Geophysical Research Abstracts
Vol. 16, EGU2014-17009, 2014
EGU General Assembly 2014

Satellite time series analysis to study the ephemeral nature of archaeological marks

Chris Stewart
Tor Vergata University of Rome (stewartchrisroma@gmail.com)

Archaeological structures buried beneath the ground often leave traces at the surface. These traces can be in the form of differences in soil moisture and composition, or vegetation growth caused for example by increased soil water retention over a buried ditch, or by insufficient soil depth over a buried wall for vegetation to place deep roots. Buried structures also often leave subtle topographic traces at the surface.
Analyses is carried out on the ephemeral characteristics of buried archaeological crop and soil marks over a number of sites around the city of Rome using satellite data from both optical and SAR (Synthetic Aperture Radar) sensors, including Kompsat-2, ALOS PRISM and COSMO SkyMed. The sensitivity of topographic satellite data, obtained by optical photogrammetry and interferometric SAR, is also analysed over the same sites, as well as other sites in Egypt.
The analysis includes a study of the interferometric coherence of successive pairs of a time series of SAR data over sites containing buried structuresto better understand the nature of the vegetated or bare soil surface. To understand the ephemeral nature of archaeological crop and soil marks, the spectral reflectance characteristics of areas where such marks sometimes appear are extracted from a time series of optical multispectral and panchromatic imagery, and their backscatter characteristics extracted from a time series of SAR backscatter amplitude data. The results of this analysis is then compared with the results of the coherence analysis to see if any link can be established between the appearance of archaeological structures and the nature of ground cover.
Results show that archaeological marks in the study areas are more present in SAR backscatter data over vegetated surfaces, rather than bare soil surfaces, but sometimes appear also in bare soil conditions. In the study areas, crop marks appear more distinctly in optical data after long periods without rainfall.
The topographic analysis shows that very high resolution Digital Elevation Models (DEMs) and derived hill-shade images extracted from satellite optical stereo and interferometric SAR data are capable of identifying archaeological features buried beneath the ground that leave a topographic signature at the surface.