



## **Large-scale high-resolution non-invasive geophysical archaeological prospection for the investigation of entire archaeological landscapes**

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Over the past three years the 2010 in Vienna founded Ludwig Boltzmann Institute for Archaeological Prospection and Virtual Archaeology (<http://archpro.lbg.ac.at>), in collaboration with its ten European partner organizations, has made considerable progress in the development and application of near-surface geophysical survey technology and methodology mapping square kilometres rather than hectares in unprecedented spatial resolution.

The use of multiple novel motorized multichannel GPR and magnetometer systems (both Förster/Fluxgate and Cesium type) in combination with advanced and centimetre precise positioning systems (robotic totalstations and Realtime Kinematic GPS) permitting efficient navigation in open fields have resulted in comprehensive blanket coverage archaeological prospection surveys of important cultural heritage sites, such as the landscape surrounding Stonehenge in the framework of the Stonehenge Hidden Landscape Project, the mapping of the World Cultural Heritage site Birka-Hovgården in Sweden, or the detailed investigation of the Roman urban landscape of Carnuntum near Vienna.

Efficient state-of-the-art archaeological prospection survey solutions require adequate fieldwork methodologies and appropriate data processing tools for timely quality control of the data in the field and large-scale data visualisations after arrival back in the office. The processed and optimized visualisations of the geophysical measurement data provide the basis for subsequent archaeological interpretation. Integration of the high-resolution geophysical prospection data with remote sensing data acquired through aerial photography, airborne laser- and hyperspectral-scanning, terrestrial laser-scanning or detailed digital terrain models derived through photogrammetric methods permits improved understanding and spatial analysis as well as the preparation of comprehensible presentations for the stakeholders (scientific community, cultural heritage managers, public).

Of paramount importance in regard to large-scale high-resolution data acquisition when using motorized survey systems is the exact data positioning as well as the removal of any measurement effects caused by the survey vehicle. The large amount of generated data requires efficient semi-automatic and automatized tools for the extraction and rendering of important information. Semi-automatic data segmentation and classification precede the detailed 3D archaeological interpretation, which still requires considerable manual input.

We present the latest technological and methodological developments in regard to motorized near-surface GPR and magnetometer prospection as well as application examples from different iconic European archaeological sites.