[Supplementary material]

The origins of Avebury

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Detail of geophysical survey

Please note, a Google Earth overlay file, which encodes the locations of the megaliths revealed by the surveys discussed below, can be accessed with the supplementary. It is in a KMZ format, which is simply a compressed version of the more familiar KML, and can be directly opened in Google Earth. This dataset is designed to allow readers to freely explore these stone positions in relation to the Avebury monument and its wider landscape.

Introduction

Whilst the entire henge has recently been surveyed using gradiometry as part of Darvill and Lüth's on-going studies of the Avebury landscape, the traces of former megalithic settings are features that have proven stubbornly unresponsive to gradiometer survey, limiting its effectiveness in the detection of stone-related features. Take for example the provisional results collected by Darvill and Lüth across the Southern Inner Circle, which show little beyond metallic debris (Darvill & Lüth 2014). The extent of prior resistance surveys in the area of the Southern Inner Circle is indicated in Figure S1. The area was covered in 1989 by the Ancient Monuments Laboratory using an RM4 and DL10 twin probe configuration and a typical 1m sampling interval (see Clark 1990: Fig 35 for a photographic record of this survey). The results were published by Ucko *et al.* (1991: 219–220) and reflect the instrumentation and data processing options available at the time. The results of this survey were far from conclusive, the authors noting that "[a]lthough resistivity anomalies are present throughout the survey data, it is not possible to discriminate with any confidence between those reflecting possible prehistoric features and those which are natural or spurious" (Ucko *et al*. 1991: 220). They illustrated this by noting how Keiller's excavated area is indistinguishable (in terms of anomalies) from the remainder, concluding that the "whole of this area of the site therefore continues to be an enigma” (Ucko *et al*. 1991: 220). A more recent survey was carried out by Martin Papworth (2003) of the National Trust, using RM15 instrumentation and a 0.5 × 1.0m sampling resolution. This demonstrated conclusively how effective soil resistance survey could be in detecting buried sarsens, but focused solely upon the eastern half of the quadrant, not extending as far to the west as the Southern Inner Circle (Papworth 2012).

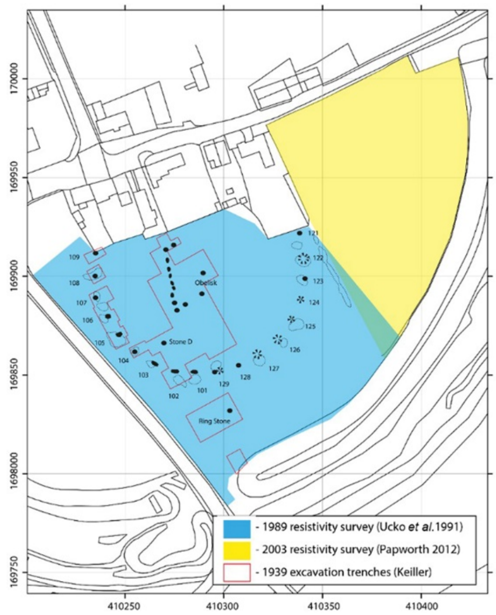

Figure S1. Previous soil resistance surveys in the south-eastern quadrant of Avebury. Image incorporates data ©Crown Copyright/database right 2012. An Ordnance Survey/EDINA supplied service.

Given the known presence of substantial buried sarsen stones at Avebury alongside highly compacted stoneholes (the upright sarsens weighing anywhere between 15 and 100 tonnes) it is particularly surprising that to date no extensive GPR surveys have been attempted at the site. This is despite the success of GPR in detecting buried megaliths in an evaluation carried out in 2000 as part of work on the line of the Beckhampton Avenue (Gillings *et al*. 2008: 64–66).

The 2017 survey

An area of 0.567 hectares was surveyed to the immediate east (and over-lapping with) the area excavated by Keiller in 1939. The survey area also overlapped with the Papworth survey block further to the east. In practice 12 full and 5 partial $20m^2$ grid squares were surveyed, aligned as closely as possible to a reconstruction of Keiller’s own excavation grid (Figure S2).

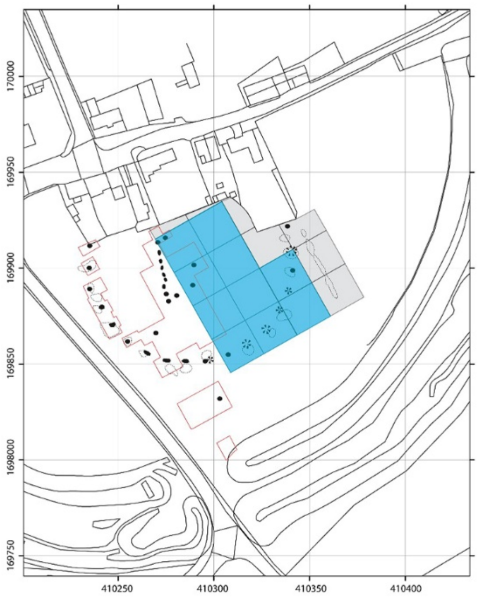

Figure S2. The survey area (shaded grey). The Square Array resistivity survey was limited to the subset of full squares (shaded in blue). Image incorporates data ©Crown Copyright/database right 2012. An Ordnance Survey/EDINA supplied service.

The soil resistance survey

Soil resistance survey was carried out initially using a Geoscan RM85 and multiplexed 3 probe parallel twin array, with a probe spacing of 0.5m and traverse and sampling intervals of 0.5 and 1.0m respectively. In an attempt to maximise the amount of information recovered this was followed by a second survey of 10 of the full grid squares using a cart-based 0.75m^2 square array (Clark 1990: 46–47) with a traverse interval of 1.0m and sampling interval of 0.25m (Geoscan RM85 & MSP25 cart). To remove any twin-peaking effects two sets of readings were logged at right-angles to one another (‘alpha’ and ‘beta’ datasets). All data was processed using the Geoplot 4 (Beta) software suite and the survey grid was geo-referenced using a Leica DGPS post-processed to Ordnance Survey CORs data. It should be noted that at the time of survey the ground was unexpectedly dry, with local National Trust staff noting anecdotally that the preceding winter had been the driest in memory. This was certainly noted during the twin-probe survey, where high contact resistance resulted in very noisy data across a number of the grids where the mobile probes had not been inserted to a sufficient depth.

These grids had to be re-surveyed. In the case of the cart-based square array, where insertion depth was less straightforward to control, it resulted in excessively noisy data that masked any archaeological features. In light of this, it would be prudent to repeat the square array survey at a later date when ground conditions are much wetter. The results of the survey are presented below. Figure S3 displays the basic data, with the high and low-pass filtered datasets displayed in Figure S4.

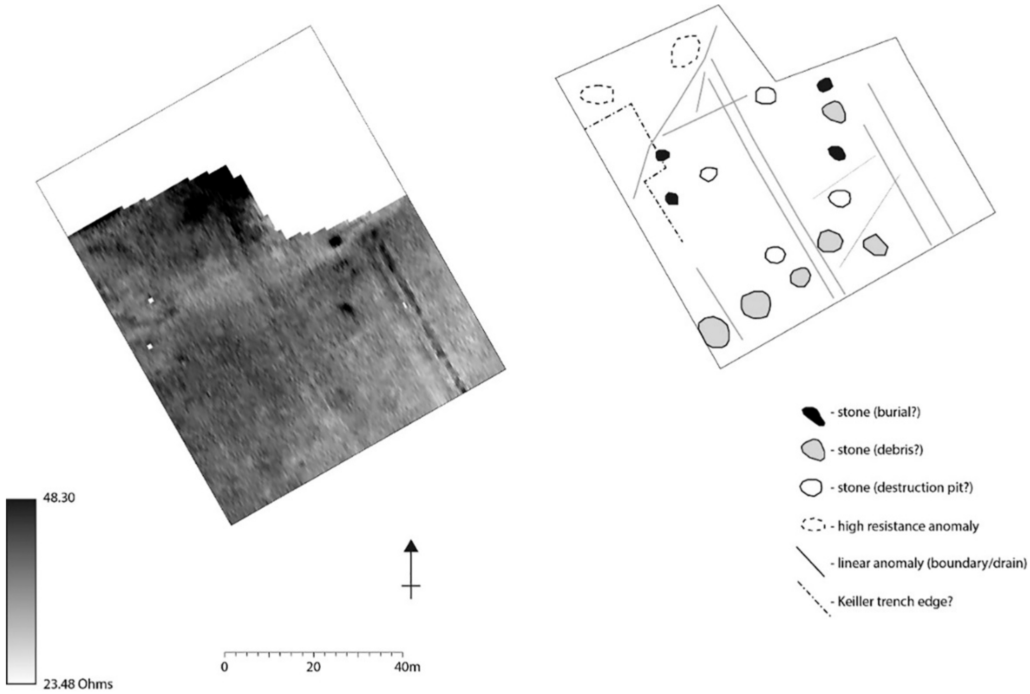

Figure S3. The twin-probe resistivity results (displaying +/- 3 standard deviations).

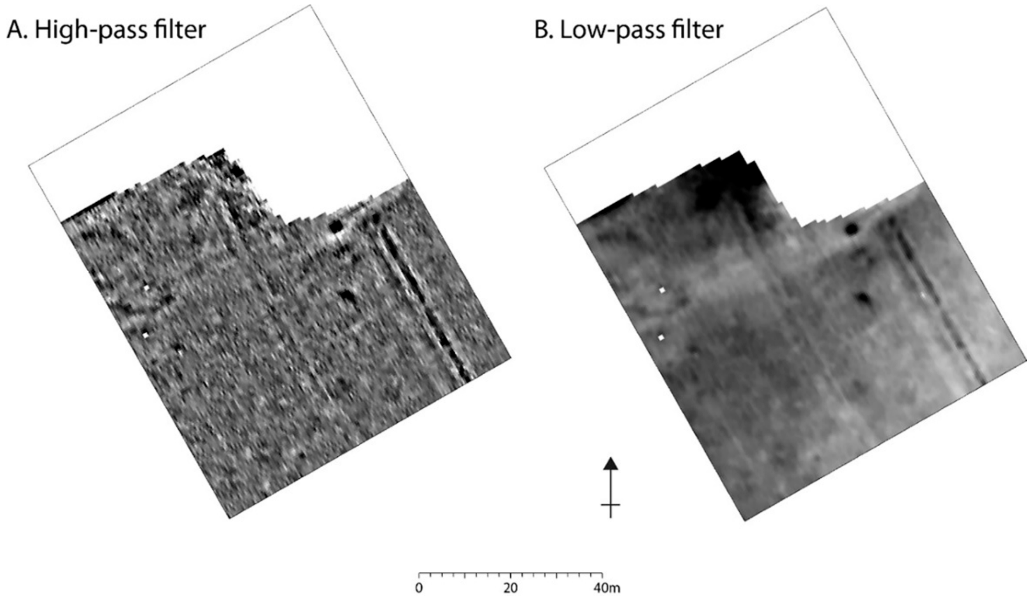

Figure S4. The data after A. High-pass filtering (to emphasise smaller amplitude anomalies) and B. Low-pass filtering (to emphasise broader trends). Data is displayed at -3/3 standard deviations.

The results from the square array survey are presented in Figure S5—please note that only full grid squares without substantial linear earthworks (that made traversing the cart impossible) were surveyed as indicated on Figure S2. With the exception of the faint traces of the main NW/SE boundary feature, the noisiness of the data makes it difficult to discern any clear archaeological features. What is interesting is that the area of the Keiller trench does appear to be visible as a markedly quieter band on the SW edge of the survey area – presumably the looser fill retaining more moisture and thus ameliorating the contact-resistance issues encountered across the remainder of the surveyed area.

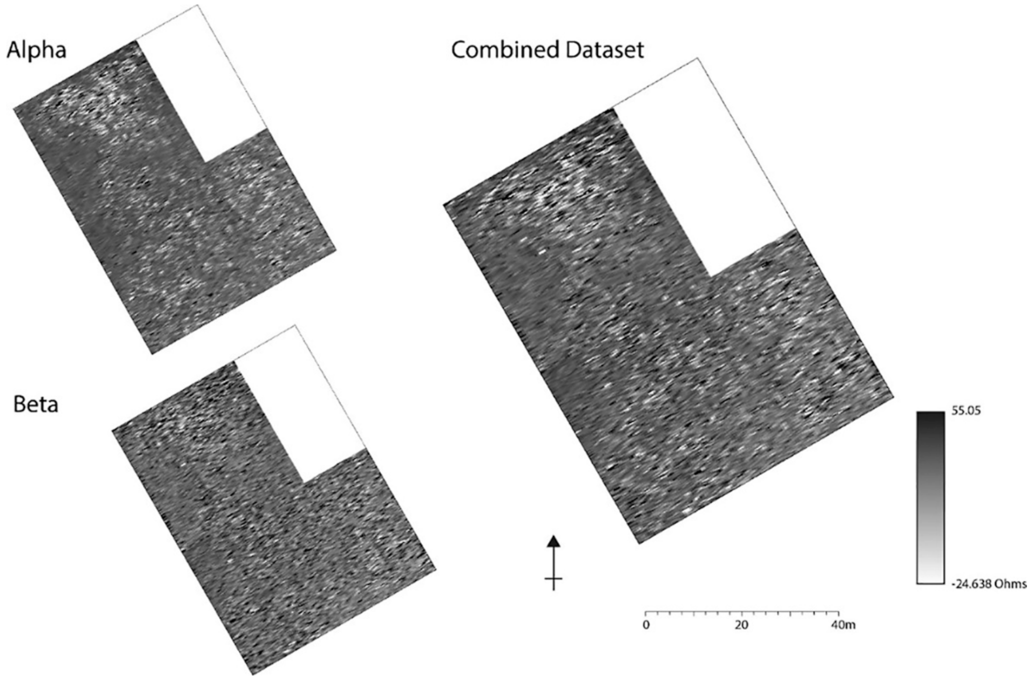

Figure S5. Square array resistivity data—Alpha, Beta and combined datasets.

GPR survey

The GPR survey was conducted using a Sensors and Software Noggin Plus system with 500Mhz antenna and Smartcart. Data were collected along traverses spaced 0.5m apart along the x direction of each survey grid and processed using GPR Slice software. The different survey profiles were presented in their relative positions, and all profiles were then processed to remove background noise. A bandpass filter was applied to each profile to remove all high and low frequency readings. The presence of hyperbola in the data were utilised to produce an estimation of signal velocity through the deposits, facilitating a calculation of the depth of different features across each site. Profiles were then converted into grid data and were sliced horizontally to produce a series of time slices from the surface to a depth of 3.1m (Figure S6).

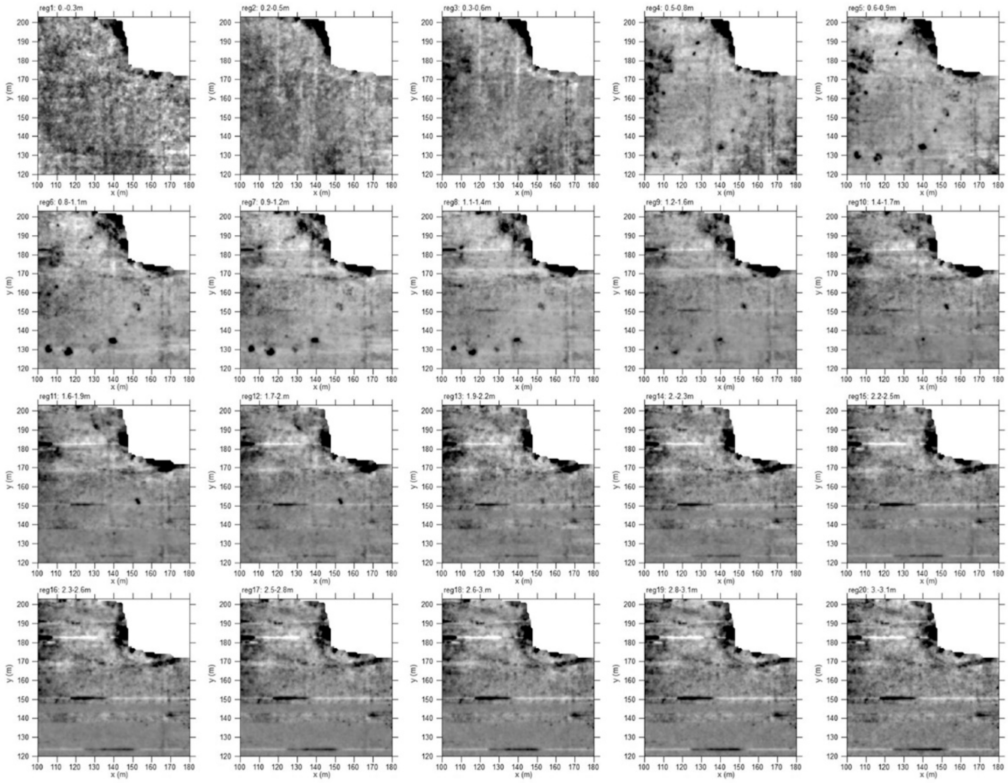

Figure S6. GPR depth slices from surface to 3.1m.

References

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