



Non invasive techniques on the detection of buried archaeological structures at Tiwanaku (Bolivia)

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The detection of buried adobe structures is a crucial issue for the remote sensing (ground, aerial and satellite) applied to archaeology. These techniques have been extensively used by authors in some archaeological sites in South America with important results [1,2,3]. Therefore, they were invited by Ministerio de Desarrollo de Culturas Unidad Nacional de Arqueología to participate to Kantatalita project at Tiwanaku archaeological site.

Tiwanaku is an important Pre-Columbian archaeological site included in the UNESCO World Heritage List. It is located on the Altiplano of Bolivia, just south of Lake Titicaca and northwest of the capital, La Paz.

Tiwanaku monumental architecture is characterized by large intrusive stones of exceptional dimension of several tons coming from quarries more than 10 kilometers away.

Katatalita site, located at east of the Tiwanaku archaeological site, was interested by non invasive studies. It was highlighted by a recent archaeological study of an Italian-Polish project and it is defined as an important ceremonial architecture with green and red andesite stones connected with the near Akapana pyramids and Kalasasaya temple. In this context, several magnetometer prospections and satellite images gave a scientific and technological support for the archaeological research. Therefore, a multi-scale approach based on the integration of aerial and satellite remote sensing with geophysical techniques was employed in order to provide data useful for archaeological excavations.

The processing of an aerial imagery time series and QuickBird satellite images, allowed for identifying some features related to shallow and buried structures.

Such features were verified by means of geophysical prospections, performed by using the magnetometric method which observed changes in the magnetic field within the first few metres beneath the subsurface detecting buried stones and anomalies linked to ceremonial fire. Moreover, the magnetic investigation was able to detect several stones in the Kantatalita archaeological site which were important to define the main floor of the site.

Finally, the integration of all data acquired by the different non invasive techniques allowed for spatially characterizing the archaeological features, thus providing important information for the planning of the next archaeological campaign scheduled on the Kantatalita project until the 2012.

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[2] Rizzo E., Masini N., Lasaponara R., Orefici G. (2010). ArchaeoGeophysical methods in the Templo del Escalonado (Cahuachi, Nasca, Perú), *Near Surface Geophysics*, 8, 433-439, [doi:10.3997/1873-0604.2010030].

[3] Lasaponara R., Masini N., Rizzo E., Coluzzi R., Orefici G. (2011). New discoveries in the Piramide Naranjada in Cahuachi (Peru) using satellite, Ground Probing Radar and magnetic investigations. *Journal of Archaeological Science*, doi:10.1016/j.jas.2010.12.010