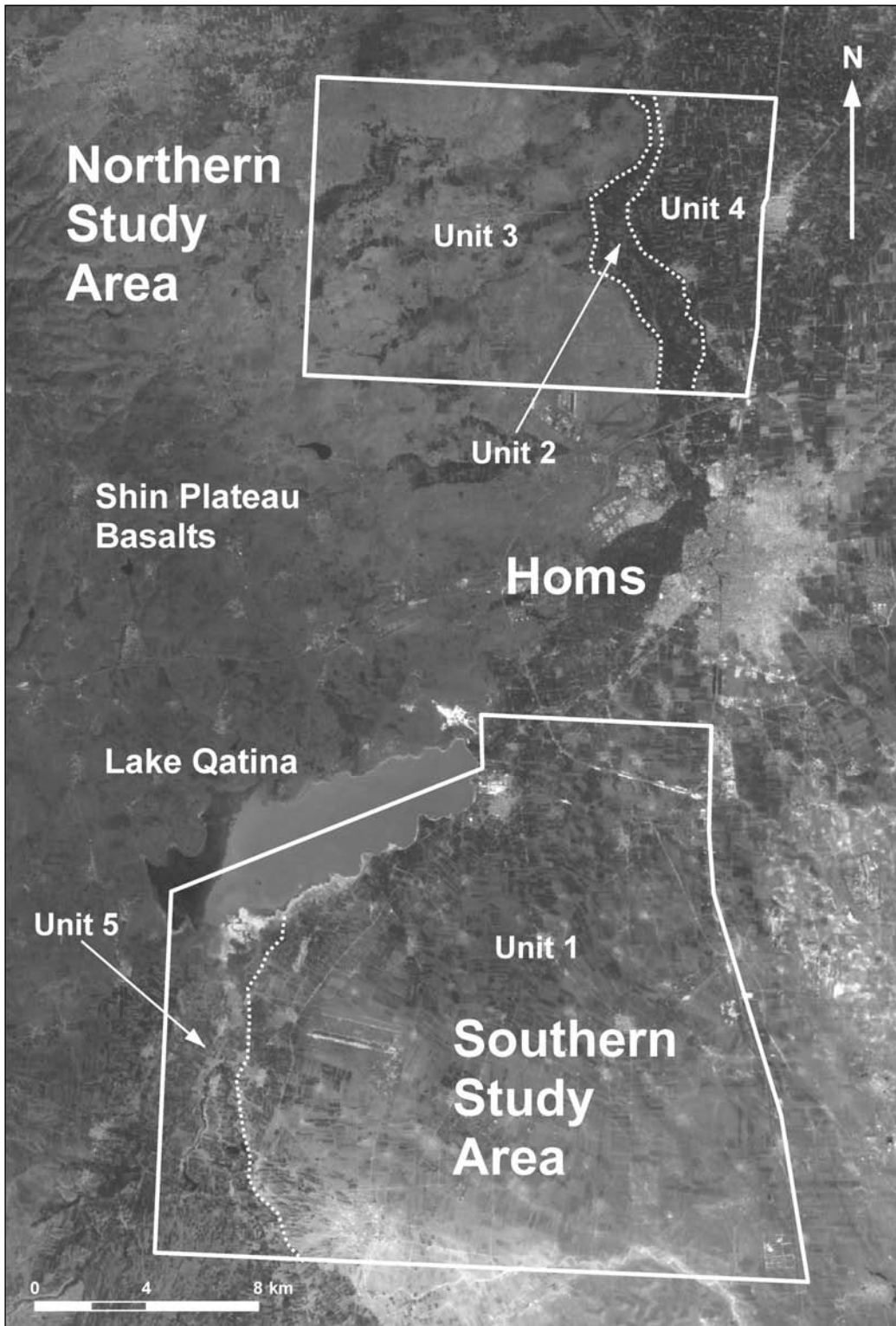


Figure 2. Map showing the location of the Northern Study Area (NSA) and the Southern Study Area (SSA). Landsat TM image, 1st October 1987.



Figure 3. Outcrop of cemented gravels, part of the al-Hauz terrace.

additional terraces have been observed, taking the number to at least fifteen. The terrace mapping has been extended northwards into the Orontes gorge through the Homs basalt, to the area of Rastan where the modern river is dammed. There is also a section through multiple channels of the Bwayda al-Sharqiyya terrace in the cutting of the Homs to Hama highway at Rastan, located some 75 m. above the present level of the river on its right bank.

While there is no published work dealing with terraces in the upper Orontes a considerable amount of work has been undertaken in the middle part of the valley, between Hama and the Ghab Basin (Besançon and Sanlaville 1993; Clark 1967, 1968; Copeland and Hours 1993; Dodanov *et al.* 1993; Guérin and Faure 1988; Guérin *et al.* 1993; Mein and Besançon 1993). A key correlation point is provided by a locality in the 60 m. terrace at Latamneh 150 km. downstream from Homs (Fig. 1), where a Middle Pleistocene mammalian assemblage has been recorded that includes *Mammuthus trogontherii*, *Stephanorhinus hemitoechus*, *Megaloceros verticornis*

and *Equus cf. altidens* (Guérin and Faure 1988; Guérin *et al.* 1993). This assemblage combines mammoth and giant deer species that are unknown in Europe after the Elsterian with a rhinoceros that first appears in Europe immediately after that glacial, in the Holsteinian. The likely correlation with the oceanic oxygen isotope sequence (cf. Shackleton *et al.* 1990) is therefore probably with stage 13 (latest Cromerian Complex) or stage 11 (Holsteinian). The first implies an age of ~0.5 Ma (millions of years ago), the second ~0.4 Ma. Comparison of terrace heights between the upper and middle Orontes suggests that it is possible to correlate the terraces in the two parts of the valley (Bridgland *et al.* 2003).

Palaeolithic artefacts

The distribution of surface-collected Palaeolithic artefacts associated with the river terraces will now be discussed with reference to evidence from the middle Orontes where terrace levels with important

concentrations of artefacts have been identified (Besançon *et al.* 1978; Copeland and Hours 1993).

Characterisation of artefacts

A total of 276 artefacts, which could readily be assigned to the Palaeolithic, were recovered from 94 localities in the Southern Study Area. Of these, 68 could be classed as Lower Palaeolithic, 169 as Middle Palaeolithic and 3 as Upper Palaeolithic. The remaining 36 artefacts are broadly dated to the Pleistocene. The vast majority (98%) are produced on chert/flint, with the few exceptions made on basalt, mudstone and quartzite. The most likely source of the raw material is the river gravels described above. (There also exists a substantial body of material the attribution of which is less clear-cut, and which is not discussed at the present time).

Lower Palaeolithic artefacts were found at 39 localities. The most prevalent Lower Palaeolithic artefact type is the handaxe (N=30). A range of morphological types was identified, including pointed, chisel-ended, trihedral and ovate varieties. A similar variety was noted among handaxes from the middle Orontes, where it is thought to have chronological significance (Copeland and Hours 1993). Middle Palaeolithic artefacts were found at 65 localities. The most commonly encountered Middle Palaeolithic artefact is the Levallois core (N=103). Many of these are small and appear to have been worked to exhaustion. Their size suggests that a significant proportion was produced using small pebbles. The full complexity of the Levallois method is represented, with examples of lineal preferential, recurrent centripetal, recurrent bipolar, recurrent unipolar and point cores all being present. In relation to Levallois cores, the number of Levallois products (i.e. flakes, points etc.) recovered is small (N=18). This could reflect collection bias or differential lithic discard by hominids. Another common prepared core type (N=35) recovered from the study area is a flat, frequently unifacial variety with one or more faceted striking platforms. These display some of the technological criteria that define Levallois (see Boëda 1991; Chazan 1997). The cores are analogous with 'flat debitage' and 'proto-Levallois' cores identified in the middle Orontes where they are associated with fluvial deposits dating to as early as ~560 kya (thousands of years ago) (Copeland and Hours 1993). There is a distinct possibility that these cores represent an evolutionary stage in the development of Levallois technology. The research identified just three diagnostically Upper Palaeolithic artefacts among the material collected. A lack of such mater-

ial has also been noted in research carried out in the middle Orontes (Copeland and Hours 1993). The lithic evidence suggests that human presence in the Orontes Valley during the Upper Palaeolithic was infrequent, leaving only ephemeral traces.

Distribution of Lower and Middle Palaeolithic artefacts

Lower Palaeolithic artefact occurrences in the upper Orontes Valley were located in the vicinity of calcreted terrace gravels which are locally and differentially decalcified. These gravels are considered to be the original context of the Lower Palaeolithic artefacts, with the decalcification of terrace deposits allowing the liberation and incorporation of artefacts into the soil, a process that will have been exacerbated by the intensive ploughing which has occurred across the area. This conclusion is supported by the fact that nearly 15% of Lower Palaeolithic artefacts retain an adhering matrix which mirrors that found in the calcreted terrace gravels. The distribution of Lower Palaeolithic artefacts compares well with the dating scheme envisaged for the upper Orontes terraces (Bridgland *et al.* 2003, 1087, fig. 8). Such artefacts were recovered from the vicinity of the Ard al-Shamal, al-Qusayr, al-Salhiyya, Bwayda al-Sharqiyya, Dmayna, Um al-Sakhr and Dehayraj East terrace deposits. The lowest terrace with which Lower Palaeolithic artefacts are associated is the Ard al-Shamal terrace which is thought to date to OIS (Oxygen Isotope Stage) 8. This is broadly in line with published dates for Late and Final Acheulean assemblages from the middle Orontes and the wider region (Copeland and Hours 1993; Bar-Yosef 1994). Lower Palaeolithic artefacts were also found in the vicinity of upper Orontes terrace gravels thought to date as far back as OIS 36 (Dehayraj East). This is ~200 kya younger than the generally accepted date for 'Ubaidiya in the Jordan valley, which at 1.4 Ma is the oldest Lower Palaeolithic artefact occurrence in the Levant (see Belmaker *et al.* 2002 and references therein).

Middle Palaeolithic artefact occurrences are located across the upper Orontes study area. They are found in the vicinity of the terrace deposits dated from OIS 6 (Tir M³ala) to as far back as OIS 36 (Dehayraj East), that is, including terraces whose formation substantially predates the Middle Palaeolithic. This suggests that these artefacts have not generally originated from the terrace gravels. Such a conclusion is supported by the fact that few of them (less than 2%) retain the adhering matrix thought to be indicative of an association with ter-

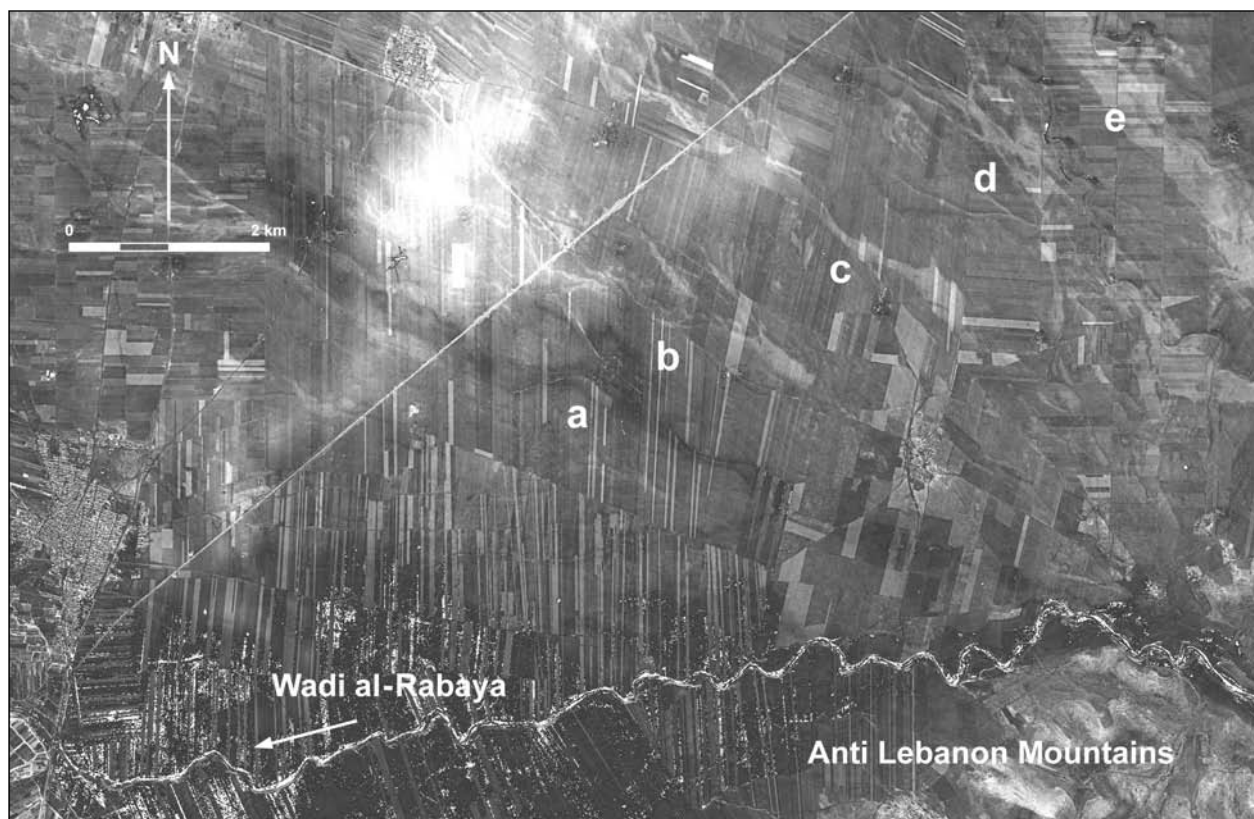


Figure 4. *Wadi al-Rabaya, now deeply incised and running east/west. Features a – e represent wadi gravels that indicate the course of earlier wadayn. Corona negative, Mission 1108, 17th December 1969. Town of al-Qusayr at lower left; white area towards the top is cloud.*

race deposits. We suggest that, in general, Middle Palaeolithic artefacts found in the upper Orontes Valley represent erstwhile surface scatters originating from the now much deflated soils which cap the terrace deposits (see below, Holocene palaeoenvironments). A similar association between Middle Palaeolithic artefacts and the soils capping terrace deposits has also been noted in the middle Orontes, where Levallois cores and products have been recovered from red palaeosols which overlie river gravels (Clark 1967; Copeland and Hours 1993).

Holocene palaeoenvironments

Apart from the area west of al-Qusayr, the marl landscape of the southern study area is devoid of surface water for much of the year, with settlements dependent upon the digging of wells. The landscape slopes gently from the south-east to north-west, and is cut by a number of shallow valleys (*wadayn*) which flow in the direction of the gradient (Philip *et al.* 2002, fig. 6). While present-day agricultural prac-

tices have modified the landscape to the extent that the *wadayn* can be hard to observe today both on the ground and in high resolution imagery, they are readily distinguishable in Corona satellite photography dating to the late 1960s. These images reveal a radiating pattern of sinuous features (presumably high reflectance sand and pebble material deposited on the wadi beds) extending across the southern study area from south-east to north-west. At least some of the *wadayn* appear to represent an erosional fan (possibly an avulsion fan) originating from the Wadi al-Rabaya catchment, a right-bank Orontes tributary that drains the eastern slopes of the Anti-Lebanon Mountains (Fig. 4). These valleys, which probably date from the last wet episode in the Quaternary history of the Homs area, cut across the calcreted gravels that in places are exposed in their sides.

At the present time the Wadi al-Rabaya is deeply incised, and its flow is directed westwards to form a fan south-west of the present day town of al-Qusayr. As a result, the north-west trending wadis now carry

no more than surface run-off, and that only during periods of heavy rainfall. The wadi channels are poorly defined except by a gentle dip of slope and a light deposit of flint and (occasionally) marl clasts along the former direction of flow. Soils in the wadis do not differ significantly from the surrounding slopes and 'upland', although it is likely that movement of soil into the shallow valleys has taken place as a result of tillage. Although lengths of two *wadayn* were explored thoroughly, no vertical sections could be found and therefore the pattern of wadi deposition and/or erosion cannot be determined at present. However, it is clear that those tells which are located away from the Orontes are concentrated along these wadi systems, suggesting that they may have been of greater significance in the past than their present-day appearance would suggest (Philip *et al.* 2002, 19, fig. 6).

Soils away from the wadis are approximately 0.3–0.7 m. thick and consist of reddish-brown loams heavily disturbed by ploughing. These appear to be agriculturally and pedogenically re-worked Pleistocene colluvium. In our previous report (Philip *et al.* 2002, 12) it was suggested that the area had undergone large-scale deflation, that is, the loss of soil through wind action. In order to investigate this, two palaeosols each buried underneath ancient tell deposits were sampled. In one location (SHR 14, Tell al-Safinat Nabi Noah) a significantly more mature, dark red soil was preserved beneath what appears likely to be a second or early first millennium BC rampart. Below-rampart soil was observed on three sides of the site and varied in thickness from 0.3 m. to more than 1.4 m. The depth of soil preserved below the rampart suggests that there has been significant soil loss since its construction. At Khirbat Kafr Moussa (SHR 218) palaeosols lay below the base of the tell which appears to have first been first occupied no earlier than the Roman period. At both sites the presence of over 1.0 m. of thick truncated B horizon was observed. Assuming that the two samples are providing essentially the same information, the evidence appears to point to the large-scale deflation of soils occurring no earlier than the Roman period (and perhaps much more recently), and suggests that before this, soils were largely intact from the Late Pleistocene. This data is consistent with the lack of preserved structures, and the predominance of what appear to be the bottoms of pits and scoops, at the recently published Neolithic settlement of Arjoune, which led the excavators to suggest that the surface layers had undergone considerable erosion (Parr *et al.* 2003, 279). One implication of the evidence for deflation is that had there existed a local equivalent of the dis-

tinctive 'hollow ways' which are characteristic of parts of northern Syria and Iraq and are often interpreted as ancient trackways (Wilkinson 1994; Wilkinson and Tucker 1995), these would not have been preserved. The current absence of evidence should not be taken as evidence for their absence in the past.

Characterisation of alluvial stratigraphy

The alluvial stratigraphy of the Orontes floodplain was examined using boreholes in two areas, one immediately north of Tell Nebi Mend and the other to the south of Khirbat Kafr Moussa (SHR 218). In the former area the alluvial stratigraphy thickened away from the tell reaching a depth of 2.12 m. at a point *c.* 70 m. north of the tell. Variations in the gravel topography suggest the presence of buried channels subsequently filled by fine-grained alluvium. The boreholes drilled to the south of SHR 218 revealed fine-grained alluvial stratigraphy of approximately 2.2 m. depth, which overlay gravels. The presence of more than 2 m. depth of alluvium in the floodplain below the first terrace indicates that any occupational evidence in this area is likely to lie below the levels reached by ploughing and thus go undetected by traditional surface collection.

3. Methodological developments

Geo-correction of the satellite imagery

In our previous report, we noted the value of using Corona data as a means of identifying the areas of distinctive reflectance which are associated with the presence of archaeological material, in particular ancient settlement debris and structural remains such as stone walls and cairns (Philip *et al.* 2002, 15). However, while Corona proved more than adequate for the location of ploughed-out artefact scatters in the SSA (it permitted survey teams to navigate to within 50–100 m. of a likely site), the problems posed by the dense, stone-strewn landscape in the basalt region of the Northern Study Area (NSA) were more demanding. Here, many of the features identifiable on Corona imagery were difficult to recognize on the ground with any real degree of certainty. This was partly attributable to the sheer density of the network of walls and cairns, and the extent of surface coverage by natural basalt boulders which meant that features which appeared very clear on the imagery were actually hard to identify securely on the ground, and partly to the degree of geometric inaccuracy inherent within Corona data.

Geo-correction refers to the process of removing spatial distortions and placing an image into a known spatial projection (becoming a geo-referenced image). This allows co-ordinates and measurements to be taken from the imagery. The accuracy of these measurements is dependent upon the accuracy of the rectification process. The problems posed by Corona lie in a combination of the unusual geometric properties of the imagery, and the difficulty of locating reliable Ground Control Points (GCPs), essential for accurate rectification, which were both visible in imagery from the 1960s and are preserved in the present-day landscape. This problem highlights the scale of environmental modification in the basalt in recent years, which has resulted in a landscape which is, in some areas, now very different from that depicted in Corona. A similar situation has also been reported by Altmaier and Kany (2002, 227).

It was not possible to geo-correct Corona using Landsat imagery as it is very difficult to find accurate GCPs between the Corona imagery (resolution 2 m.) and Landsat (resolution 30 m.). While some modern Syrian mapping was accessible, its utility was limited by unresolved questions regarding the projection used, and the technical characteristics of the numeric grid system printed on the maps. The solution to these problems came through the acquisition of modern Ikonos high-resolution imagery. Ikonos imagery can be purchased in geo-referenced form, with the differing degrees of accuracy reflected in the price. The data used on the project was the Ikonos Geo product, and while a Root Mean Square Error (RMSE) value is not provided, a series of empirical measurements placed most points within a 25 to 50 m. accuracy radius. For this product the applied geo-correction algorithms are derived from the orbital parameters of the sensor (ephemeris) and do not take into account any distortions due to variations in the elevation of the terrain. In contrast, Corona is supplied in an analogue medium (a photographic negative, positive or print) and thus requires geo-correction through the use of an alternative spatially referenced rectification medium (e.g. a map or other image product).

Given the problems inherent in using the local grid, the project used the World Geodetic System (WGS) 84 as the datum, and Universal Transverse Mercator (UTM) as the projection. In addition to being used by several Syrian government departments, UTM, which uses metres as the unit of measurement, was felt to be more intuitively comprehensible for fieldwork than Latitude/Longitude (which uses seconds of arc). It is also widely supported, for example, by Landsat, Ikonos and most

GPS (Global Positioning System) formats and is already used in Cultural Resource Management databases elsewhere in the region (Palumbo 1992).

An initial comparison between handheld GPS readings and a test area (6 × 7 km.) of Ikonos Geopanchromatic data (collected 6 September 2000), indicated that the quality of the spatial referencing between the imagery and the GPS was very good, and suggested that Ikonos derived GCPs would permit the accurate rectification of Corona imagery (Beck *et al.* in press). However, following acquisition of a complete Ikonos data set in summer 2002, it became apparent that geometric accuracy was not consistent across the entire dataset and that the ephemeris and sensor characteristics of the September 2000 imagery had allowed particularly accurate rectification.

That said the geometric errors associated with the Ikonos imagery still provide a good level of accuracy for rectification across the application area. Any image rectified using the Ikonos imagery as a GCP source will have the combined error of the rectification process and the original error of the Ikonos basemap. Hence, positional error on the raw 'geo' product will be somewhat greater than 25 m. However, the spatial errors associated with the raw Ikonos imagery were still appropriate for the mapping and location of archaeological residues in the marl landscape of the SSA.

However, many discrete elements within the basaltic landscape in the NSA are less than 10 m. in size, and individual walls and cairns are often less than 25 m. apart, and so the error inherent in the Ikonos imagery is too coarse to enable accurate desk-based mapping in this context. Quite simply while the Ikonos data might allow one to identify on the ground a group of cairns or walls visible in the imagery, it would remain difficult to equate individual cairns or wall elements on the ground to particular features visible on the imagery. However, Fraser *et al.* (2002) had demonstrated that the accuracy of the Ikonos Geo-product could be increased to sub-meter levels by using GCPs located using Differential GPS to re-geo-correct the imagery. They noted in particular that the internal geometries of the Ikonos imagery were very accurate and hence that relatively few GCPs were required for the correction; the centres of roundabouts were claimed to provide some of the best GCPs.

Applying the methodology of Fraser *et al.* (2002), fifteen GCPs were taken with hand-held GPS at points distributed throughout the two Study Areas. At each location an average of 100 GPS readings was taken to produce one point, and the process repeated so each location had two GCP points



Figure 5. The same area of fields to the west of Krad Dasiniyah is shown on an aerial photograph and a Geographical Information System (GIS) coverage. Of those walls recorded using a hand-held GPS unit, the GIS coverage is able to highlight the attributes for different wall matrices. Hence, the thin black lines represent thin modern walls of one metre in height, the grey lines older wall fragments of more than one metre in width. The dark grey areas are ploughed fields, the light grey are unploughed. (Photograph: M. Abdulkarim).

which were then averaged. A photograph of each GCP was taken to aid the subsequent rectification procedure. The Ikonos coverage of the application area consisted of five separate Panchromatic images, each of which was corrected using three GCPs using Erdas Imagine with a first polynomial nearest neighbour rectification. The high (1 m.) spatial resolution of the Ikonos panchromatic images allowed a more accurate location of the tie point than would any of the other datasets available to the project. The same GCPs and tie points were then used to correct the Ikonos Multispectral (4 m.) images, and the geocorrected panchromatic images were used as base maps for the correction of the Corona imagery. This process provided RMSE of 5–8 m. across the whole application area for both the Corona and Ikonos imagery. This is a sufficient degree of accuracy to permit desk-based mapping and subsequent field navigation to be undertaken, and has permitted field teams to identify ground features with specific elements on the imagery with considerable confidence. This simple technique appears considerably more economical than traditional total station survey.

In practice it proved possible using a hand-held GPS to identify and record attribute data on individual walls, and other features such as clearance cairns and tumuli in the field. By plotting the downloaded GPS co-ordinates over the geocorrected Ikonos imagery, it was then possible to identify the matching features on the imagery and thus link the attribute data on the database to a specific feature on the imagery. For example, in the area to the west of Krad Dasiniyah the complex network of walls could be divided into a number of interlocking wall matrices distinguished in terms of differing construction (Fig. 5). It is clear that geo-referenced Ikonos panchromatic data offers a fast and accurate way of mapping large-scale archaeological features such as field systems, cadastrations and clusters of monuments.

4. 'Offsite' archaeology in the Southern Study Area: preliminary thoughts

A major constraint upon attempts to gain a coherent understanding of the long-term development of settlement in the Middle East has been the incompatibility of current datasets from upland and lowland regions (Banning 1996; Wilkinson *et al.* 2004, 202–204). In lowland landscapes, traditional extensive survey methods have proved effective in locating the nucleated tell sites which characterise much settlement of the Bronze and Iron Ages, but less successful in recognising the smaller, dispersed settlements which bear witness to the presence of later occupation.

In contrast, research in upland areas has focused on settlements of Graeco-Roman date, which are frequently characterised by standing stone architecture (for example, Dentzer 1985; Tate 1992). Earlier material has proven elusive, and it is not always clear whether this relates to a genuine absence of such occupation in the stony upland zones, or is an artefact of survey methodologies which have focused upon standing architecture. In addition, the investigation of Islamic period rural settlement has been neglected in nearly all areas. In consequence, it has proved difficult for scholars to examine settlement and landscape development across the past organizational, and present-day disciplinary, divides between the Ancient Near Eastern and Graeco-Roman worlds, and between the latter and the Islamic period.

Work in the Southern Study Area (SSA) has sought to recover settlement data for all periods in a typical 'lowland' zone, while work in the basalt region of the Northern Study Area (NSA) is designed to create a comparable dataset for the adjacent 'upland' landscape, so we are now in a position to begin to address these issues. Satellite imagery has played a key role in site prospection. To date 101 sites, spanning the Neolithic to the Islamic period, have been identified in the 380 km². of the marl landscape of the SSA. These comprise 21 tells and 80 flat sites, the latter generally indicated by soil marks and concentrations of artefactual material. Eleven of the sites were indicated on the Syrian 1:50000 maps by antiquity symbols, a further 16 by the place name '*tell*' and 25 by the place name *khirbah* (ruin). In some instances the latter was accompanied by a contour indication on the map. In other cases the specific location to which the name referred was not clearly indicated on the maps. However, the exact locations of sites associated with a place name could generally be confirmed through inspection of the imagery for soil marks. The identification of the remaining 51 sites was made primarily through the examination of satellite imagery, an increase of almost 100% over existing records. In addition, 95 locations which were identified as possible sites, either on the basis of contour data from the maps, or through the identification of anomalies on the imagery, were confirmed as 'non-sites' through ground observation.

In our case a 'site' is defined as consisting of a distinct zone which can be understood to have resulted from either residence or repeated human activity over an extended period of time. On the ground these are characterised by a polythetic set of criteria including the presence in the same location of distinctive soils, topographic features such as mounds

or depressions, concentrations of artefacts and architectural fragments. The presence of agricultural installations such as olive press weights or large grinders is not sufficient alone to allow a location to be designated as a site. By far the majority of the 80 flat sites has been dated to the Graeco-Roman or Islamic periods through surface material. In size, as defined by the extent of the distinctive archaeological soils that can be seen readily on both the imagery and the ground, they generally range between 0.5 and 4.0 ha. The flat sites therefore represent the later settlement component of this intensively exploited, lowland region. As such they will provide a key point of comparison for the stone-built villages which characterise these same periods in the basalt landscape of the NSA (see section 7 below).

Of particular interest is the fact that while parts of northern Mesopotamia witnessed a phase of settlement dispersal from nucleated tells to dispersed rural sites during the Iron Age (Wilkinson 2003, 129), the situation in the Homs region is different. On present evidence, the major shift away from tells to dispersed settlement appears to have taken place during the Hellenistic period, which is documented by ceramics both on a number of tells (often as the latest well-represented occupation) and in several artefact scatters. This suggestion appears consistent with the re-foundation by the Seleucids of Laodicea ad Libanum, which we have identified with the lower settlement of Tell Nebi Mend (see discussion of city names in Grainger 1990, 137–39; for other references to the tell see: Matthias and Parr 1989; Parr 1983). It was this dispersed settlement pattern which predominated from that time onwards.

It has recently been suggested by Wilkinson *et al.* (2004, 190) that the settlement densities reported by surveys in the Middle East, which are noticeably lower than those achieved by projects working in the Aegean in recent years, may represent not just the different methodologies used in the two areas, but also a real contrast between past settlement patterns in the two regions. In the case of the SSA, we have identified 101 sites (present-day villages excluded) in an area covering some 380 km², that is, roughly 1 site per 3.8 km². If this figure is adjusted to allow for the multi-period nature of some of these settlements – the long-lived tells in particular but also some of those sites defined by artefact scatters – the figure would be in the region of 200 occupations, resulting in a density of 1 site per 2 km². Such a figure would place the SSA close to the settlement density levels observed by recent surveys around Tell Hamoukar and Tell Beydar in northern Syria (Ur 2002; Wilkinson 2001), that is towards the higher end of the range of densities claimed to be typical for Near

Eastern landscapes (Wilkinson *et al.* 2004, 190, fig. 14.1).

The question remains, however, to what extent these sites represent the bulk of the past settlement record, or whether there existed smaller, more ephemeral sites, perhaps marked not by soils, but by artefact scatters alone, and which may therefore go undetected in satellite imagery. However, the tell-based focus on many Middle Eastern surveys has meant that intensive survey data of the kind which is now common elsewhere in the Mediterranean is still in limited supply for Middle Eastern landscapes.

In our previous report (Philip *et al.* 2002, 13) it was noted that the distribution of surface artefacts was generally low, but for marked concentrations in the vicinity of known archaeological sites. However, this statement was made on the basis of a small number of relatively large transects collected with walkers spaced at 20 m. intervals, augmented by quantified surface collections undertaken in the immediate vicinity of small number of known sites, and which indicated a very marked decline in the quantity of surface material beyond the immediate edges of the sites. However, Wilkinson's (1998, 75–77) observation of significant localised variation in the density of off-site material in the Balikh Valley in north Syria, implies that any attempt to characterize the nature of surface distributions within the SSA would require larger-scale and more systematic surface collection.

During 2001 and 2002 efforts were made to investigate these trends in more detail by the quantified surface collection of a number of sample units (here termed transects) distributed throughout the southern study area. In order to ensure that even small scatters of material were observed, transects were walked with team-members spaced at intervals of 10 m., with each surveyor instructed to scan and collect all ceramics and chipped stone from a swathe of 2 m. width. Note that the term transect as used here applies to an area sampled by a group of walkers, not to the lines walked by individual collectors. A total of one hundred and fifty-four such transects were distributed across the Southern Study Area. Although most were in 'off-site' areas (according to the imagery), as a control, a number of transects were positioned close to or even running over known sites. Transects were designed around 'natural' collection units, such as single fields or areas in which crop cover and thus visibility was internally consistent, and the boundaries recorded using GPS. The total area covered in this way came to a little over 3 km² (c. 0.8 % of the SSA).

Initial fieldwork had established that there were major variations in the visibility of surface material

Visibility Class	Estimated % surface visibility	No. of transects collected
High	100	91
Good	75	40
Medium	50	21
Low	25	2
Poor	< 25%	–
Total		154

Table 2. *The surface visibility of the transects fieldwalked.*

across the study area because of differing levels of vegetation, and in particular, the presence in some transects of quantities of cut straw remaining on the surfaces of fields after the harvest. As the impact of surface visibility upon the detection of archaeological material is well known (e.g. Terrenato 2000, 60, fig. 7.1), transects were divided into five visibility classes, based upon the estimated percentage of the ground surface visible to walkers (i.e. ranging from 0% – 100%). As this is a procedure which continues to generate debate within the literature (Mattingly 2000, 10–12), it was decided to create a system which was robust and simple for field teams to use and understand. While an admittedly crude measure, this was felt to be better than no correction at all. In practice the majority of transects selected for walking were chosen from areas where surface visibility was good (Table 2). However, there were one or two parts of the survey area, where as a result of more intensive cropping, it proved necessary to walk areas where ground cover was rather heavier in order to obtain an appropriate sample of the study area overall.

In the analysis of density plots sherd counts are expressed in terms of numbers per 100 m². To obtain these figures the procedures were as follows.

1. all material from a single transect was aggregated, by combining the collections of the individual walkers.
2. the total number of sherds was adjusted to produce densities equivalent to those expected had visibility in the transect reached 100%.
3. the figure for the area surveyed was calculated using the area actually scanned, i.e. the combined areas of the 2 m. wide swathes which the walkers were instructed to scan.

More than two thirds of the transects produced a sherd density of less than one per hundred square metres (Table 3), while nearly all transects produced densities of surface sherds that appear low in comparison to those noted by Wilkinson and Tucker (1995, 21–22, figs 14–16) in northern Iraq. It is

worth noting that transects producing sherd densities of less than one per hundred square metres occurred in all parts of the study area, including a number of those placed very close to readily identifiable sites. On the other hand, all of those transects producing sherd densities in excess of two per hundred square metres either ran directly across, or were located within 100–200 m. of recognisable sites. These may well reflect the transportation of archaeological material from sites either through ploughing or the deliberate redeposition of archaeological material by local farmers, a practice which is now increasingly common in the area. On some transects positioned within the boundaries of identifiable sites recovery rates as high as 48 sherds per hundred square metres were attained.

These low densities appear to indicate the virtual absence of a significant ‘background’ or ‘off-site’ scatter. The relatively high levels of aeolian soil loss documented by our analysis (see section 2 above) and the relatively high survival rate of chipped stone artefacts suggests a typical deflated landscape, in which artefact densities are increased through loss of the surrounding soil matrix. Equally, the significantly higher recovery rates for pottery in on-site locations suggest that it is unlikely that large quantities of surface ceramics have been selectively destroyed on ‘off-site’ areas through post-depositional processes. Rather, the evidence appears to reflect a situation in which there has been only low level deposition of cultural material in what would normally be understood as ‘off-site’ locations.

Most importantly, the transects revealed little in the way of concentrations of artefactual material that had not already been detected on the imagery, that is through the identification of areas of high reflectivity soils. This appears to confirm the preliminary indications of the Tell Hamoukar Survey in north-east Syria (Wilkinson *et al.* 2004, 196). The surface data therefore appear to confirm our earlier impression (Philip *et al.* 2002, 13) that the marl region of the SSA is a landscape consisting of readily identifi-

Sherd density per 100 m ² (adjusted to 100% visibility)	No. of transects	Cumulative Frequency as %
0	24	15.5%
0.01–0.49	59	53.6%
0.5–0.99	19	67.10%
1.0–1.99	18	78.1%
2.0–4.99	15	87.7%
5.0–9.99	8	92.9%
10–19.99	9	98.7%
20–49.9	2	100.00%
Total	154	

Table 3. *The sherd density of the transects fieldwalked.*

able settlement concentrations, separated by areas of minimal artefact distribution. The single artefact concentration which was located through transect-walking proved, once identified, to be readily visible on the imagery as an area of increased reflectance. This had been noted, but disregarded because it was located close to an area that had been disrupted by the construction of a road embankment in recent years, and to which disturbance the higher reflectance of soils in the area of had been ascribed.

On present evidence, the data from the marl landscape of the SSA appear to confirm the suggestion (Wilkinson *et al.* 2004, 203) that some parts of the Middle East are characterised by a settlement structure that was markedly more nucleated over a very long period, than that observed in many parts of the Mediterranean basin. Thus while the Mediterranean landscape may ‘not form widely separated heaps of ceramic discard separated by ceramic wastelands’ (Bintliff and Sbonias 2000, 246), some parts of the Middle-Eastern landscape seemingly do. If this pattern is shown to occur widely in the Middle East, then it has important implications for survey methodology, and highlights the need for researchers to adapt their techniques to particular landscapes, rather than adopting approaches developed for very different conditions.

It is worth noting that there appear to be significant differences in the quantities of surface material (ceramics in particular) associated with sites of different periods. A case in point is the relatively low frequency of Neolithic-Chalcolithic material represented in transects across the well-documented and extensive site of Arjoune (around 3–5 sherds per 100 m²). While considerably higher than the ‘background’ levels, this remains low in comparison to the sherd densities occurring on

many later sites, despite the fact that both the depth of soil and intensity of recent ploughing appear broadly comparable in many parts of the study area. Put quite simply, a small, Islamic period site which may have been occupied for no more than a century or two appears to produce substantially more surface material per unit area than a larger, and much longer-lived Neolithic settlement. Two likely explanations come to mind. The first is that there were variations in the quantities of pottery in circulation, and thus available for consumption, and subsequent deposition at different periods, a point that has been noted in surveys in Europe (e.g. Millett 1991). The second view, in essence that put forward by Bintliff *et al.* (1999), suggests that a combination of relatively friable pottery, and the impact of millennia of post-depositional processes has resulted in a degree of attrition to early material that is considerably more pronounced than is the case of evidence indicative of later occupations.

While a discussion of these, and other aspects of this problem must be held off for another occasion, the key point to recognise at this stage is that the threshold level indicative of the presence of significant prehistoric activity is signalled by far lower sherd counts than is the case in later periods. This has significant implications for the ease with which prehistoric sites can be identified in the landscape, and in particular for the recognition of prehistoric components within multi-period ceramic palimpsests – as on tell sites or other frequently reoccupied locations. However, the implications go beyond prehistoric sites alone. The notions that there may have been significant differences in the amount of pottery available during different periods, and that differential pottery quality has influenced the nature and density of ploughsoil assemblages,

indicates that caution is required when dealing not only with prehistory, but also with periods such as the early Islamic and Ottoman for which the paucity of surface material recovered to date would normally be interpreted as indicating phases of settlement abatement.

5. The basalt landscape of the Northern Study Area

One of the key aims of the project has been to generate datasets which will allow the comparative analysis of material from adjacent, but contrasting environmental zones. The basalt region (Unit 3) of the Northern Study Area (NSA), is of particular interest as it conserves a unique suite of archaeological remains, including a complex network of field systems, associated settlements and thousands of clearance or burial cairns, and thus provides an excellent point of comparison for data from the marls of the SSA. The archaeological resource is now under severe threat from modern development, in particular the bulldozing of ancient stone structural remains to create large rectilinear fields suitable for mechanised agriculture.

However, as the palimpsest of stone walls, cairns and structures which characterise the NSA offered a very complex landscape in which to work, it was deemed sensible to delay the start of fieldwork in the area until such time as the geo-correction of our image datasets had reached such a level as to allow their use both as in-field navigation tools, and as a reliable means by which to identify individual walls and structures in the field. The key to this was the acquisition of Ikonos data in spring 2002, after which this hitherto confusing landscape began to take shape (see section 3 above for details of procedures employed).

GIS analysis of the ancient landscape

It was decided early in the project to use a GIS environment for the co-ordination of the fieldwork and to model the development of this complex landscape. The first question was the extent to which present-day surface remains reflected those of the (non-recent) past. Fortunately, CORONA imagery dating to the late 1960s provides a good indication of the nature of surface remains prior to the large-scale bulldozing which has modified the landscape in recent years. Moreover, comparison of CORONA with recent Ikonos imagery not only highlighted the scale of these modifications, but permitted the delimitation of a number of areas in which the

ancient landscape appeared relatively well-preserved, and in which fieldwork could sensibly be concentrated.

Using the imagery, it was possible to extract data for a variety of GIS coverages which allowed us to gain greater insights into the development of the landscape as presently constituted. The most obvious was the recognition of a range of anomalous structural features including possible 'sites'. However, it was also possible to extract coverages for new field walls (those apparent on the Ikonos imagery, but not present on CORONA), and surviving old walls (those visible on both CORONA and Ikonos imagery), as well as for cairns and the pairs of parallel walls which denote communications routes between the villages and the networks of now-disused trackways leading from the village to the surrounding fields.

As the vestigial outlines of past landscape management systems come into focus, it is becoming possible to identify a variety of field system types. These appear to be linked to factors such as field and wall size, local topography and location relative to settlements. For example, at a macro-scale, there are fragments of walls which run in parallel across the whole region, and which are of a uniform width and angle of delineation from the North, and seem to provide evidence for a widespread programme of cadastration or centuriation, probably during the Roman period (see Abdulkarim 1997). On a micro-scale, smaller areas consisting of a succession of narrow fields arranged in parallel, and divided by walls of the same width (usually less than 1 m.), and enclosed by a more substantial wall of two to three metres in width, conform to a classic representation of the Mouchaa land tenure system which was commonly used during the Ottoman period (Weulersse 1946).

Site detection

Resources dictated the need to focus upon a number of key locations, including both specific sites and larger areas of landscape, which could be identified on the Ikonos imagery. These were selected partly on the basis of the evidence of satellite imagery, in particular their state of preservation and range of visible features, and partly in recognition of areas where previous researchers had noted a particular density or clustering of ancient remains.

While the basalt region has received relatively little recent scholarly attention, brief visits were made by European travellers to the region in the first half of the nineteenth century (Smith 1846; Thomson 1848). Around half a century later visits were under-

Feature Category	No. of examples investigated	SHR ID numbers
Tells	3	860, 866, 888
Abandoned villages	2	515, 885
Large rectilinear structures	9	836, 837, 839, 840, 841, 854, 859, 895, 911
Small square structures	8	838, 856, 890, 891, 894, 899, 900, 910
Clusters of irregular-shaped enclosures	6	52, 62, 387, 389, 833, 872
Clusters of rectilinear enclosures	7	831, 855, 857, 858, 862, 874, 887
Groups of sinuous walls	7	48, 362, 386, 850, 861, 863, 901
Other site types	8	851, 852, 853, 864, 886, 889, 892, 893
Total	50	

Table 4. Feature categories as defined on the basis of Ikonos imagery.

taken by scholars interested in the Biblical and Classical history of the region (Lammens 1900, 1902; Perdrizet and Fossey 1897; Ronzevalle 1902, 1911–12). Following a review of the published Roman and Byzantine inscriptional evidence (Jalabert and Mouterde 1959 [IGLS]; Lammens 1900, 1902; Perdrizet and Fossey 1897), and a consideration of image data, areas in the centre and western half of the NSA were identified as offering the best prospect of achieving the overall fieldwork aims.

These were:

1. an area in the environs of the present-day village of Burj al-Qa'i, where there appeared to be a rich scattering of possible sites and substantial evidence for complex field systems, and including an extent of linear walls to the south and west of the village, where the imagery indicated that there was little evidence of recent landscape modification.
2. an area of mixed walls and fields to the west of the present-day village of Krad Dasiniyah, which displayed a variety of agricultural land uses and field structures, and thus provided a good cross-section of the basalt landscape as it currently exists.

Work in these two areas provided the basis for gaining an understanding of wall types and the relationships between different classes of structure.

Desk-based analysis led to the identification of seven preliminary structural categories (eight if miscellaneous is included), defined on the basis of the morphological characteristics of features visible on the imagery (Table 4). Fieldwork in 2003 was designed to ground observe a representative sample of features within each of these categories, and thus determine the extent to which classes defined on the

basis of the image data would conform to field observations (Table 5). Examples of each of the seven main classes as these appear on the imagery are given in Figure 6.

In all, 50 pre-designated sites were visited and recorded. A small proportion of the potential sites was re-classified as 'non-sites', following ground visits, for example those consisting of natural features, such as outcrops of basalt boulders the reflectivity responses of which resembled those of structures of anthropogenic origin. However, the majority of 'potential sites' was confirmed as genuine archaeological entities. In addition, fieldwork also led to the recognition of additional sites which had not been previously identified on the imagery for reasons such as small size, or concealment by clouds.

Certain overall trends are already becoming clear regarding human activity in the basalt. To begin with, the area contains tells, which points to lengthy occupations at particular locations. However, these are composed of collapsed stone structures rather than the mudbrick debris characteristic of tells in the marl landscapes to the south and east, and it is not clear how long such tells would have taken to form. In contrast, the category 'Abandoned Villages' appears to represent settlements which did not develop into tells, and were presumably therefore shorter-lived. Thus the existence of two separate 'settlement' types implied by the imagery appears to have been confirmed on the ground.

The identification of a large number of free-standing stone structures, generally located outside identifiable tells or villages, and which initial impressions suggest include agricultural infrastructure such as watermills and granaries (e.g. 839, 841, 856), and

Feature Category	Results of Ground Observation
Tells	All revealed the presence of a genuine tell, generally covered or encircled by a modern village.
Abandoned villages	Both consisted of concentrations of 'low rise' stone structures, easily recognisable as houses on the ground.
Large rectilinear structures	The features assigned to these two classes overlap, but all consist of concentrations of basalt rubble of square or rectilinear shape and within which wall lines were frequently detectable. They appear to represent collapsed free-standing stone structures of various types. It is clear that the original geometric properties of the buildings were preserved in the reflectance patterns. The imagery was frequently able to highlight the contrast between individual collapsed structures and the background coverage of basalt boulders.
Small square structures	
Clusters of irregular-shaped enclosures	The features assigned to these two classes overlap although there was a tendency for some clusters to contain mainly rectilinear and others, mainly irregular enclosures. This feature category also included clusters of large flat, or hollow-centred cairns, including examples containing groups of exposed central orthostats. In one case a 'false' signature was generated by a cluster of small ovoid depressions in which standing water inhibited the development of vegetation, thus producing a reflectance signature similar to that of small stone structures.
Clusters of rectilinear enclosures	
Groups of sinuous walls	Nearly all were of anthropogenic origin, but included areas of irregular shaped field walls, in some cases running across and around clusters of cairns. The category also includes large circular structures with complex internal divisions, some containing groups of cairns, and a concentration of small pits and depressions.
Other site types	Areas characterised by small depressions and/or dense piles of boulders or spreads of stone cobbles, perhaps indicative of quarrying for basalt stone in the relatively recent past. Also included, the remains of ancient wells or water holes. While many were anthropogenic, the features consist of areas of distinct reflectance resulting from concentrations of exposed basalt.

Table 5. *Feature categories: summary of ground observation results.*

cult and/or burial structures (e.g. 895, 910), indicates the extensive nature of human activity in the basalt, and the importance of looking beyond settlements to understand the full range of activities undertaken. The contrast between the presence of such structures in the basalt and the far more obviously site-focused record of the classical period settlements in the marls raises important questions. While this may relate to issues of taphonomy and the definition of 'sites', one might expect that the presence of something equivalent to the large stone-built structures included in this category would have resulted in a soil mark of the kind so readily detected in the SSA. It is possible therefore that these differences indicate less of a distinction in preservation and taphonomy, but also contrasting styles of settlement and land use.

Many of the sites discussed above revealed material evidence for occupation at some point during the Roman period. These include villages, both abandoned and currently settled (SHR 515, 860, 866, 885, 888), and structures located on the periphery of these villages. On present evidence it seems reasonable to argue that most of these sites were broadly contemporary with expansion in the area under the Roman Empire – and perhaps con-

temporary with the suggested programme of cadastration (Abdulkarim 1997). However, confirmation of this hypothesis must await full analysis of the ceramics. Development of the area continued through the Byzantine period, for example as shown by the standing structures and dated building inscriptions within the villages of Burj al-Qa^ci (SHR 868) and Ghour (SHR 670) (see for example *IGLS* V, 2094, 2154–56). Furthermore, the pottery collected from SHR 859, on the edge of the village of Sama³lil, suggests occupation through the Roman and Byzantine periods and into the early Islamic. This finding concurs with a preliminary analysis of the finds collected in 2002 from the deserted village of Dar al-Salaam (SHR 358), which also has indicated occupation continuing into the Umayyad period, and perhaps rather later.

The various groups of enclosures remain harder to date, as ground observation suggested that this very broad category comprises structural entities of several different kinds, which almost certainly date to more than one period. In some cases the enclosures visible on the imagery can be readily identified on the ground. In others they are less obvious on the surface. While some are simply groups of enclosures, others appear also to contain cairns (e.g. 833), in

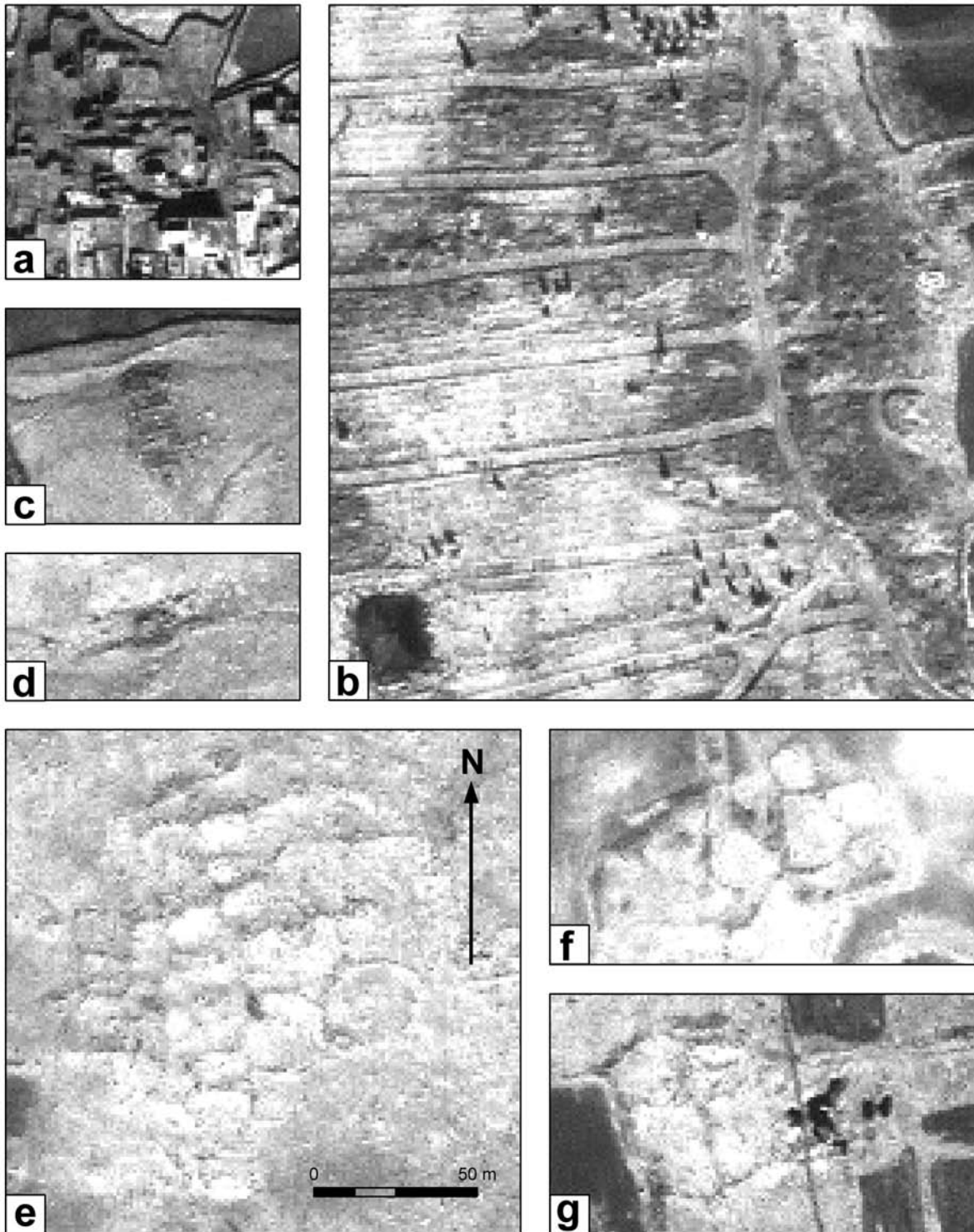


Figure 6. Examples of each of the seven main classes of site in the basalt as initially defined using the satellite imagery are shown all to the scale indicated on (e): (a) Tell – Site 888 at village of al-Hissa; (b) Deserted village – Site 885; (c) Large rectangular structure – Site 841; (d) Small square structure – Site 856; (e) Irregular enclosure cluster – Site 833; (f) Rectilinear enclosure cluster – Site 858; (g) Sinuous wall group – Site 386.

some of which the internal cists have been exposed. Within the basalt as a whole, cairns tend to be concentrated along ridge-lines where they overlook the valley floor below. In some cases cairns appear to be situated within networks of low stone wall alignments. There also exist one or two large circular structures with complex internal divisions, some of which contain groups of cairns. While hard to dissect at present, taken together the appearance of these features points to a phase of landscape modification altogether earlier than that of the Roman period.

The category 'Other site types', consisted of a catch-all for areas where the reflectance patterns visible in the imagery suggested the presence of concentrations of basalt perhaps indicative of collapsed structures. In practice, ground observation revealed that in a number of cases, while these did indeed indicate the presence of concentrations of stone, these represented not collapsed structures but locations where basalt is, or has in the past been, extracted or worked (e.g. 387), and which consisted of a spread of blocks, cobbles, or shattered fragments. That said, this category also included 889, which ground observation revealed as a small (2×2 m.) platform composed of dressed basalt blocks, preserved some 0.4 m. in height, and beside which lay part of a collapsed basalt column.

The foregoing discussion should provide an indication of both the value, and limitations, of satellite imagery for archaeological prospection in the basalt, and there are several preliminary conclusions that can be drawn from the fieldwork. Clearly, high resolution satellite imagery, when accurately geo-referenced, can greatly facilitate the rapid identification and accurate location of points of potential archaeological interest. Moreover, it is able to do so, despite an extensive surface coverage of basalt rubble and boulders, which would render systematic prospection on the ground laborious indeed. In addition, it has proved invaluable as a means of assessing overall patterning in the distribution of features such as walls and cairns.

It is also possible, to some extent, to identify specific categories of feature on the basis of image data alone. However, its value as a classificatory tool declines as features become smaller and less geometrically precise, and a truly accurate interpretation requires that sites, or at least a good-sized sample of such, be ground observed. Generally, the categories were successfully vindicated and the vast majority of potential sites provided confirmatory archaeological evidence on ground observation. The latter also added a substantial amount of detail in terms of the relationship

between surface evidence and reflectance patterns, a topic which deserves a more sophisticated treatment elsewhere. However, it must be understood that any classification scheme derived from imagery will inevitably be heavily based upon surface morphology, and there may be no simple relationship between such categories and the function or date of the individual structures assigned to it. For example, ground observation revealed that the category 'rectilinear and square structures' encompassed a diverse range of site-types including ritual sites, tombs and storage buildings. In summary, while high resolution imagery does not represent a panacea, for the organization of fieldwork such as that in the basalt landscape, it surely represents the best addition to the archaeologist's tool-kit in many decades.

6. Summary of settlement data

Prehistoric

Thus far, few Neolithic sites have been recorded, and unequivocal aceramic Neolithic material has not been recovered in significant quantities. There are hints, though, of Neolithic occupation buried below later tell deposits, in particular at sites located close to the Orontes. However, field-walking undertaken close to the Orontes river revealed that the spread of Neolithic and Chalcolithic material in the fields east of the small prehistoric tell of Arjoun is considerably larger than the 8 ha. indicated in the recent excavation report (Parr *et al.* 2003, 11), and appears to extend to 12 ha. at least. This presence of substantial concentrations of early occupation in the immediate vicinity of the Orontes river, suggests that other such riverbank concentrations of early settlement may lie under the waters of the present-day Lake Qatina (the level of which was raised by a dam of probable Roman date) and along the banks of the river in the NSA, north of Homs.

More surprising however, was the identification of an extensive area of Neolithic activity in the basalt (Site 666). This site was recognized from satellite imagery as showing a mass of walls, quite different in shape from the orthogonal arrangement of the Roman field systems. Some of these walls may represent the remains of collapsed stone-buildings. Ground investigation revealed the presence of bodysherds from basalt-tempered pottery and a range of chipped stone, including some fragments of obsidian. The discovery of this site and the major occupation around Arjoun in the southern area offers the possibility of an interesting comparison between Neolithic occupation in two quite different environmental zones.

Bronze and Iron Ages

The first widespread evidence of settlement at sites in the SSA located some way east of the Orontes relates to the EB IV period, when diagnostic ceramics appear on a number of tells. This pattern is consistent with recent evidence for a major expansion of settlement at this time in the area of the steppe margins to the north and east of Salamiyah (Geyer and Calvet 2001, 61, fig. 3). However in contrast to the steppe margins, which saw a significant abatement of settlement with the Middle Bronze Age, the SSA sees continued occupation through the second and first millennia BC. It is worth noting that 'off-site' field walking has added relatively little to the pattern of Bronze and Iron Age settlement, which still appears to be restricted to large tells close to the Orontes and smaller tells located along the relict wadi systems. The one exception to this is the presence of a distinct area (8–9 ha.) of off-tell settlement to the north and west of Tell Arquni (254). First observed on the imagery, this feature was subsequently confirmed by surface collection. Similar off-tell occupation has not yet been recognized at other small tells in the SSA.

In contrast, evidence for occupation in the basalt consists mainly of numerous stone cairns, mainly disturbed, and some of which exhibit a central chamber composed of vertical orthostats. These are augmented by occasional, hard to date, settlement remains including clusters of structures and the occasional large circular enclosure. The latter are particularly intriguing because of the parallels for this form of architecture that have been noted both at Rawda to the east (Geyer and Calvet 2001, 64–65, fig. 5) and others identified around Khirbat al-Samra in northern Jordan and elsewhere in the southern Levant (Braemer and Sapin 2001). The chronology of these sites is currently problematic because of the inherent difficulty in dating the basalt-tempered body sherds which appear to be associated both with these sites and concentrations of cairns. At present, the status of pre-classical occupation on the tell sites in the basalt remains uncertain, although the presence of some Bronze or Iron Age occupation should not be ruled out.

The bulk of the pre-Classical surface pottery collected in the basalt landscape was of a red-brown basalt-tempered fabric, often with a dark grey core. This material is probably of local manufacture, and may have continued in production, with variations over several millennia. Although few diagnostic forms have been identified, our initial impression is that this material is likely to be indicative of the fourth and third millennia BC, although it may well

have continued in use rather later than this. Whatever the case, it is the basalt-tempered pottery that is most obviously present in the vicinity of clusters of enclosures and around concentrations of burial cairns.

Graeco-Roman period

In the SSA the major shift of settlement away from tells appears to have begun during the Hellenistic rather than the Roman period as suggested in our initial report (Philip *et al.* 2002, 19), that is broadly contemporary with the re-foundation of the settlement of Laodicea ad Libanum, located immediately below Tell Nebi Mend (Grainger 1990). The marl landscape of the Homs region thus contrasts with both north Mesopotamia and the southern Levant, both of which appear to witness a major phase of settlement dispersal during the Iron Age (Wilkinson 2003, 130–134). At this preliminary stage of analysis, the evidence suggests that a pattern of relatively small rural settlements continued through the Roman and Byzantine periods. However, a detailed account of the fluctuations in the pattern of activity from the Hellenistic to the Byzantine periods will require full analysis of the ceramics.

Many of the 'classical' period sites in the SSA were initially identified on the satellite imagery as areas of increased reflectance. On the ground they consist of a combination of area(s) of distinctive light coloured soils, and surface scatters of ceramic and tile, alongside occasional fragments of stone architectural elements. While there exists considerable variation in the size of individual sites, by far the majority lie in the range 1–4 ha., inasmuch as this can be established from the extent of the soil marks, and the associated artefact scatters. Until artefact analysis or other procedures indicates differently, it seems reasonable to assume that most of these represent small agricultural settlements.

This is reinforced by the fact that in the SSA the most common agricultural installations are conical rotary grinders and large stone press weights. These weights are generally made from either basalt or cemented gravels, and typologically the majority belong to what Frankel (1999) terms the Kasfa type, a form which he noted as rare in Palestine, and a type which has not yet been reported from the basalt. In the southern study area, of particular interest was the discovery of two Roman limestone altars each around 1.5 m. high, in a field just below the new bridge over the Orontes River near Arjoune. Local farmers report that these were removed from a location north of Tell Nebi Mend at the time of the construction of the new bridge. The presence of

such substantial and well-carved altars suggests the presence of a Roman rural sanctuary on the road between Emesa (Homs) and Laodicea ad Libanum.

While the classical period occupation in the SSA is characterised by ploughed out settlement remains, the pattern in the basalt region is very different. Essentially, settlement in the NSA consists only of nucleated villages of various sizes, with little evidence for many isolated buildings away from these villages. These villages seem to be quite evenly spaced across the survey area, and at points where perennial supplies of water can be obtained. The majority of such villages are to be found centred upon the remains of low tells, apart from a few small 'hamlet'-sized settlements such as Snaisel and Jawlak which seem to be positioned along the line of the road from Homs to the important Roman settlements of Raphanea and Mariamme, modern Rafniya and Mariamin respectively (Mouterde and Poidebard 1945). Furthermore, many of the settlements of the Graeco-Roman period within the basalt exhibit a ring of individual buildings on the periphery of the village, which have been interpreted as granaries, tombs and farmhouses. Such a phenomenon has been noted in other areas (e.g. Hirschfeld 2003, fig. 3). In contrast, the Graeco-Roman settlement of the SSA is less evenly dispersed across the landscape, with concentrations of settlement near the south shore of Lake Qatina and the line of the Classical period road from Homs to Laodicea ad Libanum, and along the course of the river Orontes. However, within these areas of settlement concentration, the distances between the settlements seem to be quite uniform.

It is already becoming clear that prior to the Graeco-Roman period the marl and basalt zones show very different patterns of landscape usage. It is not yet clear, however, whether this reflects two distinct populations, or the flexible exploitation by a single population of a diverse range of opportunities. For the later periods, the difference between the remains of the stone-built villages of the basalt, and the artefact scatters of the marls are obvious in archaeological terms. However, the difficulty will be to find ways, using geophysics, artefactual analysis etc. in which two such different datasets can be meaningfully compared in functional or organisational terms. As the basic distribution of the evidence is beginning to show, future work will also have to accommodate a wide range of different settlement and land use histories along with various geomorphological and taphonomic processes. The challenge will be to construct a single overriding methodological framework which, whilst allowing the interactions between the various factors to be

explored, will also permit a cohesive narrative to be produced.

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