

EVALUATION OF AIRBORNE IMAGING SPECTROSCOPY FOR THE DETECTION OF ARCHAEOLOGICAL VEGETATION MARKS

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Abstract

Airborne Imaging Spectroscopy (AIS) is a relatively young technique, especially when applied to the specific subject of archaeological prospection. The possibilities AIS offers in visualizing features invisible to the human eye is, however, of great interest in airborne reconnaissance research. So far, the unavailability of AIS data with a satisfying Ground Sampling Distance (GSD) and the lack of proper image processing routines have restricted the general use and advanced interpretation of these complex data for archaeological purposes. The aim of this paper is to find a generally applicable workflow for the extraction of archaeological information from such high spatial resolution AIS imagery (40cm GSD) and a means to quantify a potential gain over aerial photography. The Roman town of Carnuntum (Austria) is perfectly suited for this task, since five decades of oblique and vertical airborne photography have yielded an enormous amount of archaeological interpretations. To be able to compare these results with AIS-based interpretations, AIS data had to be processed first. Using novel image processing algorithms embedded in CropMark, a MATLAB toolbox specifically developed for the archaeological processing of AIS imagery, archaeologically relevant vegetation marks could be revealed or seriously enhanced. A comparison with the simultaneously acquired vertical aerial photographs showed that the processed AIS data revealed more archaeological information (of which much was only discernible in the invisible spectrum). Afterwards, a variety of quantification approaches clearly demonstrated the gain of AIS-interpretation over aerial photography. Therefore, we propose that the presented workflow can be used as standard way to process and quantify this kind of data.

Keywords: Carnuntum, imaging spectroscopy, vegetation marks, crop marks, hyperspectral scanning, aerial archaeology