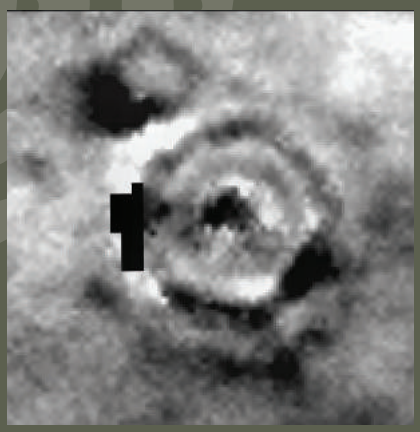
NEW GLOBAL PERSPECTIVES ON ARCHAEOLOGICAL PROSPECTION

13TH INTERNATIONAL CONFERENCE ON ARCHAEOLOGICAL PROSPECTION
28 AUGUST - 1 SEPTEMBER 2019
SLIGO - IRELAND



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Cover images:

Top Left: Earth resistance data from a circular ditched monument SL014-209041-, Carrowmore Megalithic Cemetery, Co. Sligo.
Top right: Electromagnetic induction survey of a fulacht fia, monument SL008-205----, Coney Island, Co. Sligo. Photograph: Ciarán Davis
Bottom left: Megalithic Passage Tomb, monument SL014-209006-, Carrowmore Megalithic Cemetery, Co. Sligo
Bottom right: Court Tomb, monument SL015-050----, Deerpark, Co. Sligo

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Contents

Ancient Charax Spasinou (Iraq) – Interpreting a multi-phase city based on magnetometer survey data

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Historical background and project aims

The ancient city of Charax Spasinou was situated in southern Iraq near Basra, between the rivers Tigris and Eulaios, at the modern location Jebel Khayaber. It offers the opportunity to study the layout and functionality of a major urban city dating from the Seleucid to the Sasanian period. The city was originally founded by Alexander the Great and given the name Alexandria (Campbell *et al.* 2019: 215). After its destruction by flooding, it was re-founded in BC 166/165 by the Seleucid king Antiochos IV and re-named Antiochia. This settlement was again destroyed by flooding. It was rebuilt under Hyspaosines and named Charax Spasinou (ancient Greek for 'palisade of *[Hy]spa[o]sines'*). Due to its favourable location Charax became a very important harbour in the Persian Gulf area and a major trading point between India and Babylonia, supplying goods further up to the Mediterranean (Campbell *et al.* 2019).

Charax was first identified with Jebel Khayaber in 1965, when distinctive ramparts with an average height of 4m to 6m were documented (Hansman 1967: 39). In 2016 Jane Moon, Robert Killick and Stuart Campbell (University of Manchester), together with Stefan Hauser (University of Konstanz) and the Iraqi State Board for Antiquities & Heritage, started a project to document and protect the ancient city of Charax Spasinou. The aim is to investigate the site through an integration of remote sensing technologies and surface survey as well as limited excavations in order to reconstruct the city layout, its chronology and to document its state of preservation for purposes of conservation and site management.

Methods

The mapping of *c.* 12km² was carried out using a UAV, covering the probable extent of the city and part of the wider landscape. Using Agisoft Photoscan, the images were compiled into a 3D model of the surface of the site. Together with over 60 ground control points, this allows the creation of digital elevation models (DEM) and orthomosaics with a resolution of *c.* 4cm per pixel. The upper levels of the soil are heavily salinated. Different rates of evaporation and precipitation above and between buried walls lead to visible, variable salt deposits on the surface after rain. This allows the outlines of buildings to be observed over some portions of the site (Fig. 1).

For the magnetometer survey, in March 2016 Jörg Fassbinder used a Scintrex SM4G-Special Caesium magnetometer in a duo-sensor and total field configuration. The device was carried *c.* 30cm above the ground at a sampling rate of 25cm x 50cm. The total Earth's magnetic field at Charax in October 2016 was *c.* 45700,00 ±20nT, sensitivity ±0.01nT. An area of almost 10ha was surveyed.

During the following three field seasons in 2017-18, Stuart Campbell used two Bartington Grad601 dual channel fluxgate gradiometers with a sampling rate of 12.5cm x 50cm. Area A was measured with a range of ±1000nT and Areas A1 to F with a range of ±100nT, sensitivity ±0.3nT (Fig. 2). These further surveys have covered a total of nearly 90ha.

Fig. 1. Drone photo with salt lines.

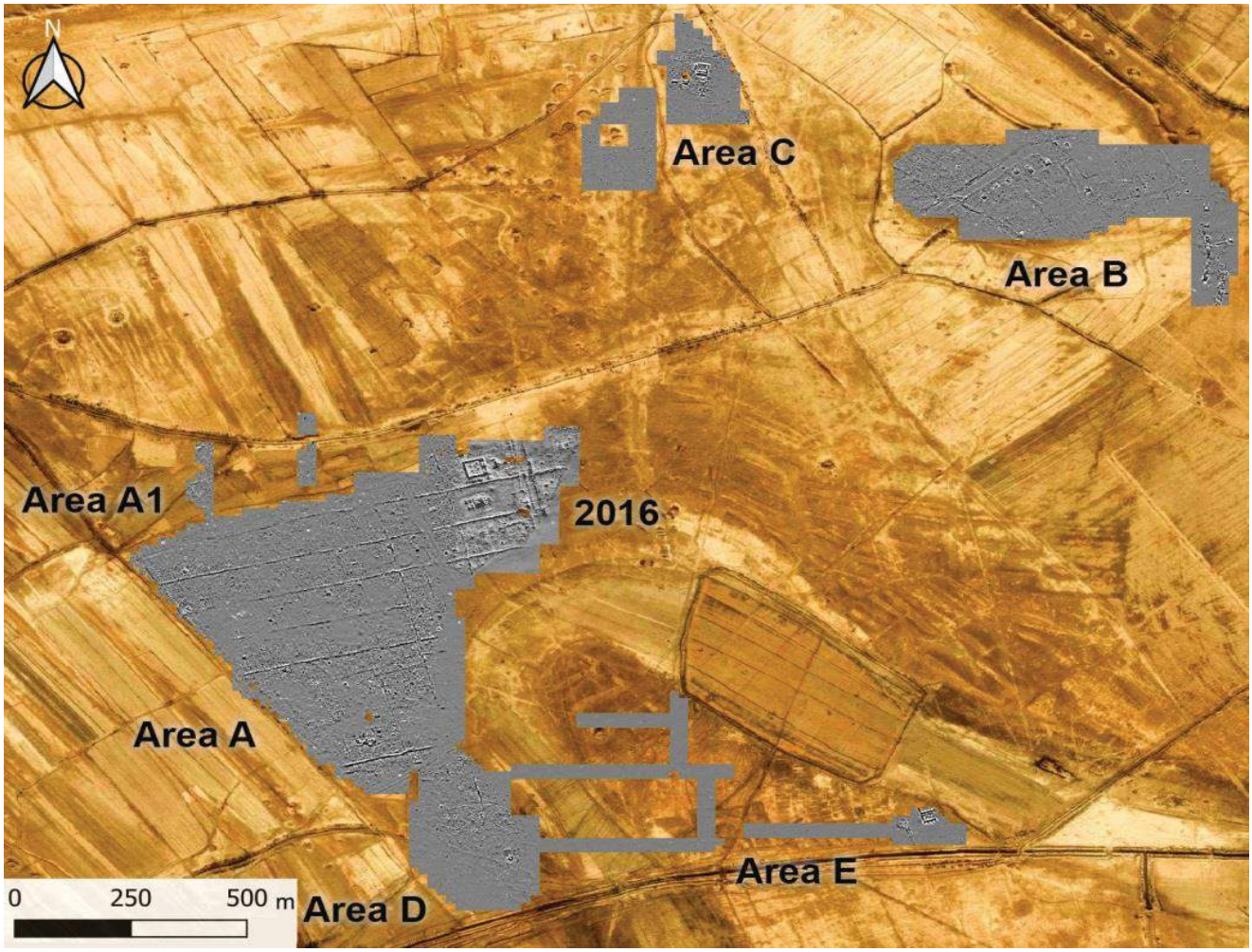

Fig. 2. Orthophoto from drone pictures with overlay of the magnetic prospection data.

Results and interpretation

The northern and eastern city limits are well preserved and marked by sections of the huge rampart over 2.4km long in the northern part and 1.1km in the north-eastern part. Magnetic prospection (Fig. 2. Area B) shows that the rampart continued in the east of the site, changing its direction to run to directly south. The former river course of the Karun has heavily eroded the southern part of the city, beyond the riverbed now visible in satellite images, but the geophysical data confirms the evidence from the surface survey that some settlement still survives to the south of the riverbed. Based on the survey results so far, we might estimate a city area of 700ha. However, the city was not only subject to repeated flooding in antiquity but was damaged by flooding into the 1970s. To date we can only verify good preservation of archaeology over an area of *c.* 150ha.

The 2016 geophysical survey suggested that the streets of the city centre follow the typical Hippodamian grid system with a grid size of around 161m x 88m (550 x 300 Attic Ionic feet), which is one of the largest we know of from the ancient world (Campbell *et al.* 2019: 220). However, the surveys in Areas A and A1, which extend the coverage of the street plan, suggest a more complex picture. The long east-west streets retained a regular spacing and orientation but the north-south streets that defined the city blocks become less regular to the west of the area. While this may be due to long-term subversion of an original urban plan by subsequent construction, it may also suggest that the apparent uniform plan always had some elements that were less tightly planned.

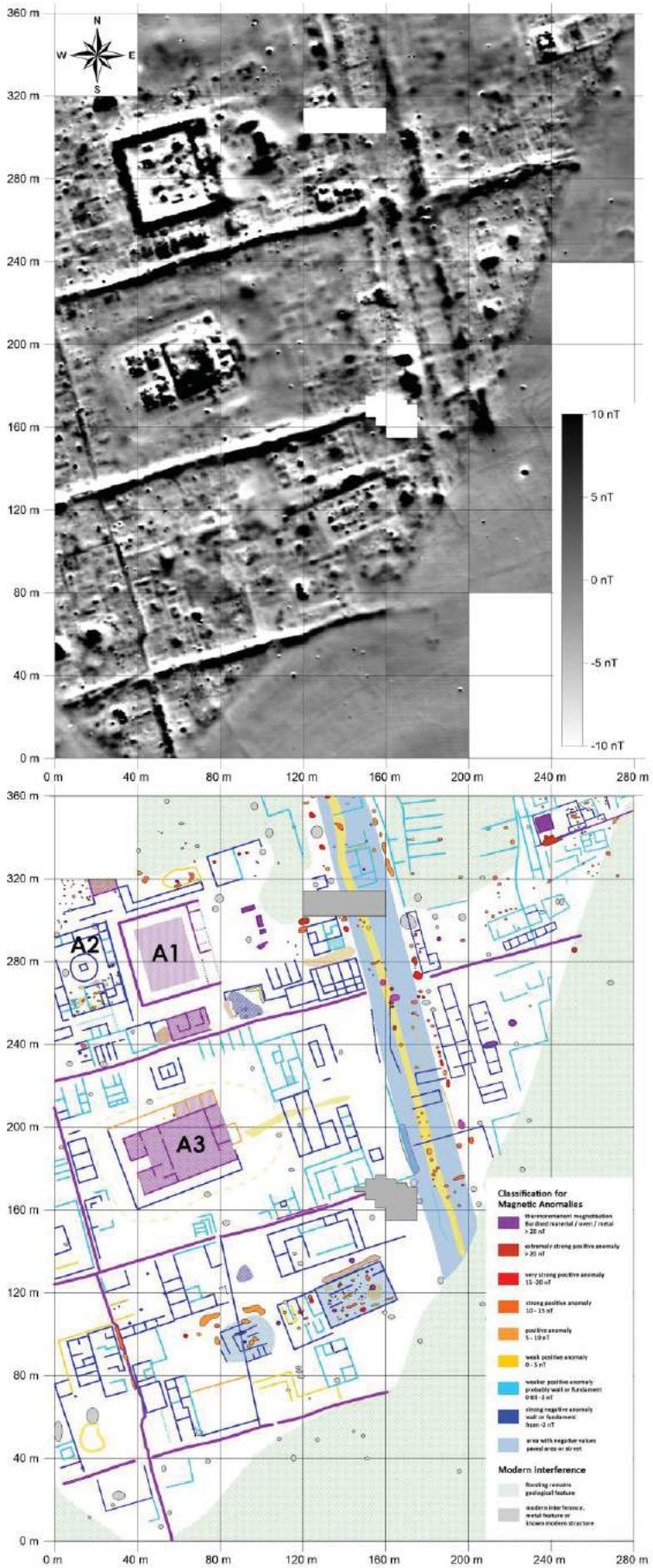

Fig. 3. Magnetic map of the 2016 survey area (sampling rate 25cm x 50cm, interpolated to 25cm x 25cm). Classification and interpretation of the magnetogram based on magnetic value.

The measurements also revealed several monumental buildings, such as temples and royal palaces, but also a wide range of residential buildings. In some places we can easily identify two building phases, mainly through their different orientations (Fig. 3). Around Building A3 we can also recognize removed and levelled ground with later building activities upon it. Building A1 intersects the walls of underlying buildings and the place in front of that building seems levelled, too. Along a central street or canal, which runs North-South and is up to 25m wide, earlier or later building phases are visible, too. In some instances the building sequence can be easily discerned. Studying the properties of the anomalies of these cases is expected to assist in the stratigraphic interpretation of other, less clear examples.

Some buildings have a higher density of high magnetic values, such as Buildings A2 and A4, which might be related to their function and use. Building A2 shows a noticeable combination of a round inner structure with surrounding small rooms. Such a ground plan suggests a *macellum*, which would be quite particular for this region.

While the magnetogram of most portions of the site show a clear picture, many areas show traces of flooding, which eroded the main inner city structures. Nevertheless, our investigations give us a coherent impression of the urban layout and planning. A number of interesting contexts revealed through magnetometry have been or will be further investigated through small-scale excavations, providing an additional data source along with archaeological, airborne and geophysical prospection for the interpretation of the site.

Two evaluation trenches showed that the east-west streets at least appear to have been placed over a drainage sub-structure of re-used storage jars (Campbell *et al.* 2019: 221-222). This arrangement is marked by a thermoremanent signal in the magnetogram. Such a complex drainage system both indicates a high level of investment in urban planning and the importance of resilience in the urban structure in the face of repeated flooding.

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