Geophysical Research Abstracts,
Vol. 11, EGU2009-4706, 2009
EGU General Assembly 2009

Remote sensing techniques in geo-archaeological research; Case studies in Turkey and Egypt

V. De Laet (1,2), E. Paulissen (1), G. Vertraeten (1), M. Waelkens (3), and H. Willems (4)

(1) Physical and Regional Geography Research Group, Katholieke Universiteit Leuven, Heverlee, Belgium (Veronique.DeLaet@ees.kuleuven.be/+32 16 32 29 80), (2) Centre for Archaeological Sciences, Katholieke Universiteit Leuven, Heverlee, Belgium, (3) Eastern Mediterranean Archaeology, Katholieke Universiteit Leuven, Leuven, Belgium, (4) Near Eastern Studies, Katholieke Universiteit Leuven, Leuven, Belgium

REMOTE SENSING TECHNIQUES IN GEO-ARCHAEOLOGICAL RESEARCH; CASE STUDIES IN TURKEY AND EGYPT

V. DE LAET, E. PAULISSEN, G. VERSTRAETEN, M. WAELKENS, H. WILLEMS

ABSTRACT

The launch of several very high spatial resolution satellite (VHSRS) systems (Ikonos-2, Quickbird-2 and others) in the recent past has provided new possibilities for archaeological research, especially in areas where aerial photography is hampered.

This paper presents an overview of research in the field of archaeological prospecting based on VHSRS imagery and digital image analysis in SW Turkey (Hisar, Sagalassos and Tepe Düzen) and Middle Egypt (Dayr Al-Barshā). The general objective is to evaluate the possibilities of VHSRS remote sensing to detect and automatically classify archaeological features using visual enhancement techniques and pixel- and object-based classification techniques. Focus is also on comparison of the contribution of spectral characteristics and pixel resolution of Quickbird-2 and Ikonos-2 for automatic extraction of ancient features from VHSRS imagery.

Various landscape elements, including archaeological remains, can be automatically classified when their spectral characteristics are different. However, major difficulties arise when extracting and classifying features such as remnants of wall structures, which are composed of the same material as the surrounding substrate. Additionally, archaeological structures do not have unique shape or colour characteristics, which could make the extraction more straightforward. For archaeological sites in general, the accuracy of the automatic extraction depends on several variables: the type and characteristics of VHSRS data, the classification method applied, the spectral variation within the site and the shape characteristics of the remnants. For Sagalassos and Quickbird-2 imagery, object-based extraction appears independent of the site characteristics, which largely influence extraction on Ikonos-2. This study shows that object-based extraction on Quickbird-2 imagery better performs for archaeological applications in general. In contrast to automatic extraction methods, a simple visual interpretation using specific enhancement techniques performs rather well as shown by results from Hisar, Sagalassos, Tepe Düzen and Dayr Al-Barshā. A profound analysis of VHSRS data at Sagalassos reveals that Quickbird-2 outperforms Ikonos-2 for the visual identification of ancient remains due to its enhanced ground resolution.

These results show that satellite remote sensing is not an exclusive prospective technique, but methods and algorithms from the field of digital image analysis nevertheless can be of significant help for the detection and documentation of archaeological features.