Multitemporal analysis of Pleiades data for study of archaeological crop marks

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In this paper we focused our attention on the capability of Pleiades-HR (High-Resolution Optical Imaging Constellation of CNES) satellite data for archaeological applications, ranging from detection to documentation and monitoring from a local analysis (single site) to a landscape view.

Pleiades, launched in 2009, offers advanced technologies in Earth observation capabilities, compared to the previous available high-resolution optical imaging. It provides an optical high-resolution panchromatic (0.5 m) and multispectral (2.0 m) imagery with high quality product available at a global coverage and with a daily observation accessibility to any point on Earth.

It is expected that the Pleiades-HR should provide high capability in detecting underground archaeological structures through the reconnaissance of the so-called "archaeological marks". These marks are generally grouped and named as "soil" and "crop marks" (Lasaponara and Masini 2007; Masini & Lasaponara 2007). In particular, crop marks are changes in crop texture linked to as differences in height or colour of crops which are under stress due to lack of water or deficiencies in other nutrients caused by the presence of masonry structures or ditches in the subsoil. For these reasons, they are generally visible only from an aerial view especially during the spring season.

In this paper, Pleiades-HR were used not only to investigate crop culture during the "favorable vegetative period" (to enhance the presence of subsurface remains) but also the "spectral response" of spontaneous herbaceous plant during less favorable period as for example summer and winter. To assess the capability of Pleiades-HR in capturing "crop signal" linked to archaeological remains we investigated a test area in the Capitanata in Southern Italty, characterised by a long human frequentation from Neolithic to Middle ages

The main interesting result was the capability of multispectral satellite Pleiades-HR data to highlight the presence of 'cultural features' below the surface even during period of year (August, October, etc) generally considered not suitable for crop mark investigations.

Reference:

Lasaponara R., Masini N. 2007, Detection of archaeological crop marks by using satellite QuickBird, Journal of Archaeological Science, 34, pp. 214-221 [ISSN: 0305-4403]

Masini N., Lasaponara R. 2007. Investigating the spectral capability of QuickBird data to detect archaeological remains buried under vegetated and not vegetated areas, Journal of Cultural Heritage, 8 (1), pp. 53-60, Doi : 10.1016/j.culher.2006.06.006